Does Interprofessional Simulation Change Dietetic Student Perception of Communication, Decision-Making, Roles, and Self-Efficacy in Working with the Healthcare Team?

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in the Graduate School of The Ohio State University

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2014

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Abstract

Despite the research that supports interprofessional education as a component to delivering optimal medical care, many education programs still provide minimal exposure and interaction during student training. This study used a pre/post-test design using a validated questionnaire and post-simulation student reflections to describe the effect of an interprofessional simulation experience on dietetic student perceptions of teamwork and decision-making, understanding roles of healthcare professionals, and self-efficacy for providing patient care. Two-tailed paired-sample t-tests assessed questionnaire items and demonstrated that students felt that learning with other students will increase effectiveness of the health care team ($p=0.032$); that shared learning with other health professions will increase their ability to problem-solve ($p=0.017$); and that shared learning will help them become better clinicians ($p=0.018$). There was a significant increase in support of small group projects ($p=0.027$) and generic lectures, tutorials, or workshops ($p=0.006$) shared with other health sciences students. Students had significant increases in their understanding for the roles of nursing, nurse practitioner, occupational therapy, pharmacy, physical therapy ($p<0.001$), medical dietetics ($p=0.012$), and medicine ($p=0.004$). Students indicated a statistically significant increase in the item "I feel confident in providing care for a ventilated patient" ($p<0.001$). This quantitative data is supported by previous Autumn 2012/Spring 2013 non-validated questionnaire data as well as qualitative reflections. This study demonstrates that

interprofessional simulation is an effective method to increase dietetic student understanding of professional roles, increase dietetic student self-efficacy for clinical care, and provide a learning experience that may impact future patient care.

Dedication

This thesis is presented with dedication to my parents, Beth and Ted, siblings, Julia and Blake, and in memory of my sister Megan Marie and mentor J. Michael Dunn – my biggest heroes who have encouraged me to pursue my passions, to strive for optimal balance in work and in life, and to fearlessly live my dash. Thank you for your endless support and inspiration.

Acknowledgments

Thank you tremendously to my advisor, Dr. Marcia Nahikian-Nelms, for providing abundant guidance and support throughout this project. Thank you to my committee members, Dr. Georgianna Sergakis and Dr. Jill Clutter for offering direction, education, and encouragement. You are very much appreciated as committee members, as professors, and as role models for who I strive to be in my profession.

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Chapter 1: Introduction

Background

Teamwork is needed for effective patient management due to the increased specialization and complexity of tasks, risks associated with treatment options, and the need to ensure optimal healthcare outcomes and patient safety.[1] In 2000, the Institute of Medicine released the report *To err is human: Building a safer heath system* detailing the importance of interdisciplinary decision-making to avoid medical errors, many of which are the result of dysfunctional or nonexistent teamwork.[1,2]

Ineffective communication among healthcare professionals has been shown to be a common denominator behind many adverse events, medical errors, and delays in patient care.[3,4] In fact, 80% of errors were documented to be due to informational or personal miscommunication (among colleagues, between patient and physician, inaccessible medical records, etc.) which led to physician reported patient-harm 43% of the time.[3]

Aside from their negative effects on human lives, these preventable medical errors due to ineffective communication can also result in the cost of approximately 17-29 billion dollars annually, as well as an overall loss of trust in the healthcare system.[2]

Teaching communication skills through interdisciplinary education may be one way to solve this issue. Interdisciplinary education is crucial to delivering cost-effective, safe, and effective medical care.[4] However, many health professions programs still educate

their students with minimal interaction and understanding of other health care professionals, which may negatively impact professionals' beliefs and values regarding other members of the health care team and their contributions to patient care.[5]

The impetus for promoting more team-based education is not new. In 1972, the Institute of Medicine encouraged team-based medicine as a possible means to use the existing health workforce optimally and cost-effectively, so that health professionals could practice to their full scope of expertise to improve patient care.[6] These recommendations still hold true today, however, opportunities to expand upon existing learning experiences to provide interprofessional education often have not been pursued.[7] Heuer et al state, "clearly, current medicine requires expanded multidisciplinary problem solving and communication in order to deliver cost-effective, quality health care." [4]

Problem Statement

Ineffective interdisciplinary communication can result in serious consequences – adverse events, medical errors, patient care delays, patient harm, and increased medical cost. Interdisciplinary education is crucial to delivering cost-effective, safe, and effective medical care. While some programs have been developed to address the need for interdisciplinary care, very few specifically address dietetic student self-efficacy.

