DISSERTATION

TEACHING PATIENT HANDOFFS IN THE AMBULATORY SETTING: A COMPARISON OF THREE INSTRUCTIONAL METHODS

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ABSTRACT

TEACHING PATIENT HANDOFFS IN THE AMBULATORY SETTING: A COMPARISION OF THREE INSTRUCTIONAL METHODS

This quantitative study explored methods of teaching patient handoff and communication skills to health professions students. The researcher sought to answer the following research questions: 1) Does the instructional mode used to deliver patient handoff training influence the participant's behaviors and performance during simulated patient handoffs? 2) Is there a difference between instructional mode groups in the participants' perceptions of their assigned teaching method during the research study? A randomized experimental design with matching was used to examine whether the instructional mode used to deliver patient handoff training influenced the participant's behaviors and performance during simulated patient handoffs. Twenty-eight physician assistant (PA) students were distributed to the three instructional groups in the study: didactic lectures (Group A), simulation of patient handoffs to paramedics (Group B), or no intervention (Group C). All PA students participated in the posttest patient handoff simulation. The results of the first question showed that simulation was more effective in teaching patient handoff skills to physician assistant students when compared to didactic lectures (p = .018) and the traditional PA curriculum (p = .000). For the second question, there were no significant differences in the instructional groups' perceptions of their assigned teaching method. These findings may help guide other physician assistant programs considering introducing patient handoff education in the didactic phase of the curriculum.

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Chapter I: INTRODUCTION

Background

In 2000, the Institute of Medicine (IOM) published the report, *To Err is Human: Building a Safer Health System*, which disclosed shortcomings in patient safety in the United States healthcare system. In the report, it was estimated that 44,000 to 98,000 deaths occur annually in the United States as a result of medical errors (Kohn, L. T., Corrigan, J., & Donaldson, 2000). The report blamed the medical errors on health system failures rather than failures of individual health care workers. Health care professionals are trained to practice as individuals even though their practice environment relies heavily on team-based patient care (Kohn, L. T., Corrigan, J., & Donaldson, 2000). According to the Joint Commission, over two-thirds of the reported sentinel events from 1995 to 2005 were due to breakdown in medical team communication (The Joint Commission, 2008a).

In addition, the IOM estimated that the direct costs of medical errors in U.S. Hospitals exceeds $2 billion annually (Kohn, L. T., Corrigan, J., & Donaldson, 2000). The indirect costs include higher insurance premiums, employee and student absenteeism, lost wages, and a decline in public confidence in the U.S. health system (Baker D.P., Gustafson S., Beaubien J.M., Salas E., 2005).

Interprofessional Collaboration and Communication in Health Care

The 2000 IOM report called for improved interprofessional collaboration and communication in health systems to reduce medical error and improve patient safety (Kohn, L. T., Corrigan, J., & Donaldson, 2000). In 2003, the Institute of Medicine published the report "Health Professions Education: A Bridge to Quality" which called for similar improvements in

communication and teamwork to reduce medical errors. The committee recommended reforming health professions education to achieve "consensus across the health professions on a core set of competencies that includes patient-centered care, interdisciplinary teams, evidence-based practice, quality improvement, and informatics" (Greiner, A.C., Knebel, 2003). U.S. and Canadian experts believe interprofessional teamwork and collaboration are necessary components in health care for better patient outcomes and effective resource management (Ho et al., 2008; Interprofessional Education Collaborative Expert Panel, 2011; Reeves et al., 2010; Smith & Cole, 2009).

Interprofessional Collaboration and Communication in Patient Handoffs

In every medical setting, patients are transferred from one healthcare provider to another. This transfer of care is known in the medical community as the patient handoff or handover (Bost, Crilly, Wallis, Patterson, & Chaboyer, 2010a). In a 2006 survey about patient handoffs, 45% of health care providers identified patient handoffs between ambulatory and acute care to be a significant patient safety risk (Russell, Doggett, Dawda, & Wells, 2013). Often times, there is lack of a formal process for patient handoffs which can hinder patient care. The human factors involved in patient handoffs can result in miscommunication between team members which lead to adverse events and compromised patient safety (Manser, Foster, Gisin, Jaeckel, & Ummenhofer, 2010a). Common barriers to high quality patient handoffs include poor communication skills, poor listening skills, poor leadership, variability in the quality of verbal and written information, and lack of a common language among the different health professions (Bost et al., 2010a).

Interprofessional Education

To improve communication and collaboration among healthcare providers, interprofessional education has become a prominent component in the curriculum in health professions schools (Gough, Hellaby, Jones, & MacKinnon, 2012). Much of the research about interprofessional education has focused on attitudes, perceptions, and roles and responsibilities of the various health professions (Brock et al., 2013; Gough et al., 2012; McNaughton, 2013; Schmitt, Gilbert, Brandt, & Weinstein, 2013).

The acute nature of medicine in an actual patient-care setting can make it difficult for health professions students to safely practice collaborative problem solving (Rodehorst, Wilhelm, & Jensen, 2005). Difficulties establishing interprofessional education opportunities in clinical settings have also been reported due to the differing educational requirements among the health professions, and the difficulty of accommodating multiple learners in a clinical environment (H. V Gilbert, Yan, & Hoffman, 2010). Medical simulation can bridge the gap between didactic learning in the classroom and clinical experience in a medical setting. Medical simulation can provide a safe setting for students to practice interprofessional communication and collaboration, and it can be used to improve patient safety (Gough et al., 2012; Reeves et al., 2010).

In the last decade, the emphasis of interprofessional education has been shifting to improving patient safety and improving teamwork and communication among health professionals (Hugh Barr, Helme, & D'Avray, 2013). There is limited research about which methods of training are most effective in improving students' behaviors and performance (Gough et al., 2012). The goal of this research study was to compare two teaching methods, didactic lectures and medical simulation, to evaluate which type of training was most effective in

improving students' behaviors and performance in a simulated patient handoff in an ambulatory clinic setting.

Interprofessional Education and Patient Handoffs

The research about patient handoff education has focused primarily on medical residents in the hospital setting. For example, extensive research has been conducted about patient handoffs between medical residents during shift changes in pediatric hospitals (Starmer et al., 2014). The Accreditation Council for Graduate Medical Education (ACGME) requires that medical residency programs teach residents the skills necessary to competently transfer a patient between care providers ("ACGME Program Requirements for Graduate Medical Education in Anesthesiology," 2011). Lane-Fall, Brooks, Wilkins, Davis & Riesenberg (2014) reviewed the U.S. literature to develop patient handoff curriculum for anesthesiology residents. They reported that there was limited evidence about which type of instructional modes or evaluation methods were most effective to teach patient handoffs. The most commonly employed teaching methods were simulation or role-playing (Lane-Fall, Meghan B., Brooks, Amber K., Wilkins, Sara A., Davis & Riesenberg, 2014). In a Canadian review of medical education, medical simulation and role playing were cited as the better learning methods to teach patient handoffs when compared to didactic sessions in medical resident education (Masterson, Gill, Turner, Shrichand, & Giuliani, 2013). Beyond residency training, there is a paucity of research about which types of learning methods are most effective to teach patient handoffs in the educational setting, and there is no published research about teaching students to perform patient handoffs in the ambulatory setting.

Purpose of Study

The purpose of this quantitative study was to determine whether the type of instructional mode used to teach patient handoff procedures and communication influences participant behaviors and performance in a simulation-based training curriculum in health professions education. First, the researcher sought to explore whether the addition of patient handoff education to the physician assistant curriculum would improve student performance during a simulated patient handoff. Of particular interest was whether the type of instructional mode used to deliver patient handoff training would influence the participant's behaviors and performance during simulated patient handoffs. The researcher was also interested in exploring whether there was a difference between the instructional mode groups in the participants' perceptions of their assigned teaching method during the research study.

Research Questions

This research project sought to answer the following research questions:

Question 1: To what extent does the instructional mode used to deliver patient handoff training influence the participants' behaviors and performance during simulated patient handoffs?

a. Is there a difference between the three instructional mode groups with regard to the time allowed for questions during the patient handoff as measured by the IMIST-AMBO evaluation tool?
b. Is there a difference between the three instructional mode groups in the time length of the patient handoff as measured by the IMIST-AMBO evaluation tool?

c. Is there a difference between the three instructional mode groups in the information transferred, based on the IMIST-AMBO mnemonic, to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    i. Is there a difference between the three instructional mode groups in the identification of the patient during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    ii. Is there a difference between the three instructional mode groups in the medical complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    iii. Is there a difference between the three instructional mode groups in the information related to the complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    iv. Is there a difference between the three instructional mode groups in the signs and symptoms including vital signs reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    v. Is there a difference between the three instructional mode groups in the treatment and trends reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    vi. Is there a difference between the three instructional mode groups in the allergies reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

vii. Is there a difference between the three instructional mode groups in the medication reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

viii. Is there a difference between the three instructional mode groups in the background history reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

ix. Is there a difference between the three instructional mode groups in the other social information reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

d. Is there a difference between the three instructional mode groups in the organizational structure of information transferred to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?

e. Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the use of the IMIST-AMBO mnemonic pocket card during the patient handoff?

f. Does gender or previous crisis training effect the total IMIST-AMBO evaluation score as measured by the IMIST-AMBO evaluation tool?

Question 2: Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the participants' perceptions of their assigned teaching method during the research study as measured by the Patient Handoff Education survey?

Definition of Terms

Team is defined as a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves mutually accountable (Katzenbach & Smith, 1993).

Teamwork represents a set of values that encourage listening and responding constructively to views expressed by others, giving others the benefit of the doubt, providing support, and recognizing the interests and achievements of others (Katzenbach & Smith, 1993).

Communication is the effective sharing of important information and exchanging of ideas and discussion (Norsen, Opladen, & Quinn, 1995).

Patient handoffs is the transfer of patient information, and responsibility from one medical provider to another (Bost et al., 2010a).

Collaborative teamwork is "a higher level of team engagement, including respectful understanding of diverse scopes of practice and a value of the unique contributions that each profession brings to the team" (Greer & Clay, 2010).

Medical simulation has been defined as ''a person, device, or set of conditions which attempts to present the evaluation of problems authentically, readily available at any time, and can reproduce a wide variety of clinical conditions (Scalese, Obeso, & Issenberg, 2008).

Interprofessional education has been defined as 'two or more professions learning from and about each other to improve collaboration and the quality of care' (H. Barr, 2001).

Interprofessional simulation is two or more professions interacting in a highly realistic environment to learn from and about each other in a safe, controlled environment (Gough et al., 2012).

Delimitations

This study was delimited to health professions students from a California university. This university was referred to as Institution A. Institution A was a private, not-for-profit, comprehensive university located in southern California in the United States. The institution was regionally accredited by the Western Association of Schools and Colleges (WASC). The institution's willingness to participate, as well as the type of health professions students at the university was the reason the institution was selected for the study.

Assumptions and Limitations

Valid and reliable interpretation of the participant performance scores were limited by the convenience sample of health profession students from the California institution. The type of health profession students in the study may limit the generalizability of the results of the study to other health professions students and disciplines. In addition, the results of this study pertain to the teaching and training of students and may not be generalizable to experienced health professionals in clinical settings. Lastly, the acute care scenario involved pre-hospital and ambulatory-based health professionals who may limit the generalizability of the results to other health care professionals and settings.

Significance of the Study

The results of this study add to the limited research about the teaching of interprofessional communication and collaboration of office-based health professions students. Knowing whether the type of instructional mode affects students' performance in a clinical setting may help institutions in the development and implementation of curriculum to teach patient handoffs and communication to their student learners. In addition, the findings in this study may encourage collaboration between technical and health professions institutions.

The practical significance and motivation for this study was to contribute to the limited research about patient handoffs in the ambulatory setting. The vast majority of research about patient handoffs has focused on the acute care setting. Since most care occurs in the ambulatory setting, the information found in this study could enhance the processes to improve patient safety and outcomes during patient transfer to higher acuity facilities.

Researcher's Perspective

The contacts within institution A were established through working relationships with professional associates in the institution. The focus of the study was chosen due to the researcher's personal interest and experience in the fields of medicine, medical simulation and interprofessional education. The researcher is a physician assistant and a director of a physician assistant school. Healthcare communication and interprofessional practice are important aspects of the physician assistant profession. The Provost of the University recommended interprofessional education as a dissertation topic since this was an important initiative for the University. Concurrently, the physician assistant school was building a simulation laboratory. Based on these events, the researcher decided to explore the topics of healthcare communication, and patient handoff skills as they relate to interprofessional education and medical simulation.

The type of health professions students were chosen based on the researcher's experience in the ambulatory setting. The researcher was interested in studying the communication needed to transfer a patient from the primary care clinic to an acute care setting. Paramedics are often the intermediary for this transfer of patient care. Accurate and clear communication between the primary care providers and the paramedics is a crucial step in transferring the patient's care to the emergency department. Since paramedic students are usually trained at technical institutions,

other health professions students, such as the physician assistant students have limited opportunities to interact and practice teamwork skills with them.

CHAPTER II: LITERATURE REVIEW

In order to understand the concepts of patient handoffs, interprofessional education, and medical simulation, the medical literature was reviewed and synthesized. Literature from medicine, paramedic, nursing, health professions, psychology, sociology, and pharmacy disciplines were reviewed through access to PubMed, CINAHL, OVID, Academic Search Premier, PsycINFO, and ProQuest Nursing & Allied Health Source online databases. The search terms included combinations of the following terms: interprofessional, interprofessional education, patient safety, patient outcome, clinical outcome, ambulatory, outpatient, paramedic, patient handoff, patient handover, handoff mnemonics, and simulation.

Patient Handoffs

Transferring patient information between healthcare providers is a crucial component of effective transitions in care. Healthcare professionals refer to the transfer of care from one provider to another as the patient handoff or handover. Along with the transfer of patient information, the medical professional is transferring the authority and responsibility for patient care to another healthcare provider (Russell, Doggett, Dawda, & Wells, 2013).