Purpose of the Study

The purpose of this study was to explore dietetic student reactions and to assess self-efficacy for dietetic students regarding their participation with members of an interdisciplinary team before and after a simulation experience.

Research Objective

The objective of this study was to describe the difference in dietetic student perceptions of teamwork and decision-making, understanding roles of healthcare professionals, and self-efficacy in patient care before and after an interprofessional education simulation experience.

Significance of the Study

Adverse events, medical errors, and harm are serious concerns for patient care. Interdisciplinary learning experiences can provide the knowledge, skills, and attitudes necessary for increased effective communication among healthcare team members. While some interprofessional education programs have been developed, very few include research on dietetic student perceptions prior to and following the experience.

Definition of Terms

1. Interdisciplinary: involving two or more academic, scientific, or artistic disciplines (http://www.merriam-webster.com/dictionary/interdisciplinary).

2. Interprofessional education: a teaching and learning process that fosters collaborative work between two or more health care professions.[8]
3. Simulation: a method of education that integrates with, and complements, other traditional and nontraditional training approaches, such as lectures, problem-based learning, and bedside teaching.[9]
4. Self-efficacy: beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations.[10]

Chapter 2: Literature Review

Introduction

Preventable medical errors due to ineffective communication can result in approximately 17-29 billion dollars spent per year, an overall loss of trust in the healthcare system, and patient harm.[2] In fact, 80% of errors due to informal or personal miscommunication between colleagues and patients were shown to lead to physician reported patient harm 43% of the time.[3]

Communication through teamwork may be one way to address this complex issue. Teamwork through interdisciplinary decision-making can be useful in avoiding preventable medical errors and is needed to ensure optimal healthcare outcomes and patient safety.[1,2] Many have advocated for interdisciplinary education as a way to deliver cost-effective, safe, and effective medical care.[4] However, many medical programs still educate their students with minimal interaction or understanding of other health care professionals. In fact, opportunities to expand upon existing learning experiences to provide interdisciplinary education have not often been pursued.[7]

Adult learning theory serves as one of the theoretical foundations to effective education for the curriculums of several allied health professions' programs. Adult learning theory can be applied through the teaching method known as problem-based

learning, where students learn to resolve problems through collaboration and active listening.[11] When adult learning theory is used as the foundation of education, academic performance, critical thinking, self-directedness, and team-working skills are all enhanced.[12–19]

Self-efficacy is a measure of an individuals' perceived ability to execute a task or skill. High self-efficacy beliefs have been demonstrated to lead to improved performance and clinical competence.[10,20–22]

Current research relevant to adult learning theory, self-efficacy, interprofessional education, and simulation is the focus of this literature review.

Adult Learning Theory

Malcolm Knowles introduced Adult Learning Theory, otherwise known as "andragogy," as "the art and science of helping adults learn." The theory, which shares details about the process, attitude, and motivation of adult learning, is rooted in five key assumptions:

1. Adults are independent and self-directing.
2. Adults have accumulated a variety of experiences, which serve as rich resources to new learning.
3. Adults become ready to learn information when they know they can integrate the knowledge with their everyday life.
4. Adults have a problem-centered (i.e. task-centered) orientation to learning, rather than a subject-centered approach.