Patient handoffs can occur in a multitude of settings including pre-hospital, ambulatory clinics, nursing homes, hospitals, emergency departments, and surgical settings. To date, there is one known published research article about patient handoffs from ambulatory care providers to emergency medical personnel for transfer of the patient to an acute care setting (Lavelle & Mclaughlin, 2008). The majority of the research literature about patient handoffs has centered on improving the processes involved in the transfer of patients from the paramedic to the emergency department staff (Bost et al., 2010a; Iedema et al., 2012; Jensen, Lippert, & Østergaard, 2013;

Manser, Foster, Gisin, Jaeckel, & Ummenhofer, 2010b; Sujan & Spurgeon, 2013), or the transfer of care between healthcare providers in the acute care or hospital setting (Cohen & Hilligoss, 2010; Sawatsky, Mikhael, Punatar, Nassar, & Agrwal, 2013a; Symons et al., 2012; Weingart et al., 2013; Wohlauer et al., 2012).

The patient handoffs often occur between providers who have different clinical backgrounds and levels of experience, such as transfers between paramedics and emergency medicine physicians, hospitalists and nursing staff, and primary care providers and emergency medical services personnel. Despite these differences, the healthcare providers need to preserve patient safety by communicating efficiently and effectively to transfer patient information and responsibility.

Patient Handoffs and Patient Safety

Poorly performed patient handoffs have caused medical errors with resultant patient harm. Kitch et al. (2008) surveyed medical and surgical residents about patient harm incidents during patient transfers. The authors found that 59% of the residents reported that one or more patients had been harmed during the process of transferring the patient. 12% of the residents reported that the medical errors during the patient handoffs caused major harm (Kitch et al., 2008). In 2009, a qualitative review of patient transfer failures between the emergency department and inpatient care reported that 29% of the physician respondents reported an adverse event or medical error as a result of a poor patient handoff (Horwitz et al., 2009).

To determine why the medical errors occurred, researchers studied the processes involved in the transfer of patients. Several common themes emerged, including 1) the management, organization and flow of patient information, and 2) the tensions during the patient handoff related to the roles and responsibilities for patient care, 3) a collaborative working environment,

and 4) limiting interruptions and distractions (Agency for Healthcare Research and Quality, 2012; Committee on Patient Safety and Quality Improvement, 2012; Manser et al., 2010a; Owen, Hemmings, & Brown, 2009; Sujan & Spurgeon, 2013). In all the studies, collaboration across professions and communication were vital for effective patient handoffs.

Collaboration in Patient Handoffs

Collaborative practice is based on the idea that single practitioners cannot provide all the care patients need, instead excellent care is achieved by combining the skills and expertise of all the health care providers (Norsen et al., 1995). Ideally, interprofessional collaboration occurs at all levels of care in a medical setting. Interprofessional collaborative practice occurs "when multiple health workers from different professional backgrounds work together with patients, families, and communities to deliver the highest quality of care" (J. H. V Gilbert, Yan, & Hoffman, 2010).

Professional relationships.

Professional relationships have been identified as an important aspect of collaboration. Dawson, King, and Grantham (2013) studied patient handoffs between paramedics and emergency medicine physicians. The authors noted that the collaboration between the providers failed when there was lack of eye contact, frequent distractions and interruptions, and disinterest or disrespect of the paramedics. During patient handoffs, the degree of active listening, succinct reporting, confidence, and experience level affected the communication between the health care professionals. Familiarity with each other, speaking a common medical language, and encouraging open communication and active listening led to improved patient outcomes (Dawson, King, & Grantham, 2013).

To improve professional relationships, researchers have recommended co-development of shared mental models across healthcare disciplines to enhance team performance, improve collaboration and increase shared responsibility during patient handoffs (Gillespie & Chaboyer, 2009; Haig, Sutton, & Whittington, 2006).

Communication in Patient Handoffs

Communication is the effective sharing of important information and exchanging of ideas and discussion (Norsen et al., 1995). Effective communication is clear, succinct, accurate and well-timed (Committee on Patient Safety and Quality Improvement, 2012). A critical component of patient safety is the transfer of patient information through accurate communication from one healthcare provider to another.

According to the Joint Commission, the accreditation and certification organization for health care entities in the United States, over two-thirds of the reported sentinel events from 1995 to 2005 were due to breakdown in medical team communication (The Joint Commission, 2008a). In addition to the poor patient outcomes, there were significant economic consequences including costs to the health system, to the patient and family, and to society (O'Byrne, Weavind, & Selby, 2008).

In studies of closed malpractice claims for medical practitioners and medical trainees, poor communication during patient handoffs was found to be the leading cause of preventable medical errors (Committee on Patient Safety and Quality Improvement, 2012; Kachalia et al., 2007; Singh, Thomas, Petersen, & Studdert, 2007). Barriers to effective communication included poor listening skills, poor eye contact, environmental noise and distractions, mismatched communication styles, and lack of common language across professional boundaries (Bost, Crilly, Wallis, Patterson, & Chaboyer, 2010b; Committee on Patient Safety and Quality

Improvement, 2012; Iedema et al., 2012). To avoid miscommunication during patient handoffs, researchers recommended that structured processes for patient handoffs and handling of patient medical information should be developed to improve the quality and safety of patient care (Webster et al., 2008).

Standardizing communication during patient handoffs.

Recognizing the importance of communication in patient handoffs, the Joint Commission included patient handoffs in its national safety goals and accreditation standards. In 2006, 2007, and 2008, the Joint Commission National Patient Safety goals included the recommendation to "implement a standardized approach to handoff communication" (Catalano, 2006; The Joint Commission, 2008b; WHO Collaborating Centre for Patient Safety Solutions, 2007). In 2010, the Joint Commission added patient handoffs to its accreditation standards (The Joint Commission, 2010).

In 2007, The World Health Organization (WHO) Collaborating Center for Patient Safety, the Joint Commission, and the Joint Commission International published a joint report on patient safety which focused on a standardized approach to communication during patient handoffs. In addition, the joint report called for training and educational curriculum about handoff communication for healthcare professionals and health professional students (WHO Collaborating Centre for Patient Safety Solutions, 2007). As a result, healthcare systems and medical residency programs began teaching systematic approaches for patient handoffs utilizing patient handoff mnemonics.

Patient Handoff Mnemonics

Simplifying the processes and protocols during handoffs minimizes the medical errors caused by human factors. Protocols that include mnemonics allow for an organized method to

share information. A shared mnemonic also balances the expectations for both the giver and receiver of patient information (Iedema et al., 2012).

A review of patient handoff literature identified 24 different mnemonics used in healthcare systems today (Riesenberg, Leitzsch, & Little, 2009). While many different patient handoff mnemonics have been developed, the most appropriate tool is the one that assists with the type of handoff medical personnel are performing based on their work setting (Dawson et al., 2013; McQueen-Shadfar & Taekman, 2010). To date, a patient handoff mnemonic has not been developed specifically for the outpatient setting. The majority of mnemonics have been developed to improve patient handoffs in the emergency department and the hospital setting.

The more widely used mnemonics include IMIST-AMBO (Identification of the patient, Medical complaint, Information relative to the complaint, Signs including vital signs, Treatment and trends, Allergies, Medications, Background medical history, and Other issues) (Iedema et al., 2012), SBAR (Situation, Background, Assessment, and Recommendation) (Heisler, 2004), and I-PASS (Illness severity, Patient summary, Action list, Situation awareness, and Synthesis by receiver) (Starmer et al., 2012).

IMIST-AMBO Mnemonic

Iedema et al. (2012) studied ambulance-to-emergency-department handoffs. The authors videotaped the existing approaches to patient handoffs between paramedics and emergency staff, involved the practitioners in reflection about the video recordings of the handoffs, and developed and tested a handoff tool based on their interviews and observations. The handoff tool, known as IMIST-AMBO, improved the organization of information, reduced clarifying questions and repeats of information, and reduced the handoff duration. The IMIST-AMBO mnemonic includes 1) Identification of the patient, 2) Medical complaint, 3) Information relative to the

complaint, 4) Signs including vital signs, 4) Treatment and trends including interventions and response to treatment, 5) Allergies, 6) Medications, 7) Background medical history, and 8) Other issues such as social history and advanced directives (Iedema et al., 2012). The IMIST-AMBO mnemonic is used in patient handoffs between paramedics and emergency department staff.

SBAR Mnemonic

SBAR (Situation, Background, Assessment, and Recommendation) is a technique used commonly in hospital setting for communication between healthcare team members. Often times it is used as a communication method to request help from a nurse or to ask for guidance from a physician about patient care management issues. The tool was developed by Kaiser Foundation Health Plans, Inc., which adapted a tool that was first developed by the US Navy. Kaiser Permanente recognized that nurses and physicians perceptions of teamwork and communication were quite different. The SBAR tool was developed to bridge the communication gap and improve patient care (Heisler, 2004).

I-PASS Mnemonic

The verbal I-PASS mnemonic was developed to facilitate patient handoffs performed by medical residents during transitions of care in the hospital setting. The tool was extensively studied in a pediatric resident handoff improvement program that included nine hospitals. It was developed after a review of the literature to identify the best handoff practices, and was modified based on the results of a pilot pediatric resident study (Starmer et al., 2012).

Limitations of Patient Handoff Mnemonics

While patient handoff mnemonics provide a structured method for communication, the patient handoff process involves multiple components including collaboration among healthcare providers. Woods, Crouch, Rowland and Pope (2014) reviewed patient handoff studies during

January 2000 to March 2014 with the purpose of improving patient transfers between pre-hospital and hospital staff. The authors concluded that although there is strong advocacy for the use of mnemonics to standardize patient handoffs, the actual benefit is inconclusive based on the literature review results. The authors suggested that patient handoffs are multifaceted and standardizing communication through a mnemonic is not sufficient to correct all the variations and complexities found in healthcare settings (Wood, Crouch, Rowland, & Pope, 2014b).

Colligan, Brick, and Patterson (2015) reviewed Starmer and colleagues' I-PASS patient outcome results. The I-PASS pediatric resident handoff improvement program reduced the medical error rate by 23% when compared to the pre-intervention period (Starmer et al., 2014). The authors cautioned healthcare providers to avoid oversimplifying the results by assuming that the improved patient outcomes were the sole result of the implementation of the I-PASS mnemonic. The authors emphasized that the collaborative cross-checking among health care providers was an important aspect in the reduction of the medical errors (Colligan, Brick, & Patterson, 2015). Based on this information, an ideal educational program should include implementation of a patient handoff mnemonic as well as education about collaboration and communication between health professionals.

Patient Handoff Education

Sawatsky, Mikhael, Punatar, Nassar, and Agrwal (2013) developed a standardized patient handoff communication training program for first-year medical residents that included deliberate practice and feedback. Following the program, residents felt more comfortable performing handoffs and perceived improvements in their handoff efficiency. The researchers also noted improved handoff practices and procedures among the residents following the training (Sawatsky

et al., 2013a). The researchers did not measure whether the improved handoff practices reduced medical errors and improved patient safety.

Patient Handoff Education and Patient Outcomes

Prior to 2010, an extensive literature review about patient handoffs in the hospital found that patient handoff training has been associated with improved transfer processes in hospitals but improvements in measured patient outcomes had not been firmly established. Many of the studies were designed to look at work processes rather than patient outcomes (Cohen & Hilligoss, 2010).

More recently, Starmer et al. (2014) conducted a large prospective intervention study of 10,740 pediatric admissions as a part of a pediatric resident handoff improvement program in nine hospitals. The primary outcomes were medical errors and preventable adverse events. The medical error rate was reduced by 23% when compared to the pre-intervention period. The researchers reported that medical errors decreased from 24.5 per 100 hospital admissions to 18.8 per 100 admissions ($p<0.001$) following medical resident training about standardized communication and patient handoffs. Preventable adverse events decreased by 30%, from 4.7 per 100 admissions to 3.3 per 100 admissions ($p<0.001$) (Starmer et al., 2014). Teaching patient handoffs in health professional schools before they transition to the clinical setting may strengthen the foundation to improve patient handoffs, and ultimately improve patient outcomes.

Teaching Collaboration in Patient Handoffs

In the educational setting, instructors have the responsibility to teach students how to work collaboratively in an interprofessional team in the clinical environment (Bandali, Parker, Mummery, & Preece, 2008; Romanow, 2002). Anderson et al. (2011) results showed that interprofessional education (IPE) opportunities in the classroom and through immersion in

practice settings advanced knowledge, skills, attitudes, and values about teamwork (Anderson et al., 2011). Within the interprofessional education curriculum, students from different professions can be taught to provide collaborative patient care through shared and complementary competencies. Through complementary competencies, students from different professions learn profession-specific competencies that interconnect to provide interprofessional collaborative patient care (Baker et al., 2008). To develop collaborative skills, students need to have opportunities to learn, interact, and communicate with one another.

Teaching through Experiential Learning

Experiential learning provides students with opportunities to learn how their profession interacts, cooperates, and complements the other professionals in the health care team (Hall, 2005; Ho et al., 2008). When experiential learner-centered strategies are used, collaboration is fostered among the health professions through practice in simulated work situations that mirror real life scenarios (Baker et al., 2008; H. Barr, 2001; Hall, 2005).

In a best-evidence systematic review of health professional education, Hammick et al. (2007) found that positive educational outcomes were associated with experiential learning that mirrored the reality of the practice environment. The researchers suggested that the effectiveness of interprofessional education experiences were improved through the use of modalities such as medical simulation or simulated practice experiences which enhanced the authenticity of the learning environment (Hammick, Freeth, Koppel, Reeves, & Barr, 2007).