5. Adults are more motivated to learn by internal incentives – like the desire for accomplishment, curiosity, and the need for self-esteem – than external drives.[23,12,24]

Many health professions suggest a need for adult learning theory to guide their curricula. Goldman writes that educators can improve the efficiency and effectiveness of their teaching when including the principles of adult learning theory to promote residents' learning.[25] Additionally, Dewitt writes that "the application of social and adult learning theory to the development and implementation of community pediatrics curricula will be necessary to succeed in these endeavors."[26] When adult learning theory coupled with Bandura's self-efficacy concept served as the foundation for a program to provide nurses with an orientation to hemodialysis, informal feedback showed that the orientation was effective for transitioning new graduate and transitioning nurses to nephrology.[27]

Adult learning theory has been the foundation of many medical education programs and has demonstrated effectiveness in increasing overall knowledge and performance. For example, when an evidence-based medicine curriculum rooted in adult learning theory was used to teach a group of 34 second and third year internal medicine residents, case subjects significantly improved their scores on an evidence-based medicine skills test when compared to the control group.[12] In addition, when the staff of an internal medicine journal club recreated the club with a new model based in adult learning theory, 88% of the residents believed that the new model increased their medical knowledge. 82% of the residents believed that they were able to apply the methods learned to actual

patients and 100% believed that the new model based in adult learning theory was better than the previous model.[13]

Adult learning theory can be applied throughout curriculum development and is the foundation for the teaching approach known as problem-based learning (PBL). In a small-group format, problem-based learning can incorporate clinical knowledge as well as attitudinal and psychomotor skills.[1,11] Problem-based learning typically utilizes case-based presentations as the method for learning. In problem-based learning, students learn to resolve a problem through collaboration and listening to each other.[11]

Many initiatives in interprofessional education use curricula with problem-based learning.[5] When a four-day problem-based learning exercise was developed and delivered to a group of 59 dietetic and clinical psychology students, students reported a positive difference in their perceptions of team-working skills, awareness of professional limitations, and attitudes towards other professionals.[14]

Again, problem based learning was analyzed in a study comparing 1159 graduates from one problem-based learning and four non-problem-based learning schools 18 months after graduation. Of all the graduates surveyed, all demonstrated satisfaction with their learned knowledge and skills, however, those in the problem-based learning group reported better preparation with respect to several general medical competencies.[15]

Similarly, after two problem-based learning sessions were delivered to 72 undergraduate medical students, pre- and post-test questionnaires revealed that students felt that the problem-based learning sessions created better interest, better understanding, and promoted self-directed learning. About 90% thought that the problem-based learning

method motivated them to learn and 83% felt that it facilitated team learning. In the same study, student test scores on the content covered during the sessions significantly increased.[16]

Not only do perceptions in interprofessional beliefs as well as test scores increase with problem-based learning, but the level of critical thinking skills increases also. In the study by Tiwari et al, 79 undergraduate nursing students were randomly assigned to a course delivered by either problem-based learning or lecturing over one academic year. Data was collected to assess students' disposition towards critical thinking through the California Critical Thinking Disposition Inventory (CCTDI). Compared with the lecture group, those in the problem-based learning group demonstrated statistically significant improvements in overall CCTDI scores.[18]

Problem-based learning includes the thought of active learning, whereby students are engaged in classroom content rather than participating as a traditional passive listener. By stimulating student learning, problem-based learning helps students attain competencies, encourage deep thinking, and prepares students for lifelong learning.[19] In the redesign of a biochemistry and metabolism course to students studying nutrition and dietetics from traditional lectures to active learning, students participating in the active learning course experienced significantly higher final exam test scores than their counterparts who participated in the conventional lecture courses.[17]

Thus, we can deduce that when curriculum is rooted in adult learning theory – and specifically through problem-based learning – students report increased knowledge[13,15] which they display through an increase in content and/or skills test scores[12,15–17].