Simulation-Based Medical Education

Simulation-based medical education (SBME) has been used by health care professionals to imitate medical situations in which learners can practice their technical skills, communication skills and teamwork (Brock et al., 2013; Patterson, Geis, LeMaster, & Wears, 2013). In a 2011

meta-analysis comparing the effectiveness of SBME vs. traditional medical education, the authors reported that SBME was found to be a superior method to teach a wide range of medical procedural skills (McGaghie, Issenberg, Cohen, Barsuk, & Wayne, 2011).

Medical simulation has been defined as ‘‘a person, device, or set of conditions which attempts to present the evaluation of problems authentically, readily available at any time, and can reproduce a wide variety of clinical conditions” (Scalese et al., 2008). There are many different types of simulation-based training. In addition to mannequin-based training, real-life scenarios can be simulated through computer-based case studies, virtual reality, task trainers (replicas of parts of the body to practice skills such as venipuncture), patient actors, or a hybrid of these methods (Marshall & Flanagan, 2010).

The acute nature of medicine can make it difficult for students to safely practice collaborative problem solving (Rodehorst et al., 2005). Simulation bridges the gap between the classroom and the clinical setting by allowing the students to practice real-life scenarios in a safe, controlled environment without the risk of harm to the patient. The same simulation can be repeatedly practiced by the same or different group of learners to enhance learning and improve performance (Marshall & Flanagan, 2010). The simulation can be videotaped, and then reviewed during a debriefing with the students, which is conducted by a skilled facilitator after the simulation. The debriefing provides an opportunity for students to reflect on their performance during the simulation. During the simulation, students may not have realized how their behaviors and actions impeded the collaboration needed to care for the patient. The review of the simulation provides a constructive method to correct ineffective communication and collaboration skills (Marshall & Flanagan, 2010). Since communication and collaboration are essential components in patient handoffs, simulation is often used to practice these skills.

Teaching Patient Handoffs through Simulation

There is increased potential for miscommunication when care is being transferred between personnel with highly differentiated work experience, training and expertise, such as pre-hospital and clinical personnel (Senette, O'Malley, & Hendrix, 2013). Simulation can provide an avenue for clinicians to safely practice patient handoffs in the ambulatory setting. In a simulation-based training sponsored by Health Partners, clinician teams were able to practice identifying two emergency conditions, myocardial infarction and anaphylaxis, along with activating the emergency response system. Following the training, 40 patient safety concerns were identified in the ambulatory clinics which resulted in implementation of corrective plans. In addition, paramedic crews noted marked improvements in the patient handoffs procedures at the clinics (Lavelle & Mclaughlin, 2008).

In a 2013 review of the literature about patient handoffs, simulation training was found to reduce observable errors, and improve staff respect, attitudes, communication and behaviors. The researchers recommended simulation and communication training across professions to improve patient outcomes (Dawson et al., 2013; Kenaszchuk, MacMillan, van Soeren, & Reeves, 2011). Likewise, simulation has been incorporated into interprofessional education to teach patient handoffs to health professions students.

Students Perceptions of Simulated Patient Handoff Education

Students have had positive perceptions of interprofessional simulations that teach patient handoffs, in particular they appreciated the opportunity to interact with other disciplines in realistic settings (Reese, Jeffries, & Engum, 2010; Senette et al., 2013).

A 2013 systematic review of educational resources for teaching patient handoffs to Canadian medical residents and other healthcare professionals showed that patient handoffs were

most often taught through role playing and simulation. Both of these methods were perceived more positively by resident physicians and other healthcare professionals than didactic lecture sessions. Teaching patient handoffs resulted in demonstrated improvements in handoff communication (Masterson et al., 2013).

Simulation training has also been shown to improve confidence levels. Medical residents' confidence during patient handoffs increased after simulation training using a structured checklist and a standardized mnemonic for patient handoffs (Lane-Fall, Brooks, Davis, & Riesenberg, 2014; Starmer et al., 2013).

Regardless of the teaching strategy, training programs should include a structured verbal and written process for patient handoffs. The educational program should also include opportunities for teamwork and development of a common language for communication (Bost et al., 2010a; Senette et al., 2013). The ultimate goals of educational programs should be to improve collaboration and communication in order to reduce medical errors and improve patient safety.

Patient Handoff Education in the Ambulatory Setting

In the ambulatory setting, Lavelle and McLaughlin (2008) developed a two-phase simulation program called *The First Response: The First 10 Minutes* to improve immediate care of myocardial infarctions and anaphylaxis. Since the majority of patient care occurs in the ambulatory setting, further examination of office-based providers' knowledge, confidence and skills for identifying emergent situations and transferring patients to higher acuity clinical settings seemed prudent. While providers in ambulatory settings are not emergency care clinicians, they are expected to recognize emergency situations, understand when to call emergency medical personnel, and provide the key medical information needed for an effective

transport of the patient to an acute care setting. The simulation program was facilitated by paramedic educators. The training included practicing patient handoffs to paramedics. Following the simulation training program, 96% of the participants rated an increased confidence in their ability to manage the transfer of critically ill patients. One year later, paramedic crews continued to note improved patient handoffs from the clinics (Lavelle & Mclaughlin, 2008). Since the majority of health professionals practice in an outpatient setting, a simulation program for students could help better prepare them to participate in the transfer of critically ill patients to paramedics.

Challenges

Transitioning from traditional health professions curriculum to a model that incorporates interprofessional education and simulation requires a cultural shift in health professions schools. It also requires a significant investment in capital and time to develop the new curriculum and facilities, and ideally should include partnerships between academic institutions and health care organizations (Robertson & Bandali, 2008).

Shrader (2004) reported logistical challenges in coordinating small group sessions for students from different professional schools. The simulations were resource-intensive requiring lab space, high-fidelity manikins, and sufficient faculty and technical support to run the scenarios. The faculty were also challenged to create scenarios that were applicable to learners at different levels of their education (Shrader, McRae, King, & Kern, 2011).

Conclusion

Prevention of medical errors and improving patient safety are critical goals for all health care workers. Effective patient handoffs have resulted in a reduction of medical errors and improved patient outcomes. Quality collaboration across health professions requires

commitment, competence, communication, coordination and agreement on the common goals for the patient. Health professional schools can improve the transfer of patients by including interprofessional patient handoff education as part of the curriculum. Simulation provides a safe, controlled environment for students to practice communicating and collaborating during patient handoffs to provide quality patient care.

CHAPTER III: METHODS

Research Design and Rationale

The purpose of this quantitative study was to determine whether the type of instructional mode used to teach patient handoff procedures and communication influences participant behaviors and performance in a simulation-based training curriculum in health professions education. This research project sought to answer the following research questions:

Question 1: To what extent does the instructional mode used to deliver patient handoff training influence the participants' behaviors and performance during simulated patient handoffs?

a. Is there a difference between the three instructional mode groups with regard to the time allowed for questions during the patient handoff as measured by the IMIST-AMBO evaluation tool?
b. Is there a difference between the three instructional mode groups in the time length of the patient handoff as measured by the IMIST-AMBO evaluation tool?
c. Is there a difference between the three instructional mode groups in the information transferred, based on the IMIST-AMBO mnemonic, to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?
    i. Is there a difference between the three instructional mode groups in the identification of the patient during the patient handoff as measured by the IMIST-AMBO evaluation tool?

ii. Is there a difference between the three instructional mode groups in the medical complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

iii. Is there a difference between the three instructional mode groups in the information related to the complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

iv. Is there a difference between the three instructional mode groups in the signs and symptoms including vital signs reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

v. Is there a difference between the three instructional mode groups in the treatment and trends reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

vi. Is there a difference between the three instructional mode groups in the allergies reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

vii. Is there a difference between the three instructional mode groups in the medication reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

viii. Is there a difference between the three instructional mode groups in the background history reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

ix. Is there a difference between the three instructional mode groups in the other social information reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

d. Is there a difference between the three instructional mode groups in the organizational structure of information transferred to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?

e. Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the use of the IMIST-AMBO mnemonic pocket card during the patient handoff?

f. Does gender or previous crisis training effect the total IMIST-AMBO evaluation score as measured by the IMIST-AMBO evaluation tool?

Question 2: Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the participants' perceptions of their assigned teaching method during the research study as measured by the Patient Handoff Education survey?

This type of investigation is well-suited for a randomized quantitative research design utilizing the post-positivist paradigm which can provide conclusions about whether an intervention will improve clinical outcomes (Gliner, Morgan, & Leech, 2009).

A randomized experimental design with matching was used to examine whether the instructional mode used to deliver patient handoff training influenced the participant's behaviors and performance during simulated patient handoffs. The independent variable in this study was the type of instructional method. Physician assistant (PA) students were distributed to the three instructional groups in the study: didactic lectures (Group A), simulation of patient handoffs to

paramedics (Group B), or no intervention (Group C). PA students in Group A participated in didactic lectures about patient handoffs and communication. Group B participated in active learning sessions in which they practiced patient handoffs to paramedics. Group C received no intervention. All PA students received the traditional physician assistant curriculum.

The 28 PA students were matched in triads according to the type and length of their emergency care experience and crisis communication experience prior to enrollment in physician assistant school. The matched triads (Figure 1) were randomly assigned to the learning groups: Group A (didactic lectures), Group B (simulated patient handoffs), or Group C (no intervention). All PA students participated in the posttest patient handoff simulation.

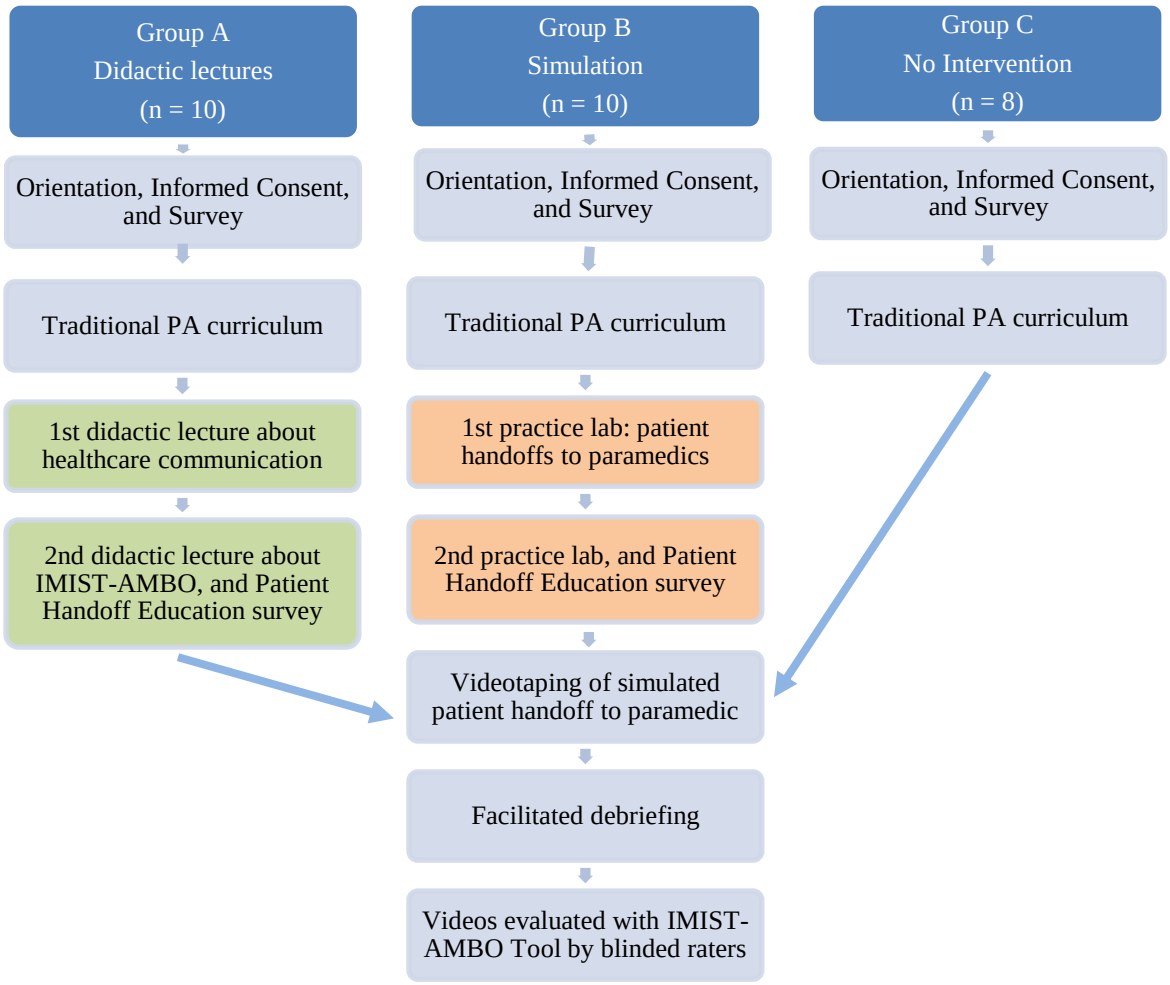

Figure 1: Research Design

Participants

Contacts within institution A were established through working relationships with professional associates in the institution. The researcher approached the Provost within the institution to ask if he would allow the physician assistant students to participate in this study.

Participants were 28 physician assistant students who were currently participating in the didactic curriculum in the PA program in Institution A. The PA students were completing their third didactic quarter of the physician assistant program, and they had completed two oral presentations to their preceptor about a simulated clinical encounter prior to the study.

The PA students completed a demographic data survey (Appendix A) in order to match the participants for the study. The survey included questions about gender, age, years of prior health care experience, type of previous health care experience, previous leadership experience, previous experience with crisis communication, and previous emergency care experience to include paramedic, emergency medical technician, police officer, firefighter, and emergency department medical personnel.