Students also demonstrate the ability to attain required competencies[19], report increased critical thinking and deep thought[18,19], and increased self-directedness[16]. Additionally, students report better team-working[14,16] and the ability to apply concepts from problem-based learning to actual patients and their future practice.[13,19]

Self-Efficacy

Bandura defined perceived self-efficacy as the "beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" as part of his Social Learning Theory. Later, the theory was renamed Social Cognitive Theory. Beliefs in self-efficacy influence how individuals think, feel, motivate themselves, and act. Self-efficacy can be influenced with the following four main interventions:

1. Mastery experiences: Selecting appropriate courses of action for managing life circumstances.
2. Vicarious experiences: Seeing others similar to own self persevere and succeed raises belief that the individual, too, can thrive.
3. Social persuasion: Those who are persuaded verbally that they possess the skills needed to master given activities are more likely to utilize greater effort and sustain it than if they doubt themselves when problems arise.
4. Psychological and emotional states: positive mood improves perceived self-efficacy whereas a negative mood weakens it.[10,28]

In 2007, Ammentorp et al evaluated the self-efficacy of 19 physicians and 11 nurses in a pediatric outpatient clinic through a randomized controlled trial in which the intervention group received a 5-day communications course and the control group received no intervention. Questionnaires with 13 items to measure the professionals' self-efficacy were completed before the intervention, just after the intervention, 3 months after the intervention, and 6 months after the intervention for both the intervention and control group. Each group had similar baseline perceptions in self-efficacy. After the intervention, mean scores of self-efficacy increased considerably from T1 (before the intervention) to T2 (just after the intervention) for all 13 questions in the intervention group; however, these scores remained unchanged in the control group. After the intervention, the mean of the mean-scores for all 13 questions was calculated and the intervention group's overall self-efficacy was statistically significantly higher just after the course and 6 months after the course.[29]

Differences in self-efficacy have been shown to be related to differences in skill level and performance.[30] In their 2012 study, Norgaard et al assessed the effectiveness of a 3-day training course in patient-centered communication and interdisciplinary communication on participant's self-efficacy before (T1), immediately after (T2), and 6 months after the course (T3) with an 8-item questionnaire. One hundred eighty one participants – all staff members from an orthopedic clinic including doctors, nurses, and nursing assistants – completed the course; 175 completed the survey before, 165 immediately after the course, and 150 six months after the course. After statistical

analysis was performed, increases in self-efficacy from T1 to T2 and from T1 to T3 were significant for all questions regarding communication with both patients and colleagues.[30]

Once more, Norgaard measured self-efficacy in 2013. Students from nursing, medicine, physiotherapy, occupational therapy, laboratory technology, and radiography were included in a two-week clinical training program to enhance interprofessional collaboration, practice duties and knowledge, and interprofessional as well as uniprofessional competence. The study was designed as a quasi-experimental intervention; students in the interprofessional clinical study received interprofessional clinical training, whereas the students in the control group received the usual clinical training. After their training, all students completed an online questionnaire that included an instrument of four questions to assess perceived self-efficacy in interprofessional collaboration. Questions included: "To what extent do you believe that you successfully can…

1. Collaborate with other professions in planning goals and actions for patient rehabilitation?
2. Collaborate with other professions for rehabilitation in an inpatient ward?
3. Identify the functions of other professions in relation to inpatient care?
4. Clearly assess and describe patients' needs and problems, so that other professions can engage in a dialogue about goals and actions?"

There were no statistically significant differences in mean self-efficacy between the two groups at baseline. Scores increased significantly among students in the interdisciplinary clinical study group both after completion of the study program and

those scores were maintained at the end of their clinical training. As compared to the control group, the intervention group's mean scores showed statistically significant increases in the first three self-efficacy questions and increases of borderline statistical significance for the fourth question.[31]

As demonstrated through these studies, self-efficacy continues to be an efficient and reliable method for monitoring professionals' benefit of attending a communication skills training course.[28,29,31] Not only can self-efficacy be improved upon after a training course, it can also be of benefit in developing commitment to a certain specialty or field of interest. In February 2014, Goodin et al demonstrated that the interaction of one's self-efficacy and "calling" seems to be the key measure in developing medical student commitment to a given specialty.[32]