First, the investigator matched the 28 physician assistant students into eight triads and two pairs according to their previous emergency care experience and crisis communication experience prior to enrollment in the physician assistant program. The two pairs of students had emergency care experience that far exceeded the emergency care experience of the other students. Next, the Clinical Skills Coordinator randomly assigned the members of each triad to the learning groups: one member of each triad was assigned to intervention group A (didactic lectures), one member to intervention group B (simulated patient handoffs) and one member to group C (comparison group). For the pairs, one member of each pair was assigned to intervention group A (didactic lectures), and one member to intervention group B (simulated patient handoffs). Each learning group had 10 participants, and the comparison group had 8 participants.

Informed consent (Appendix B) was obtained from each subject prior to their participation. Participants were informed that participation or lack of participation would not affect their academic standing in the physician assistant program.

Simulated Patient Handoff Setting

The simulated patient handoff scenario was delivered in the Simulation Center. The room was designed to resemble an acute care treatment room in an ambulatory clinic. The room was equipped with digital recording equipment including a camera and microphone. The system captured communication between the physician assistant student and the paramedic. The digital recordings were saved on a secure server for retrospective review and scoring.

Interventions

During the research study period, all 28 physician assistant students participated in the traditional PA curriculum which included internal medicine lectures, physical exam lectures and labs, and lectures and labs about presenting patients to the supervising physician.

In addition to the traditional PA curriculum, Group A received two supplemental didactic lectures about communication in healthcare and using the IMIST-AMBO mnemonic during patient handoffs. Group B practiced the IMIST-AMBO mnemonic during simulated patient handoffs to paramedics during two lab sessions.

Didactic Lecture Sessions

Participants in the intervention Group A received two supplemental lectures about communication in healthcare and patient handoffs. The training was conducted by the Clinical Skills Coordinator for the School. The first 60-minute didactic lecture session included a PowerPoint presentation developed by the Agency for Healthcare Research and Quality (AHRQ) that highlighted the importance of communication, the connection between communication and

medical error, the standards of effective communication, strategies for information exchange, and the identification of barriers, tools, strategies and outcomes to communication. The last 15 minutes was utilized for student questions.

In the second 60-minute didactic lecture session, the participants received an overview of the IMIST-AMBO mnemonic and procedure for patient handoffs between care providers (Iedema et al., 2012). The components of IMIST-AMBO include 1) Identification of the patient, 2) Medical complaint, 3) Information relative to the complaint, 4) Signs including vital signs, 5) Treatment and trends including interventions and response to treatment, 6) Allergies, 7) Medications, 8) Background medical history, and 9) Other issues such as social history and advanced directives. Each student was given a pocket-sized plastic card with the mnemonic to reinforce the method (Appendix C). The last 20 minutes was utilized for questions and the participants completed an anonymous Patient Handoff Education survey (Appendix D) about the didactic lecture sessions.

Simulated Patient Handoff Sessions

Participants in the intervention Group B practiced patient handoffs to paramedics during two 60-minute active learning sessions. In the first session, the Clinical Skills Coordinator provided a brief orientation to the IMIST-AMBO mnemonic. Participants were given pocket-sized plastic cards with the IMIST-AMBO mnemonic to use as they practiced patient handoffs (Appendix C). The participants were given three scenarios to practice patient handoffs to a paramedic. Each student had an opportunity to participate as the PA (the giver of the patient handoff), the paramedic (the receiver of the patient handoff), and the observer. The observer evaluated and provided feedback to the PA student on their use of the IMIST-AMBO mnemonic by scoring him/her using the IMIST-AMBO evaluation tool. Participants were given the full 60-

minutes to practice patient handoffs. The Clinical Skills Coordinator answered questions as students practiced patient handoffs using the mnemonic, and facilitated a 15-minute debriefing of the participants following the completion of the active learning session. In the second active learning session, the Clinical Skills Coordinator answered clarifying questions about the use of the IMIST-AMBO mnemonic. As with the first session, the participants were given three scenarios to practice patient handoffs to a paramedic. During the last 20 minutes of the second active learning session, the Clinical Skills Coordinator debriefed the students, and the participants completed an anonymous Patient Handoff Education survey (Appendix E) about the active learning sessions.

Posttest Simulated Patient Handoff

All 28 PA students in the study participated in a 30-minute posttest simulated patient handoff. Participants arrived at the simulation center 5-minutes before their scheduled videotaping session. The participants were given a handout that explained the videotaping of the patient handoff (Appendix F). Each student viewed an 8-minute video of a patient encounter in an ambulatory clinic. In the video, the PA assessed and medically managed a patient who was having a myocardial infarction. At the end of the video, the PA called the Emergency Medical Services (EMS) to transport the patient to the emergency department. The PA students were directed to watch the video once, and then the students had a maximum of 15 minutes to organize their notes in preparation for the handoff of the patient to the paramedic. Subsequently, each student was videotaped as they completed the patient handoff to the paramedic.

Debriefing

The 20-minute debriefing session included a facilitated discussion about the IMIST-AMBO patient handoff procedure and communication. The facilitators provided a general

summary of the participants' performance during the simulated patient handoff to the paramedics highlighting the strengths and opportunities for improvement. Students were given an opportunity to discuss the observations. The facilitators emphasized teaching points based on the group's conversation about the patient handoff. Teaching materials about the IMIST-AMBO patient handoff and the AHRQ PowerPoint about communication in healthcare were shared with all the students.

Measurement Instruments

The IMIST-AMBO Evaluation Tool

IMIST-AMBO evaluation tool was developed from the IMIST-AMBO mnemonic to assess participant performance during patient handoffs (Iedema & Ball, 2010; Iedema et al., 2012) (Appendix G). The IMIST-AMBO evaluation tool includes the following categories: 1) Identification of the patient, 2) Medical complaint, 3) Information relative to the complaint, 4) Signs including vital signs, 5) Treatment and trends including interventions and response to treatment, 6) pause for clarifying questions, 7) Allergies, 8) Medications, 9) Background medical history, 10) Other issues such as social history and advanced directives, and 11) pause for questions (Iedema & Ball, 2010; Iedema et al., 2012) . The authors of the IMIST-AMBO mnemonic gave the investigator permission to use the mnemonic in the research study, and reviewed the IMIST-AMBO evaluation tool (Appendix H).

The maximum score was 88. A maximum of 4 points were allowed for each of the 11 items, with a four indicating the highest level of achievement for each item. There were five categories of skill achievement for each item, using the behaviorally anchored ranking system of 0-4 [no information provided (0), and poor/novice (1) to excellent/expert (4)]. Each category was scored twice. The Initial score was the skills achievement for the item before clarifying questions

were asked by the paramedic; the Final score was the skills achievement for the item following clarifying questions by the paramedic. A qualitative comments section about communication skills during the patient handoff was also included for each item in the IMIST-AMBO evaluation tool.

Evaluator training.

The two evaluators participated in training about how to use the IMIST-AMBO evaluation tool. The evaluators rated a sample video of a simulated patient handoff using the newly developed tool. Disagreement in scoring was discussed to improve consistency of assessment interpretations. Next, a pilot study of six participants was completed. The evaluators independently scored the six videos of simulated patient-handoffs using the IMIST-AMBO evaluation tool. To assess agreement between the two raters, a Bland and Altman plot was used and limits of agreement were calculated. The evaluators were given a guide to support consistency of performance assessment scoring.

Pilot results.

A Bland-Altman assessment for agreement was used to compare the two raters IMIST-AMBO evaluation scores. The Bland-Altman indicated that the 95% limit of agreement between the two raters was 95%. This suggests that the two raters provided a similar assessment. Cronbach's alpha was conducted to assess the internal consistency reliability of the eleven items used to derive a summative IMIST-AMBO scaled score. The alpha was .79 which provides good support for internal consistency reliability of the eleven-item evaluation tool.

The Patient Handoff Education Survey

The Patient Handoff Education survey was developed to assess the participants' perceptions of their assigned teaching method (didactic lecture vs. simulated patient handoff)

(Appendix D and E). Group A (didactic lectures) and Group B (simulated patient handoffs) completed the survey. Each item was rated on a 4-point scale [strongly disagree (1) to strongly agree (4)]. The survey included items to assess the participants' perceptions about whether the educational sessions improved their ability to perform patient handoffs, broadened their knowledge of patient handoffs, helped them to prevent medical errors, and improved their ability to communicate with emergency medical personnel. The survey also assessed participants' perceptions about the usefulness of the IMIST-AMBO pocket cards, and the participants' confidence in performing a patient handoff following the educational sessions. The Group A survey included an item to assess participants' perceptions of the educational value of the PowerPoint presentations. The Group B survey included items to assess participants' perceptions of the educational value of role playing and feedback from their peers.

Procedure (for Data Collection)

The patient handoff videotapes were evaluated by two raters (one physician assistant and one paramedic) who were trained to use the IMIST-AMBO evaluation tool. The evaluators were blinded to the training type. The raters were able to pause the videos and scroll through them to evaluate different aspects of the patient handoff as needed. To assess agreement between the two raters, a Bland and Altman plot was used and limits of agreement were calculated. All data from the IMIST-AMBO evaluation tool score sheets were entered into SPSS before the participants' group assignments were revealed.

The Patient Handoff Education survey was completed by the students in the didactic lecture (Group A) and simulated patient handoff (Group B) groups at the end of the second educational session. The online survey and data collection was conducted through the cloud-based company, SurveyMonkey.

Data Analysis

The analyses were performed on a group basis. The independent variable in the study was the type of instructional mode. The participants' received either (a) the formalized communication training module taught to intervention group A, (b) the simulation practice of the patient handoff in intervention group B, or (c) no additional training in group C. The dependent variables were the participants' skills performance ratings related to the IMIST-AMBO evaluation tool and the participants' perceptions of the educational method related to the Patient Handoff Education survey.

Question 1: To what extent does the instructional mode used to deliver patient handoff training influence the participants' behaviors and performance during simulated patient handoffs?

a. Is there a difference between the three instructional mode groups with regard to the time allowed for questions during the patient handoff as measured by the IMIST-AMBO evaluation tool?
b. Is there a difference between the three instructional mode groups in the time length of the patient handoff as measured by the IMIST-AMBO evaluation tool?
c. Is there a difference between the three instructional mode groups in the information transferred, based on the IMIST-AMBO mnemonic, to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?
    i. Is there a difference between the three instructional mode groups in the identification of the patient during the patient handoff as measured by the IMIST-AMBO evaluation tool?

ii. Is there a difference between the three instructional mode groups in the medical complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

iii. Is there a difference between the three instructional mode groups in the information related to the complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

iv. Is there a difference between the three instructional mode groups in the signs and symptoms including vital signs reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

v. Is there a difference between the three instructional mode groups in the treatment and trends reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

vi. Is there a difference between the three instructional mode groups in the allergies reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

vii. Is there a difference between the three instructional mode groups in the medication reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

viii. Is there a difference between the three instructional mode groups in the background history reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

ix. Is there a difference between the three instructional mode groups in the other social information reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

d. Is there a difference between the three instructional mode groups in the organizational structure of information transferred to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?

e. Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the use of the IMIST-AMBO mnemonic pocket card during the patient handoff?

f. Does gender or previous crisis training effect the total IMIST-AMBO evaluation score as measured by the IMIST-AMBO evaluation tool?

Question 2: Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the participants' perceptions of their assigned teaching method during the research study as measured by the Patient Handoff Education survey?

The research questions compared the behaviors and performance of the participants in the three instructional mode groups during patient handoffs as measured by the IMIST-AMBO evaluation tool, and the participants' perceptions of their assigned teaching method as measured by the Patient Handoff Education survey. The independent variable was categorical (type of instructional mode). The dependent variables were ordinal (scores on the Patient Handoff Education survey and IMIST-AMBO components of the evaluation tool) and scale (time length of patient handoff, and total score on the IMIST-AMBO evaluation tool). The suitable procedure

to answer the research questions was analysis of variance. IBM SPSS Statistics 22.0 for Windows was used to analyze the data and answer the research questions.

Statistical Analysis

Groups were compared using analysis of variance. SPSS (Statistical Package for Social Sciences) version 22 (SPSS, Inc.: Chicago, IL) was used for statistical analysis. Values are expressed as mean ± standard deviation ($M \pm SD$) unless otherwise indicated. The statistical level of significance was set at $p < 0.05$. Cohen's d was used to examine mean effect size differences. According to Cohen's (1988) guidelines, the strengths of the relationships were based on the conventions 'small' (d = 0.20-0.49), 'medium (d = 0.50-0.79), and 'large ($d \geq 0.80$). Agreement between the raters was calculated by using a Bland and Altman plot and calculating limits of agreement. Cronbach's was used to examine the internal consistency of the measurement instrument.

Chapter IV: RESULTS

Description of Data Set

The sample for this study included 28 physician assistant students who were enrolled in the didactic phase of the physician assistant program at Institution A during the 2014-15 academic year. A total of 28 cases were evaluated. The N for each variable below includes all 28 cases, unless otherwise noted.

Demographics

A total of 28 physician assistant students (Table 1) completed the patient handoff study. All the participants matriculated into the physician assistant program in August 2014, and were completing the third quarter of the physician assistant program during the patient handoff study. The participants were randomly distributed to the didactic lecture group (n = 10, 35.7%), the simulated handoff group (n = 10, 35.7%), and the comparison group (n = 8, 28.6%). Age of the participants at the time of the study ranged from 23-37 years of age; the median age was 26.00 years old and the mean was 26.57. The mean age in the didactic lecture group was 26.40 years of age, 27.70 for the simulation group, and 25.38 for the comparison group. 53.6% of participants were female (n = 15) and 46.4% were male (n = 13). The majority of participants had reported no previous critical care experience (50%, n = 14). Only 14% of the physician assistant students (n = 4) had extensive critical care experience as a paramedic.