Self-efficacy is an important measure since a low sense of self-efficacy is related to feelings of stress, depression, anxiety, helplessness, low self-esteem, low motivation, and pessimism towards accomplishments. A strong sense of self-efficacy is related to critical thinking, performance, quality decision-making, and academic achievement. Those with high self-efficacy tend to be more motivated to approach challenging tasks rather than avoid them. Additionally, those with higher self-efficacy tend to set higher goals for themselves and are more committed to those goals.[28]

In order to gain a sense of self-efficacy, one must be able to successfully finish a task (mastery experience), observe someone else completing a task (vicarious experience), acquire positive feedback (social persuasion), or have a positive mood (psychological/emotional cues).[10,28]

An interprofessional education simulation experience can be a source of self-efficacy as it includes all four of these components of Bandura's theory. Simulation includes mastery experience, since students must complete a case study and act in their own future professional role. It includes vicarious experience, since students are observing other students complete the case and practice their roles. It includes positive feedback through faculty members' and other students' guidance, suggestions, and advice. Finally, interprofessional simulation may provide a better means for positive emotional states since students are in a "safer" environment.

Ultimately, self-efficacy affects behavior and outcomes.[28] In fact, Lenz & Shortridge-Baggett note that it is "the most important predictor of change in behavior."[20] Bandura confirms that high-self efficacy beliefs will lead to improved performance in any activity.[21,22] Therefore, developing teaching approaches that improve self-efficacy is essential for improved clinical competence.[21]

Interprofessional Education

Interprofessional education (IPE) occurs when multiple professions gather together to "learn with, from, and about each other in order to improve collaboration and quality of care." [33]

In 2011, the Interprofessional Education Collaborative Expert Panel designed competencies and competency domains that should be instituted across various health professions. The goal of interprofessional learning, they write, is "to prepare all health professions students for deliberatively working together with the common goal of

building a safer and better patient-centered and community/population oriented U.S. health care system." [7]

The core competencies proposed by the Interprofessional Education Collaborative Expert Panel include competency domains, which include specific competency statements. The following is a list of the competency domains and key statements regarding the specific competencies:

1. Competency Domain 1: Values/Ethics for Interprofessional Practice – mutual respect, trust, and shared values serve as the foundation to working in an interprofessional environment.
2. Competency Domain 2: Roles/Responsibilities – health professionals should understand one's own professional role and responsibilities, as well as the role and responsibilities of other members of the healthcare team.
3. Competency Domain 3: Interprofessional Communication – communication is central to interprofessional collaborative practice; health professionals should be responsive and responsible in supporting a team approach.
4. Competency Domain 4: Teams and Teamwork – relationship-building values should be applied to effectively perform in different team roles to plan and deliver care that is safe, timely, efficient, effective, and equitable.[7]

In dietetics, specific competencies are mandated for the accreditation of dietetic education programs. These competencies support the need for the inclusion of interprofessional experiences in both the classroom and supervised practice. The

Accreditation Council for Education in Nutrition and Dietetics has set forth the following competencies, which emphasize the need for interprofessional education:

- CRD 2.5 Demonstrate active participation, teamwork and contributions in group settings.
- CRD 2.7 Refer clients and patients to other professionals and services when needs are beyond individual scope of practice.
- CRD 2.10 Establish collaborative relationships with other health professionals and support personnel to deliver effective nutrition services.
- CRD 2.11 Demonstrate professional attributes within various organizational cultures.[34]

The importance for interprofessional training is increasingly recognized.[2] However, despite this widespread recognition for the need for interprofessional training, data regarding the beneficial effects of training remains limited.[35]

The underlying rationale for including interprofessional training within the curricula is that doing so will result in an increased understanding of the role, function, and overall comfort level among students pursuing various health professions.[4] Many believe that interprofessional training will enhance communication, collaboration, and thus result in improvements in patient care.[36,37] Others state that interprofessional teamwork can improve the quality of patient care and reduce workload issues that cause burnout among healthcare professionals.[1]