Table 1

Participant Characteristics

Measure	Criteria	Didactic *n* = 10 (35.7%)	Simulation *n* = 10 (35.7%)	Comparison *n* = 8 (28.6%)	All Students n = 28
Age	23-27 years	7 (70%)	7 (70%)	8 (100%)	22 (79%)
	28-32 years	2 (20%)	2 (20%)	0 (0%)	4 (14%)
	>33 years	1 (10%)	1 (10%)	0 (0%)	2 (7%)
Gender	Male	4 (40%)	5 (50%)	4 (50%)	13 (46.4%)
	Female	6 (60%)	5 (50%)	4 (50%)	15 (53.6%)
Critical Care Experience	None	5 (50%)	5 (50%)	4 (50%)	14 (50%)
	ED Scribe	2 (20%)	2 (20%)	3 (37%)	7 (25%)
	EMT	1 (10%)	1 (10%)	1 (13%)	3 (11%)
	Paramedic	2 (20%)	2 (20%)	0 (0%)	4 (14%)

Research Question Results

Question 1: To what extent does the instructional mode used to deliver patient handoff training influence the participants' behaviors and performance during simulated patient handoffs?

Two trained raters evaluated participants' behaviors and performance using the IMIST-AMBO evaluation tool. For Rater 1, a statistically significant difference was found among the educational groups on the IMIST-AMBO total evaluation score during the simulated patient handoff, $F(2,25) = 14.50$, $p = .000$. Table 2a shows that the mean IMIST-AMBO total evaluation score for the didactic group (Group A) was 46.40, 62.20 for the simulation group (Group B), and 31.75 for the comparison group (Group C). The Post Hoc Tukey HSD tests indicate that the simulation group (Group B) differed significantly from the didactic group (Group A) ($p = .018$, $d = 1.17$), and the comparison group (Group C) ($p = .000$, $d = 3.45$). Likewise, the didactic group (Group A) differed significantly from the comparison group (Group C) ($p = .041$, $d = 1.21$).

For Rater 2, a statistically significant difference was found among the educational groups on the IMIST-AMBO total evaluation score during the simulated patient handoff, $F(2,25) = 14.79$, $p = .000$. Table 2c shows that the mean IMIST-AMBO total evaluation score for the didactic group (Group A) was 47.20, 62.80 for the simulation group (Group B), and 31.75 for the comparison group (Group C). The Post Hoc Tukey HSD tests indicate that the simulation group (Group B) differed significantly from the didactic group (Group A) ($p = .021$, $d = 1.15$), and the comparison group (Group C) ($p = .000$, $d = 3.55$). Likewise, the didactic group (Group A) differed significantly from the comparison group (Group C) ($p = .032$, $d = 1.25$).

Table 2a

Rater 1: Means and Standard Deviations Comparing the Total Score of the Three Educational Groups

	IMIST-AMBO Total Score		
	n	*M*	*SD*
Simulation Group	10	62.20	15.86
Didactic Group	10	46.40	10.64
Comparison Group	8	31.75	6.54

Table 2b

Rater 1: One-Way Analysis of Variance Summary Table Comparing Three Educational Groups on IMIST-AMBO Total Scores

Source	*df*	*SS*	*MS*	*F*	*p*
ID					
Between Groups	2	4153.93	2076.96	14.50	.000
Within Groups	25	3581.50	143.26		
Total	27	7735.43			

Table 2c

Rater 2: Means and Standard Deviations Comparing the Total Score of the Three Educational Groups

	IMIST-AMBO Total Score		
	n	*M*	*SD*
Simulation Group	10	62.80	10.38
Didactic Group	10	47.20	16.17
Comparison Group	8	31.75	6.71

Table 2d

Rater 2: One-Way Analysis of Variance Summary Table Comparing Three Educational Groups on IMIST-AMBO Total Scores

Source	*df*	*SS*	*MS*	*F*	*p*
ID					
Between Groups	2	4305.73	2152.86	14.79	.000
Within Groups	25	3638.70	145.55		
Total	27	7944.43			

Inter-rater reliability.

A Bland-Altman assessment for agreement was used to compare the two raters IMIST-AMBO evaluation scores. The Bland-Altman indicated that the 95% limit of agreement between the two raters was 95%. This suggests that the two raters provided a similar assessment. The Bland-Altman plot (Figure 2) shows that there is no consistent bias between the two raters.

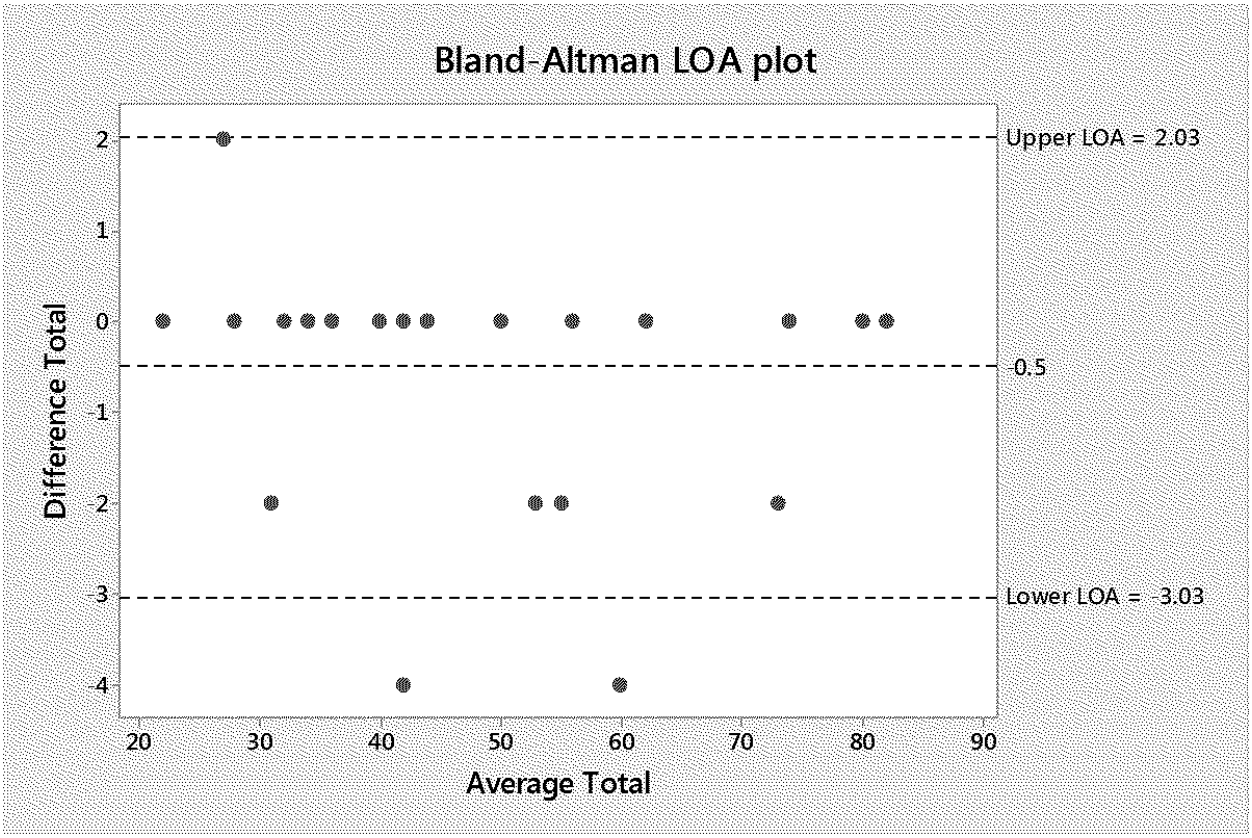

Figure 2: Bland-Altman LOA Plot

Given the results of comparison of the IMIST-AMBO total evaluation scores for the three instructional groups, six sub-research questions were asked to further explore if there were differences between the instructional groups with regard to the participants' behaviors and performance as measured by the IMIST-AMBO evaluation tool:

a. Additional Question: Is there a difference between the three instructional mode groups with regard to the time allowed for questions during the patient handoff as measured by the IMIST-AMBO evaluation tool?
b. Additional Question: Is there a difference between the three instructional mode groups in the time length of the patient handoff as measured by the IMIST-AMBO evaluation tool?

c. Additional Question: Is there a difference between the three instructional mode groups in the information transferred, based on the IMIST-AMBO mnemonic, to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    i. Is there a difference between the three instructional mode groups in the identification of the patient during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    ii. Is there a difference between the three instructional mode groups in the medical complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    iii. Is there a difference between the three instructional mode groups in the information related to the complaint reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    iv. Is there a difference between the three instructional mode groups in the signs and symptoms including vital signs reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    v. Is there a difference between the three instructional mode groups in the treatment and trends reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

    vi. Is there a difference between the three instructional mode groups in the allergies reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

vii. Is there a difference between the three instructional mode groups in the medication reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

viii. Is there a difference between the three instructional mode groups in the background history reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

ix. Is there a difference between the three instructional mode groups in the other social information reported during the patient handoff as measured by the IMIST-AMBO evaluation tool?

d. Additional Question: Is there a difference between the three instructional mode groups in the organizational structure of information transferred to the paramedics during the patient handoff as measured by the IMIST-AMBO evaluation tool?

e. Additional Question: Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the use of the IMIST-AMBO mnemonic pocket card during the patient handoff?

f. Additional Question: Does gender or previous crisis training effect the total IMIST-AMBO evaluation score as measured by the IMIST-AMBO evaluation tool?

Additional Question 1a

To determine if there was a difference between the three instructional mode groups with regard to the time allowed for questions during the patient handoff, the IMIST-AMBO evaluation tool contained two skill level scoring categories: “Pause for Questions 1” and “Pause for Questions 2.” “Pause for Questions 1” measured if the participants paused after the IMIST portion of the mnemonic to allow the paramedic to ask questions and clarify information. “Pause

for Questions 2" measured if the participants paused after the AMBO portion of the mnemonic to allow the paramedic to ask questions and clarify information.

A Kruskal-Wallis nonparametric test was conducted to test for significant differences between the instructional groups whether time was allowed for questions because the skill level scoring data was ordinal. The test indicated that the three educational groups differed significantly on "Pause for Questions 1," χ^2 (2, N = 28) = 13.89, p = .001. Also, the Kruskal-Wallis nonparametric test indicated that the three educational groups differed significantly on "Pause for Questions 2," χ^2 (2, N = 28) = 7.19, p = .027. Post hoc Mann-Whitney tests compared the educational groups on "Pause for Questions 1," and "Pause for Questions 2," using a Bonferonni corrected p value of .025 to indicate statistical significance (Tables 3a and 3b). The mean rank "Pause for Questions 1" for the simulation group (13.10, n = 10) was significantly higher than that of students in the comparison group (5.00, n = 8), z = -3.69, p = .000, r = -.0.87, a much larger than typical effect size according to Cohen (1988). Likewise, the mean rank "Pause for Questions 1" for the didactic group (11.50, n = 10) was significantly higher than that of students in the comparison group (7.00, n = 8), z = -2.29, p = .022, r = -0.54, a larger than typical effect size. Similarly, the mean rank "Pause for Questions 2" for the simulation group (11.50, n = 10) was significantly higher than that of students in the comparison group (7.00, n = 8), z = -2.29, p = .022, r = -0.54, a larger than typical effect size. Also, the mean rank "Pause for Questions 2" for the didactic group (11.90, n = 10) was significantly higher than that of students in the comparison group (6.50, n = 8), z = -2.61, p = .009, r = -0.62, a larger than typical effect size. There was no difference between the didactic lecture and simulation groups on "Pause 1 for questions" (p = .057), or "Pause 2 for questions" (p = .661).

Table 3a

Mann-Whitney comparison of the simulated patient handoff (Group B) and comparison groups (Group C) on the time allowed for questions as measured by the IMIST-AMBO evaluation tool (n= 10 Group B participants, and 8 Group C participants)

Variable	Mean Rank	*z*	*p*	*r*
Pause 1 for Questions		-3.69	.000*	-0.87
Group B	13.10			
Group C	5.00			
Pause 2 for Questions		-2.29	.022*	-0.54
Group B	11.50			
Group C	7.00			

*$p < .025$

Table 3b

Mann-Whitney comparison of the didactic lecture handoff (Group A) and comparison groups (Group C) on the time allowed for questions as measured by the IMIST-AMBO evaluation tool (n= 10 Group B participants, and 8 Group C participants)

Variable	Mean Rank	*z*	*p*	*r*
Pause 1 for Questions		-2.29	.022*	-0.54
Group A	11.50			
Group C	7.00			
Pause 2 for Questions		-2.61	.009*	-0.62
Group A	11.90			
Group C	6.50			

*$p < .025$

Additional Question 1b

A one-way analysis of variance was performed to test for significant differences in the time length of the patient handoff between the instructional groups. There was no difference in the time length of the patient handoff between the educational groups as measured by the IMIST-AMBO evaluation tool, $F(2,25) = 2.28$, $p = .123$. Table 4a shows that the mean time length of the patient handoff for the didactic group (Group A) was 2.11, 2.29 for the simulation group (Group B), and 1.68 for the comparison group (Group C).

Table 4a

Rater 1: Means and Standard Deviations Comparing the Time Length of the Patient Handoff of the Three Educational Groups

	Time Length of Patient Handoff		
	n	*M*	*SD*
Simulation Group	10	2.29	0.56
Didactic Group	10	2.11	0.72
Comparison Group	8	1.68	0.52

Table 4b

Rater 1: One-Way Analysis of Variance Summary Table Comparing the Three Educational Groups on the Time Length of the Patient Handoff

Source	*df*	*SS*	*MS*	*F*	*p*
ID					
Between Groups	2	1.73	0.86	2.28	.123
Within Groups	25	9.45	0.38		
Total	27	11.18			

Internal consistency reliability of IMIST-AMBO evaluation tool.

Cronbach's alpha was conducted to assess the internal consistency reliability of the eleven items used to derive a summative IMIST-AMBO scaled score. The alpha was .75 which provides good support for internal consistency reliability of the eleven-item evaluation tool.

Additional Question 1c

A Kruskal-Wallis nonparametric tests were conducted to test for significant differences between the three educational groups on the components of the IMIST-AMBO mnemonic as measured by the IMIST-AMBO evaluation tool because the data measurements were ordinal (Table 5). A *p*-value of 0.01 was used to declare statistical difference. A statistically significant difference was found among the educational groups on the following IMIST-AMBO

components: *I* (identification of the patient), χ^2 (2, *N* = 28) = 9.39, *p* = .009, and *O* (other social information), χ^2 (2, *N* = 28) = 9.95, *p* = .007. Post hoc Mann-Whitney tests compared the educational groups on *I* (identification of the patient), using a Bonferonni corrected *p* value of .006 to indicate statistical significance. The mean rank for *I* (identification of the patient) for the simulation group (12.70, *n* = 10) was significantly higher than that of students in the comparison group (5.50, *n* = 8), *z* = -3.08, *p* = .002, *r* = -1.09, a much larger than typical effect size according to Cohen (1988). There was no difference on the *I* evaluation score between the simulation group and the didactic group, *z* = -1.65, *p* = .099, or the didactic group and the comparison group, *z* = -1.46, *p* = .143. The mean rank for *O* (other social information) for the simulation group (14.00, *n* = 10) was significantly higher than that of students in the didactic group (7.00, *n* = 10), *z* = -2.80, *p* = .005, *r* = -.88, which is considered a much larger than typical effect size. There was no difference on the *O* evaluation score between the simulation group and the comparison group, *z* = -2.53, *p* = .011, or the didactic group and the comparison group, *z* = -.096, *p* = .923.

There was no difference among the three educational groups on the following IMIST-AMBO components: *M* (medical complaint), *p* = .018, $I_{(2)}$ (information related to the complaint), *p* = .018, *S* (signs and symptoms), *p* = .074, *T* (treatment and trends), *p* = .176, *A* (allergies), *p* = .378, $M_{(2)}$ (medication), *p* = .240, *B* (background history), *p* = .408.

Table 5

Kruskal-Wallis comparison of three educational groups on the components of the IMIST-AMBO mnemonic as measured by the IMIST-AMBO evaluation tool

Variable	Mean Rank	*n*	*H*	*p*
Identification of the Patient			9.39	.009*
Group A	3.0	10		
Group B	4.0	10		
Group C	2.0	8		
Medical Complaint			8.05	.018
Group A	2.0	10		
Group B	4.0	10		
Group C	2.0	8		
Information related to the complaint			8.07	.018
Group A	1.0	10		
Group B	2.0	10		
Group C	1.0	8		
Signs and Symptoms			5.21	.074
Group A	1.0	10		
Group B	3.0	10		
Group C	1.0	8		
Treatment and trends				
Group A	3.0	10	3.47	.176
Group B	3.0	10		
Group C	2.0	8		
Allergies			1.94	.378
Group A	4.0	10		
Group B	4.0	10		
Group C		8		
Medication			2.86	.240
Group A	1.0	10		
Group B	1.5	10		
Group C	1.0	8		
Background history			1.80	.408
Group A	1.0	10		
Group B	1.0	10		
Group C	1.0	8		
Other social information			9.95	.007*
Group A	2.0	10		
Group B	3.0	10		
Group C	2.0	8		

*$p < .01$

Additional Question 1d

An independent t-test was performed to compare the students' use of the IMIST-AMBO organizational sequence on the total IMIST-AMBO evaluation score. Table 6 shows that students who used the IMIST-AMBO organizational sequence to relay patient information were significantly different from students who did not use the IMIST-AMBO sequence on total IMIST-AMBO evaluation score (p = .000). Inspection of the two group means indicates that the average IMIST-AMBO evaluation score for students who did not use the IMIST-AMBO organizational sequence (M = 33.69) is significantly lower than the score (M = 60.13) for the students who did use the IMIST-AMBO sequence. The difference between the means is 26.44 points on an 88-point evaluation scale. The effect size d is approximately -2.56, which is much larger than typical size for effects in behavioral sciences.

Table 6

Comparison of the student use of the IMIST-AMBO organizational sequence on total IMIST-AMBO evaluation score (n= 13 no sequence and 15 used IMIST-AMBO sequence)

Variable	*M*	*SD*	*t*	*df*	*p*	*d*
IMIST-AMBO sequence			-6.65	26	.000	-2.56
No sequence	33.69	7.48				
Used sequence	60.13	12.52				

Additional Question 1e

Participants were given IMIST-AMBO pocket cards as part of their educational teaching sessions. The researchers noted which participants used the IMIST-AMBO pocket card during the research study. An independent t-test was performed to compare the students' use of the IMIST-AMBO pocket cards on the total IMIST-AMBO evaluation score. Table 7 shows that students who used the IMIST-AMBO pocket card were significantly different from students who

did not use the IMIST-AMBO pocket card on total IMIST-AMBO evaluation score (p = 0.012). Inspection of the two group means indicates that the average IMIST-AMBO evaluation score for students who did not use the IMIST-AMBO pocket card (M = 38.83) is significantly lower than the score (M = 54.63) for the students who did use the IMIST-AMBO pocket card. The difference between the means is 15.80 points on an 88-point evaluation scale. The effect size d is approximately -1.04, which is much larger than typical size for effects in behavioral sciences.

Table 7

Comparison of the student use of the IMIST-AMBO pocket card on total IMIST-AMBO evaluation score (n= 12 no pocket card and 16 used the pocket card)

Variable	*M*	*SD*	*t*	*df*	*p*	*d*
IMIST-AMBO Pocket Card			-2.72	26	.012	-1.04
No pocket card	38.83	14.78				
Used card	54.63	15.54				

Additional Question 1f

An analysis of variance was performed to determine whether gender and previous crisis training had an effect on the total IMIST-AMBO evaluation score. Table 8 shows that gender had no effect on the IMIST-AMBO total evaluation score (p = .628). Likewise, crisis training before PA school had no effect on the IMIST-AMBO total score (p = .682).

Table 8

Analysis of Variance Summary Table: Effect of Gender and Previous Crisis Training on IMIST-AMBO Total Score

Source	*n*	*df*	*SS*	*MS*	*F*	*p*
Gender		1	74.73	74.73	0.24	.628
Male	13					
Female	15					
Crisis Training		3	470.32	156.77	0.51	.682
None	14					
ED Scribe	7					
EMT	3					
Paramedic	4					

Question 2: Is there a difference between instructional mode group A (didactic lecture) and instructional mode group B (simulated patient handoff) in the participants' perceptions of their assigned teaching method during the research study as measured by the Patient Handoff Education survey?

Because the dependent variables were ordinal, Mann-Whitney *U* tests were performed to compare the educational groups' perceptions of their assigned teaching method. The didactic lecture participants (Group A) did not differ significantly from the simulated handoff participants (Group B) on their perceptions of their educational experience. Each item was rated on a 4-point scale [strongly disagree (1) to strongly agree (4)].

The survey intended to measure the participants' perceptions on six aspects of the educational experience: ability, knowledge, and prevention of errors, usefulness of the pocket card, communication, and confidence. In Table 9, Group A did not differ significantly from Group B on the following aspects of the educational experience: improvement in ability to perform patient handoffs ($p = .232$), broadened knowledge of patient handoffs ($p = 1.000$), ability to prevent

medical errors (p = .264), usefulness of IMIST-AMBO pocket card (p = .391), ability to communicate with emergency medical services (p = 1.000), and confidence in participating in a patient handoff (p = .113).

Table 9

Mann-Whitney comparison of didactic lecture participants' (Group A) and simulated handoff participants' (Group B) perspective on the quality of their educational experience (n= 10 Group A participants and 10 Group B participants)

Variable	Mean Rank	*z*	*p*	*r*
Improved ability		-1.18	.240	-0.37
Group A	9.2			
Group B	11.8			
Broadened knowledge		0.00	1.000	0.00
Group A	10.5			
Group B	10.5			
Prevent errors		-1.08	.282	-0.34
Group A	11.75			
Group B	9.25			
Pocket card helpful		-0.61	.547	-0.19
Group A	11.2			
Group B	9.3			
Communicate with EMS		0.00	1.000	0.00
Group A	10.5			
Group B	10.5			
Confidence		-1.59	.111	-0.50
Group A	8.8			
Group B	12.2			

Additionally, the Group A survey included an item to assess participants' perceptions of the educational value of the PowerPoint presentations (weighted average = 3.2). The Group B survey included items to assess participants' perceptions of the educational value of role playing (weighted average = 3.2), role playing increasing confidence to perform a patient handoff (weighted average = 3.1), and helpfulness of feedback from their peers (weighted average = 3.3).

In summary, the results of the first question showed a statistically significant difference among the educational groups on the IMIST-AMBO total evaluation score during the simulated

patient handoff. For the sub-questions of question one, there were statistically significant differences among the educational groups for time allowed to ask questions, organizational structure of the information, and use of the IMIST-AMBO mnemonic pocket card. There were no significant differences in the time length of the patient handoff between the instructional groups. Gender and previous crisis training did not affect the total IMIST-AMBO evaluation score. The results for the components of IMIST-AMBO were mixed, with significant differences among the educational groups for identification of the patient, and other social information. For the second question, there were no significant differences in the instructional groups' perceptions of their assigned teaching method. Chapter five discusses the findings and implications of this study, and also addresses recommendations for future research.

CHAPTER V: DISCUSSION

Discussion

This study sought to discover whether teaching patient handoffs in physician assistant education would improve student performance in a simulated patient handoff. Physician assistant students do not typically learn about patient handoffs. Instead, they learn how to present a patient to a clinical preceptor, such as their supervising physician. The typical outline of a patient presentation includes the patient history, physical exam, assessment or diagnosis, and treatment or management plan. The information contained within a patient handoff and patient presentation are similar, so prior to this study it was unclear whether the additional patient handoff education would be necessary for the students to complete a patient handoff. The results of this research study showed that students in the traditional physician assistant curriculum do not necessarily know how to communicate and transfer responsibility for patient care through a patient handoff to a paramedic.

Overall, the information presented by the students in the comparison group was disorganized and incomplete. In addition, through review of the IMIST-AMBO evaluation tool scoring, it was evident that the students had difficulty identifying which patient information was important and relevant to share with the paramedic. The students tended to focus on the electrocardiogram results which showed an anterior myocardial infarction, and neglected to report pertinent findings related to the chief complaint: epigastric pain with nausea and vomiting while walking up a hill. As examples, students in the comparison group did not report that the epigastric pain was exacerbated with exertion. In addition, the students omitted findings in the category *I*nformation related to the complaint, such as timing (the patient had never had these symptoms before), and pertinent negatives to rule out abdominal diagnoses (no hematemesis or

black tarry stools). All new learners have difficulty determining which patient information is important to document, but students in the educational groups were more likely to include these findings than students in the comparison group because they had learned the details included in the mnemonic IMIST-AMBO. Since the study results did show that patient handoff education improved the students' performance during simulated patient handoffs, the researcher was interested in comparing the instructional methods as well.

Exploring Differences between the Instructional Groups

The study was designed to compare instructional methods to determine which method of teaching resulted in the best student performance during a simulated patient handoff. The study found statistically significant differences between the simulated patient handoff group and the comparison group, and the didactic lecture group and the comparison group. This suggests that both teaching methods were more effective in teaching patient handoff skills to the physician assistant students when compared to the traditional PA curriculum. In both educational groups students learned about the process and procedure of transferring a patient using the IMIST-AMBO mnemonic.

Comparing the Simulation Handoff Group and the Didactic Lecture Group

The results of the study also showed a statistically significant difference between the simulated handoff group and the didactic lecture group. These results suggest that active learning was more effective in teaching patient handoff skills to physician assistant students when compared to the didactic lecture educational group. During the two educational sessions, the simulated handoff group had multiple opportunities to practice the IMIST-AMBO mnemonic. They were also critiqued by their peers and their instructor, resulting in corrections and improvements in their transfer of the patient to the paramedic. Students in the simulated handoff

group were more likely to use the IMIST-AMBO pocket card, present the information in an organized manner using the IMIST-AMBO mnemonic, and provide more complete information in the categories of the IMIST-AMBO mnemonic. These results support the body of simulation literature which show that active learning through simulation is perceived more positively as a learning method when compared to traditional didactic lectures in a classroom (Bost et al., 2010b; Lane-Fall et al., 2014; Masterson et al., 2013).

Discussion of Sub-questions

For the sub-questions of question one, there were statistically significant differences among the educational groups for time allowed to ask questions, organizational structure of the information, and use of the IMIST-AMBO mnemonic pocket card. The results for the components of IMIST-AMBO were mixed, with significant differences among the educational groups for identification of the patient, and other social information.

Time allowed for questions.

The IMIST-AMBO mnemonic includes pauses for clarifying questions by the paramedic following the IMIST components, and again following the AMBO components. The study found statistically significant differences between the simulated patient handoff group and the comparison group, and the didactic lecture group and the comparison group in the time allowed for questions following the IMIST components (Pause 1 for Questions), and following the AMBO components (Pause 2 for Questions) of the mnemonic. On average, students who learned how to use the IMIST-AMBO mnemonic paused for questions from the paramedic. Students in the comparison group tended to present all the patient information as if it was a report. These findings suggest that teaching students how to use a mnemonic during a patient handoff may help them to remember to pause to allow the receiving provider to ask question. When students

paused for questions, there was an opportunity to clarify patient information and collaborate with the paramedic resulting in fewer communication errors.

Time length of patient handoff.

There were no significant differences in the time length of the patient handoff between the instructional groups. The mean time lengths were 2:29 for the simulation group, 2.11 for the didactic group, and 1.68 for the comparison group. Iedema et al. had found that once the paramedics were taught to use the IMIST-AMBO mnemonic, patient handoff time lengths were shorter because there were fewer clarifying questions and less repetition of information (Iedema et al., 2012). Although the results are not statistically significant, an opposite pattern was found in this study. This is likely due to the simulated environment in which the paramedic chose to limit the number of clarifying questions. Asking questions would have been necessary in a real patient scenario.

IMIST-AMBO components.

All students, regardless of the type of instructional methods, struggled with providing a complete history. These findings are due to the type of participants in the study, new learners in their third quarter of physician assistant education. Two-thirds of the students had limited hands-on patient experience prior to PA school. At the time of the study, the students had not had any clinical experiences with patients. The results may be different if a similar study is conducted with clinical phase students or practicing physician assistants.

As new learners, the students focused on presenting the positive results, such as the electrocardiographic findings which showed an anterior STEMI (ST segment elevation myocardial infarction). Very few students included pertinent negatives in the medical complaint and information about the medical complaint sections including reporting items such as: previous

cardiac or abdominal history, and associated characteristics such as diaphoresis, radiating pain, hematemesis, and blood in stools. In addition, few students presented the complete medication history including the name of the medication, dosing, frequency, compliance, and whether the patient had taken his medications that morning. In signs and symptoms, the students tended to present the full physical exam findings, but left out the finding of "moist mucus membranes." This is a pertinent finding in a patient with vomiting, but the students may have not considered it relevant in light of the patient's diagnosis of myocardial infarction. Newer learners may not have recognized how these history and physical examination details related to the chief complaint of "abdominal pain with nausea and vomiting while walking up a hill," and to the diagnosis of a myocardial infarction.

For the identification of the patient component, the simulation group's mean score on the IMIST-AMBO evaluation score was significantly higher that the comparison group's mean score ($p = .002$). The four key components for identification of the patient were name, age, gender and ethnicity. Students in the comparison group were more likely to exclude ethnicity (Latino) when reporting the identification of the patient to the paramedic. In this case, practicing with a checklist during the simulated patient handoff educational sessions likely helped the students in that group remember to report all four aspects of the patient's identification.

For the other social information component, the simulation group's mean score on this component was significantly different from the didactic group's mean score ($p = .005$). The mean score of the simulation group was higher than the comparison group mean score as well ($p = .011$), but it wasn't statistically significant using a Bonferonni corrected p value of .006. All students struggled with understanding the importance of transferring information to the paramedic about social information, such as tobacco use, alcohol use, drug use, insurance and

employment status, significant others and religion. Instead, they wanted to transport the patient to the emergency department as quickly as possible to avoid a negative patient outcome. They failed to understand that reporting this information took very little time, and that the information was useful information for the receiving hospital. Again, students in the simulation group had practiced with a checklist, and were critiqued by their peers in their educational sessions, so they were more practiced and prepared for completing this component of the IMIST-AMBO mnemonic.

Organizational structure.

Students who used the IMIST-AMBO organizational structure scored higher on the IMIST-AMBO evaluation tool than those who communicated in a disorganized fashion. Not only did the mnemonic provide an organized structure, the results showed that students who used the structure presented more complete information for each category of the mnemonic.

Students who didn't use the organizational structure where less likely to present the patient information in a logical sequence: history, physical exam, assessment, treatment and management, and other background and social information. For example, the students often began their patient handoff with information they determined was most important, such as the diagnostic testing results (electrocardiogram and chest x-ray), and would mix up information from the history and physical exam in an illogical fashion. The disordered reporting of information was confusing to the receiving provider, the paramedic, which resulted in a longer time period for clarifying information and asking questions.

IMIST-AMBO pocket card.

The findings above are consistent with the results of the students who used the IMIST-AMBO pocket card. The students who used the pocket card scored higher on the IMIST-AMBO

evaluation tool. Students in the two educational groups (didactic lecture and simulated patient handoffs) were all given the IMIST-AMBO pocket card, but not all students used it. These findings suggest that students would benefit from carrying a quick reference card to quickly recall learned information about the IMIST-AMBO mnemonic. Similarly, in the study by Iedema et al, participants were given pocket cards to reinforce the use of the IMIST-AMBO mnemonic (Iedema et al., 2012).

Previous crisis training.

Previous crisis training did not affect the total IMIST-AMBO evaluation score. Originally, the researcher hypothesized that students with more crisis training would perform better during the IMIST-AMBO patient handoff. Participants in the study were matched according to their type of crisis training, leadership experience, and years of experience, and then they were randomly assigned to the three groups in the study. In actuality, there were no differences between the students based on their level of crisis training.

Interestingly, there was no difference in the total IMIST-AMBO score between the students who had the most crisis training and the student who had no crisis training ($p = .716$). The paramedics, scored on average, 50.50 when compared with the students with no crisis training, 47.00. In the traditional PA classroom, the students with paramedic experience have had the most difficulty transitioning from the professional role as a paramedic to their new role as a physician assistant. This is likely due to the number of years they practiced as a paramedic, some students were paramedics for more than thirteen years before choosing to become a physician assistant. Likewise, in review of the videos of the four students who had the most paramedic experience, it was evident they did not adopt or adapt to the new method of IMIST-AMBO when presenting the patient to the paramedic, but instead used a presenting style that they had used in

their previous employment as paramedics. All students had participated in the educational sessions to learn the IMIST-AMBO mnemonic, two in the didactic lecture group, and the others in the simulated patient handoff group.

Discussion about the Educational Survey

There were no significant differences in the instructional groups' perceptions of their assigned teaching method. The Clinical Skills instructor noted that the didactic group was very comfortable in this mode of delivery since many of their traditional physician assistant courses are taught in a similar manner. They were interested in the history and clinical importance of the patient handoff and communication in healthcare.

The Clinical Skills instructor noted that the simulated patient handoff group was initially frustrated with the teaching style. Purposely, the instructor did not provide any didactic lecturing. The students struggled with why it was important to learn how to perform a patient handoff in the outpatient setting. To address their frustration, the instructor gave the students a brief one-page handout during the second session that highlighted bullet points about the research that had been conducted by Iedema et al. about the IMIST-AMBO mnemonic (Iedema et al., 2012).

At the end of the educational sessions, students from both groups, on average, were equally satisfied with the quality of their educational experience. The weighted averages ranged between 3.1 – 3.6 on a 4-point scale, which translated to scores within the survey categories of agree (3) to strongly agree (4).

Ideally, both teaching methods should be employed. If patient handoff education is incorporated into the physician assistant curriculum, the sessions should begin with a brief lecture about communication in healthcare and the importance of patient handoffs, followed by

patient handoff practice sessions, and finally with an evaluation of the students' patient handoff skills.

Comparing this Study to Other Recent Studies

Patient Handoff Studies

As with other patient handoff studies, teaching and practicing with a mnemonic improved performance during a simulated patient handoff (Lavelle & Mclaughlin, 2008; Sawatsky, Mikhael, Punatar, Nassar, & Agrwal, 2013b). Consistent with the findings of Iedema et al, this study found improvement in how the information was organized and relayed to the paramedic with the use of the IMIST-AMBO mnemonic (Iedema et al., 2012).

Students' perceptions of their abilities and confidence to perform patient handoffs improved following the educational sessions. These results were consistent with other student survey results which found increased comfort and perceived improvements in patient handoff efficiency (Sawatsky et al., 2013b).

It has been noted that it is overly simplistic to assume that a standardized mnemonic is sufficient to correct all the variations and complexities found in healthcare settings (Wood, Crouch, Rowland, & Pope, 2014a). An important aspect of the patient handoff is the communication between the provider and the paramedic that includes clarifying questions to ensure the patient information is accurate for a seamless transition to higher acuity care. The paramedic in this study asked minimal clarifying questions so this aspect of the patient handoff needs further examination in a future study.

Simulation Studies

Consistent with other simulation studies in medical education, students in the simulation group performed better than students in a traditional lecture format as measured by the IMIST-AMBO total evaluation score (Hammick et al., 2007; McGaghie et al., 2011)

As with other studies, it is unknown whether the newly acquired skills can be transferred to the real clinical setting. The one study that examined patient handoffs in the outpatient setting with practicing clinicians documented that the paramedics had noted improvements in patient handoffs up to a year following the simulated patient handoff workshop (Lavelle & Mclaughlin, 2008). Since the participants in this study were new learners, it would be interesting to retest their knowledge prior to their clinical phase (six months later) to assess whether they retained the patient handoff skills and IMIST-AMBO mnemonic information. Even more importantly, it would be useful to evaluate the students during an actual patient handoff in an ambulatory clinic to assess whether they retained information from the educational sessions in the study.

Limitations to this Study

This study demonstrated differences between the instructional groups immediately following the two educational sessions about patient handoffs. It is unclear whether students will retain this information in order to adequately transfer patients in the clinical settings. Repeating the simulated patient handoff evaluation six months later, as they are beginning their clinical rotations, would assess whether the students retained the information about how to transfer a patient in the outpatient setting. Ideally, the students would review the key components of a patient handoff prior to the clinical phase of their physician assistant education, and then they would be evaluated during an actual patient handoff to a paramedic during their clinical rotations.

The design of the study required the educational sessions to be purely didactic lectures in a classroom setting or purely active learning with simulated patient handoffs in a laboratory setting. Participants in both instructional groups voiced frustration with the limitations of their educational method. Ideally, students would receive a brief didactic lecture followed by an active learning session that included practicing patient handoffs to paramedics.

The patient handoff used to evaluate the participants was artificial, and the results may not be translatable to patient handoffs in the clinical setting. Students viewed a videotape of a patient encounter to ensure all students received the same information. This prevented students from being able to ask clarifying questions to the patient. The method also required students to be good listeners and note takers, as they were only allowed to watch the patient encounter one time. While these are necessary skills in a clinical encounter, watching rather than participating with the patient may have affected the quality of the patient information transferred during the patient handoff for some of the students.

The results of this study are not translatable to the practicing physician assistant. The students in this study were new learners who were completing the third quarter in the didactic phase of their physician assistant education. Many of the students had limited previous experience in a medical setting, and half of the students had no experience with emergency medical situations. A practicing physician assistant is typically skilled at presenting patients during patient transfers. While they would likely be unfamiliar with the IMIST-AMBO mnemonic, they would be familiar with other methods to use during patient handoffs.

Implications

This study was designed to explore the teaching of patient handoffs from the primary care provider to the paramedic in the outpatient setting. While there are several studies examining the

transfer of patients from the paramedic to the emergency department staff, there is a paucity of research studies addressing the patient handoff in the ambulatory clinic. Patient handoffs to paramedics in the ambulatory setting occur frequently, and students would benefit from instruction about communication and delivery of the patient handoff. Traditional physician assistant curriculum does not typically include patient handoff education. This study suggests that any form of teaching of the patient handoff improves the transfer of patient care to the paramedic, and students who actively practiced patient handoffs performed better in the evaluation. Students who were assigned to the simulation group performed better than those in the didactic lecture group because they were able to practice the communication and mechanics of the patient handoff.

These findings may help guide other physician assistant programs considering introducing patient handoff education in the didactic phase of the curriculum. The patient handoff educational program would ideally include both didactic and simulation components: a brief overview of healthcare communication and the process of patient handoffs using a mnemonic, followed by multiple opportunities to actively practice patient handoffs with feedback from an observer. The most important aspect of the educational sessions is whether the information is translatable to the clinical setting, and ultimately improves patient care.

Directions for Future Research

There is a need for longitudinal research studies of students to assess the retention of the educational knowledge about patient handoffs in the outpatient setting. The physician assistant curriculum has been likened to "drinking water out of a fire house" due to the fast pace and extensive medical knowledge acquired during the two-year educational program. As stated earlier, to assess retention of the patient handoff knowledge, student should be reassessed prior to

the clinical phase of their education. If the patient handoff information is not retained, the researcher recommends a brief refresher course with a repeat evaluation during the clinical phase while the students are in their primary care clinical rotation.

An area of further exploration would be to examine the use of the IMIST-AMBO mnemonic in the outpatient setting with the practicing provider, which includes the physician assistant, the advance practice nurse, and the physician. Iedema et al. have documented performance improvements of practicing paramedics and clinicians during patient handoffs to the emergency department (Iedema et al., 2012). Future research could examine whether work flow, communication, and transfer of patient responsibility improves with the use of the IMIST-AMBO mnemonic in the ambulatory setting.

Finally, with the development of the patient-centered medical home, patient handoffs between healthcare providers with differing educational backgrounds will be a regular occurrence. There is a paucity of research about the transfer of patients across professions outside the scope of professionals in the traditional emergency department or hospital setting, such as the physician, nurse, resident, and paramedic. In the patient-centered medical home, primary care providers are transferring patient care to a multitude of providers including social workers, psychologists, pharmacists, physical therapists, dentists, and optometrists. The language and culture of these professions can vary drastically, and practice communicating and transferring patient care would likely lead to improved patient outcomes.

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APPENDIX A: DEMOGRAPHIC DATA SURVEY

* 1. What is your name?

* 2. How many years of prior health care experience did you have before PA school?

* 3. Please list all types of health care experience you have participated in prior to PA school.

* 4. Please list any previous leadership experience prior to PA school.

* 5. Please list any previous training or experience with crisis communication prior to PA school. If you have no previous training or experience, please write NONE in the essay box.

* 6. Please list any previous emergency care experience prior to PA school (such as paramedic, EMS, police officer, firefighter, emergency department personnel). If you have no previous experience, please write NONE in the essay box.

APPENDIX B: INFORMED CONSENT

Consent to Participate in a Research Study

Colorado State University

TITLE OF STUDY: A Comparison of Instructional Modes to Teach Interprofessional Patient Handoffs Using Simulation

PRINCIPAL INVESTIGATOR: Linda Kuk, Ph.D., School of Education, Linda.Kuk@colostate.edu

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WHY AM I BEING INVITED TO TAKE PART IN THIS RESEARCH? You are being invited to participate in this study because you are a first-year physician assistant student.

WHO IS DOING THE STUDY? The research in this study is being conducted by a PhD student, Judy Ortiz.

WHAT IS THE PURPOSE OF THIS STUDY?
The research is being performed by a Colorado State University PhD student. The purpose of this study is to evaluate the effects of didactic crisis communication and patient handoff instruction in combination with simulation on student knowledge of communication during patient handoffs.
The objectives of the proposed study are:
(a) Determine if the type of instructional mode used to deliver crisis communication and patient handoff education impacts students' knowledge of the communication process needed during a patient handoff.
(b) Determine if the instructional mode used to deliver crisis communication and patient handoff education impacts participant performance in a simulated patient handoff.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?
The research study will be conducted in the physician assistant classrooms at your University. Based on your research group assignment, you may be asked to participate in 4 hours of additional instruction which includes two 90-minute teaching sessions, and one 20-minute simulation session.

WHAT WILL I BE ASKED TO DO?
As a participant, you will be asked to complete a survey about your medical experience prior to PA school. You will be assigned to group A, B, or C based on your answers to the survey. If you are assigned to group A, you will be presented with two 90-minute didactic lectures on crisis communication and will have an opportunity to participate in a simulated patient handoff. Medical simulation allows for practice of real-life scenarios in a safe, controlled environment without the risk of harm to the patient. The participants are expected to participate in the simulation as if it was a real-life situation. Each simulation is

approximately 20 minutes in duration. If you are assigned to group B, you will participate in two additional 90-minute simulated handoff trainings, and will have an opportunity to participate in a simulated patient handoff. If you are in group C, you will not participate in additional training, and will have an opportunity to participate in a simulated patient handoff. The simulated session will be videotaped and reviewed by two evaluators who will score participant performance during a simulated patient handoff. Following the simulation, you will take part in a debriefing session and will complete an exit survey. At the conclusion of the study, you will receive the educational information given to all three groups. There will be someone available to you at all times to answer questions pertaining to the study.

ARE THERE REASONS WHY I SHOULD NOT TAKE PART IN THIS STUDY? No.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?
There are no added risks to you during the simulation session. You will be asked to use your current knowledge, and skill to contribute to the care of a simulated sick patient to the best of your ability. The results of the patient handoff scoring tool will be kept confidential. Your participation in this research study will not have an impact on your progression in your course of study or your grade.

ARE THERE ANY BENEFITS FROM TAKING PART IN THIS STUDY?
Participants in the study will learn how to communicate during a patient handoff in a risk free environment. Your participation in the study will provide information about the best methods to teach patient handoffs. There may be no direct benefits to the participant.

DO I HAVE TO TAKE PART IN THE STUDY?

Your participation in this study is completely voluntary and you may withdraw at any time. The research in this study is being conducted by a PhD student, Judy Ortiz, and participation in this research will have no impact on your progression in your course of study or your grade at your University. As much as your volunteering is appreciated, the researcher may also withdraw you from the study if they feel it is needed. Your participation in this research is voluntary. If you decide to participate in the study, you may withdraw your consent and stop participating at any time without penalty or loss of benefits to which you are otherwise entitled.

WHO WILL SEE THE INFORMATION THAT I GIVE? We will keep private all research records that identify you, to the extent allowed by law.

For this study, we will assign a code to your data (Group A: 01A, 02A, etc.; Group B: 01B, 02B, etc; Group C: 01C, 02C, etc.) so that the only place your name will appear in our records is on the consent and in our data spreadsheet which links you to your code. Only the research team will have access to the link between you, your code, and your data. The only exceptions to this are if we are asked to share the research files for audit purposes with the CSU Institutional Review Board ethics committee, if necessary. In addition, for funded studies, the CSU financial management team may also request an audit of research expenditures. For financial audits, only the fact that you participated would be shared, not any research data. When we write about the study to share with other researchers, we will write about the combined information we have gathered. You will not be identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private.

CAN MY TAKING PART IN THE STUDY END EARLY? If you fail to participate in all the educational sessions, you may be removed from the study.

WILL I RECEIVE ANY COMPENSATION FOR TAKING PART IN THIS STUDY? Your time and participation are very much appreciated. Unfortunately we have no funds to reimburse you financially for your time.

WHAT HAPPENS IF I AM INJURED BECAUSE OF THE RESEARCH? The Colorado Governmental Immunity Act determines and may limit Colorado State University's legal responsibility if an injury happens because of this study. Claims against the University must be filed within 180 days of the injury.

WHAT IF I HAVE QUESTIONS?
Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions about the study, you can contact the investigator, Judy Ortiz at jortiz@ketchum.edu. If you have any questions about your rights as a volunteer in this research, contact the CSU IRB at: RICRO_IRB@mail.colostate.edu; 970-491-1553. We will give you a copy of this consent form to take with you.

WHAT ELSE DO I NEED TO KNOW? Prior to participation in the study, you will be asked to complete a survey about your medical experience prior to PA school.

Your signature acknowledges that you have read the information stated and willingly sign this consent form. Your signature also acknowledges that you have received, on the date signed, a copy of this document containing 3 pages.

_____ _____
Signature of person agreeing to take part in the study Date

_____
Printed name of person agreeing to take part in the study

_____ _____
Name of person providing information to participant Date

_____
Signature of Research Staff

APPENDIX C: IMIST-AMBO POCKET CARD

IMIST-AMBO Handover Protocol	
I---Identification of patient **M**---Mechanism of injury or Medical complaint **I**---Injuries or Information related to complaint **S**---Signs and Symptoms **T**---Treatment and Trends **A**---Allergies **M**---Medication **B**---Background **O**---Other information	
Outpatient clinicians are asked to:	**Paramedics are asked to:**
1. Review handover details pre-arrival **2.** Maintain 20-30 second period with patient on the exam table to deliver IMIST information uninterrupted **3.** Encourage questions on completion of IMIST and at the end of AMBO **4.** Treating clinician to remain with the patient during handover	**1.** Ensure handover is interruption free **2.** Ask questions during the two provided opportunities, between IMIST and AMBO and upon completion of IMIST-AMBO **3.** Observe 'Hands off, Eyes on', for a 20-30 second period until the IMIST information is delivered **4.** Identify team leaders

APPENDIX D: PATIENT HANDOFF EDUCATION SURVEY (DIDACTIC GROUP)

1. Please rate your experience in the educational sessions by answering the following questions:

	Strongly Agree	Agree	Disagree	Strongly Disagree
The educational sessions improved my ability to perform patient handoffs in the ambulatory setting.	○	○	○	○
The educational sessions broadened my knowledge of patient handoffs.	○	○	○	○
The educational sessions will help me prevent errors.	○	○	○	○
The I'MIST•AMBO pocket card was helpful.	○	○	○	○
The educational sessions will help me communicate with emergency medical personnel.	○	○	○	○
Following the educational sessions, I feel confident that I can participate in a patient handoff.	○	○	○	○
The PowerPoint presentations were valuable to my comprehension of patient handoffs.	○	○	○	○

APPENDIX E: PATIENT HANDOFF EDUCATION SURVEY (SIMULATION GROUP)

1. Please rate your experience in the educational sessions by answering the following questions:

	Strongly Agree	Agree	Disagree	Strongly Disagree
The educational sessions improved my ability to perform patient handoffs in the ambulatory setting.	○	○	○	○
The educational sessions broadened my knowledge of patient handoffs.	○	○	○	○
The educational sessions will help me prevent errors.	○	○	○	○
The IMIST•AMBO pocket card was helpful.	○	○	○	○
The educational sessions will help me communicate with emergency medical personnel.	○	○	○	○
Following the educational sessions, I feel confident that I can participate in a patient handoff.	○	○	○	○
The role playing enhanced my learning experience.	○	○	○	○
The role playing increased my confidence about participating in patient handoffs.	○	○	○	○
The feedback from my peers improved my patient handoff skills.	○	○	○	○

APPENDIX F: VIDEOTAPING DIRECTIONS FOR PARTICIPANTS

Step 1 – Watch the Video

1. You will watch a video of a clinical encounter.
2. You can watch the video once because this simulates real life in which you will experience a clinical encounter once in "real time". Due to time constraints, this video is not comprehensive or complete. You do not need to add additional information.
3. While watching the video, you should take notes about what you saw and heard during the patient encounter. You will be reporting to a paramedic what you saw and heard in the video.

Step 2 – Organize your thoughts

4. You will have 15 minutes to organize your notes for your presentation to the paramedic.

Step 3 – Videotaping of patient handoff to the paramedic

5. You will have 10 minutes to present the patient to the paramedic. You will be videotaped during this time. Your videotape will be coded and will not identify you by name.

APPENDIX G: IMIST-AMBO EVALUATION TOOL

There are four categories of skill level, 1-4 (poor to excellent, or novice to expert). See ***Skill Level Scoring System*** below for definitions of the four skill level categories. If no information is provided, the skill level is 0 (no information provided).

As you evaluate the performance during the patient handoff mark the number which best describes the observed behaviors using the ***Skill Level Scoring System***. The ***initial score*** reflects the provider's skill level at initial report before they are prompted by questions or comments from the receiving provider. The ***final score*** reflects the provider's skill level in relaying information to the receiving provider at the end of the patient handoff. The final score will occur after information is clarified by the receiving provider through interactive dialogue.

Please rate the Provider's skill level in each category. Use the comments section to record your observations about the Provider's skill in each category.

IMIST-AMBO	**Skill Score (1 - 4)**		**Comments**
	Initial Score	**Final Score**	
Identification of the patient			
Medical complaint			
Information related to the complaint			
Signs and symptoms			
Treatment and trends			
Pause for questions			
Allergies			
Medication			
Background			
Other social information			
Pause for questions			

Skill Level Scoring System

Score		Skill Level	Information	Organization	Teaching Support
0	**No Information Provided**	Not applicable	No information provided	Not applicable	Needs significant support
1	**Poor Novice**	No skills	Critical omission of information	Information disorganized	Needs significant support
2	**Progressing Developing**	Limited skills	Information incomplete, >2 vital details missing	Inconsistent organization	Needs moderate support
3	**Acceptable Proficient**	Strong skills	Information is mostly complete with 1-2 missing non-vital details	Mostly organized in a logical sequence	Needs minimal support
4	**Excellent Expert**	Excellent skills	All essential information is included	Information organized in a logical sequence	No support needed

Key

IMIST-AMBO	Skill Score 1 Poor Novice	Skill Score 2 Progressing Developing	Skill Score 3 Acceptable Proficient	Skill Score 4 Excellent Expert
Identification of the patient	Critical omission of information; information presented is disorganized	$\underline{\geq}$ 2 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All identification information presented in a logical sequence: Name Age Gender Ethnicity
Medical complaint	Critical omission of information; information presented is disorganized	$\underline{\geq}$ 2 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All medical complaint information presented in a logical sequence: Reason for seeking care
Information related to the complaint	Critical omission of information; information presented is disorganized	$\underline{\geq}$ 2 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All History of Present Illness information presented in a logical sequence: Onset Location Duration Characteristics Aggravators Relievers

				Timing/Treatments Ever had before Summarize
Signs and symptoms	Critical omission of information; information presented is disorganized	≥ 2 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All physical exam information presented in a logical sequence: General appearance Vital signs: HR, RR, BP, SpO2, Height, Weight Pain scale Case-specific: Pertinent Review of Symptoms and Physical Exam Skin Head Neck Eyes Ears Nose Mouth & Throat Breast Chest/Lungs Cardiovascular Abdomen Female/Male Genitalia Rectum/Prostate Musculoskeletal Neuro Psych/Mental Status Endocrine Hematology
Treatment and trends	Critical omission of information; information presented is disorganized	≥ 2 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All treatment information presented in a logical sequence: Medications - Dosing - Trends Diagnostic testing - Results Intervention Supportive care Consultations
Allergies	Critical omission of information; information presented is disorganized	≥ 2 pertinent information items missing; Vital element is missing; inconsistent	1-2 non-vital information items missing; information is mostly organized in a	All Allergies information presented in a logical sequence: Allergies Adverse reactions Drug Intolerance

		organization of material	logical sequence	Symptomatology
Medication	Critical omission of information; information presented is disorganized	≥ 2 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All medication information presented in a logical sequence: Medications Herbs OTC Dosing Compliance
Background	Critical omission of information; information presented is disorganized	≥ 3 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All background information presented in a logical sequence: General health Significant Illnesses Hospitalizations Surgeries Trauma Transfusions Family History Nutrition/Diet
Other social information	Critical omission of information; information presented is disorganized	≥ 3 pertinent information items missing; Vital element is missing; inconsistent organization of material	1-2 non-vital information items missing; information is mostly organized in a logical sequence	All social information presented in a logical sequence: Family structure Occupational history Physical activity Caffeine Nutrition Tobacco Alcohol Drugs Safety Financial Situation Housing Situation Spirituality Support system

APPENDIX H: PERMISSION TO USE IMIST-AMBO MNEMONIC

From: Rick Iedema [ram.iedema@gmail.com]
Sent: Thursday, February 20, 2014 7:16 PM
To: Ortiz, Judy A.
Subject: Re: Request to use the IMIST-AMBO Tool

Dear Judy
Thanks for your enquiry. Great to hear you're finding it useful.

Of course you can use it, thanks for asking!

I've attached a full-length report in which we present eye-contact analyses, and an evaluation of the communication differences between pre- and post-protocol uptake.

We also made a DVD modelling the new communication behaviours which I've just discovered is not on youtube - need to fix that.

Anyway, let me know how you go.

Regards,

Rick