Interprofessional education (IPE) can help students achieve objectives to engage in teamwork, interdisciplinary interaction, reflection, and professionalism.[38] IPE can also

help students understand the roles of other healthcare professionals in improving patient and health outcomes and the quality of life in communities.[38–40] Hallin et al write that interprofessional education provides the ability for students to acquire knowledge, skills, and attitudes that they would not have otherwise acquired through uniprofessional education.[41]

In 2009, Hallin et al researched students' perceptions of interprofessional competence after participation in clinical teamwork training. Six hundred and sixteen students from four undergraduate programs (medicine, nursing, physiotherapy, and occupational therapy) participated in a two-week course in an orthopedics clinic. The students participated in interprofessional collaboration to take care of and treat the patients. Students filled out questionnaires before and after the course. Students from all four programs reported that they increased their knowledge of the other professions' work. They also perceived that they better understood the importance of communication and teamwork in patient care. Additionally, students from all four programs reported that the clarity of their own professional role was enhanced after the course. This study concluded that active patient based learning by working in an interdisciplinary team in a real clinical setting can be an effective approach to increasing collaborative and professional competence.[41]

In 2008, the New Jersey Medical School at the University of Medicine and Dentistry in New Jersey piloted a one-hour case-based educational module to orient medical students to other members of the healthcare team (eight other professions) and to discuss the responsibility of collaborative care. After completing the class, 116 medical students

completed surveys. The surveys were based on a 5-point Likert scale, with 5 being the most favorable. Results showed mean scores of 4.28, 4.06, and 4.03 for the module's ability to increase awareness of other professions, enhance appreciation for interdisciplinary communication/care, and enhance the effectiveness of a physician, respectively.[4]

Hamilton et al developed a two-day interdisciplinary education session for first year medical and physical therapy students at the Mayo Clinic College of Medicine in order to evaluate the effectiveness of and student attitudes towards interprofessional education. The students met for four hours each of the two days. An 18-item questionnaire was distributed to the students before and after the two-day session. The questionnaire asked students items regarding teamwork and collaboration, cross-discipline learning, shared learning, cross-discipline respect and communication, and professional limitations. Thirty-five medical students and 28 physical therapy students completed the questionnaire before the session and 40 medical students and 28 physical therapy students completed the questionnaire after the session. Results indicated generally positive responses as well as improvements in questionnaire items. Ninety-two percent of all the students indicated that interprofessional learning would help them interact with other professionals in the future.[38]

Dietetic Student Perceptions of Interprofessional Education

Though interprofessional education may improve interprofessional relationships, little information exists regarding dietetic student participation in interprofessional education

experiences.[42] Few studies on interprofessional education have included dietetic students.[43] Of those that do, generally positive outcomes have been reported.

Nineteen students from a graduate physical therapy program and 9 students from a graduate dietetics program at the same university were evaluated using an interdisciplinary case study approach by Smith and Christie in 2004. The researchers set out to (A) increase student awareness of other professions, (B) increase the ability of students to obtain and analyze information relative to a patient case, and (C) increase student communication skills across disciplines. Students worked collaboratively to complete a case study assignment. Three weeks after the due date of the assignment, the students were asked to complete a five-item open-ended survey regarding their experience. Several themes emerged from the responses, including a deeper appreciation and understanding of the other profession and a perceived growth in communication skills. Additionally, several students believed that the assignment assisted in improving future teamwork.[44] However, barriers presented themselves as well. Many students reported that they had difficulties coordinating time to meet. In the end, Smith and Christie write, "incorporation of collaborative assignments in didactic and supervised practice curriculums will improve dietetic professionals' skills in working with professions from other disciplines."[44]

In 2005, Whelan et al analyzed dietetic student reactions following seven interprofessional education sessions. The sessions included information regarding interprofessional health care and communication. Twenty-six dietetic students completed the coursework in the 2003-2004 academic year alongside medical and nursing students.

Dietetic students were asked to rate their reaction to each of the seven sessions in relation to: (A) interest value; (B) the learning experience and (C) value for clinical practice by using a 5-point Likert scale. Students also had the ability to enter free-text comments. Overall, the students rated their course as positive for interest value ($p=0.14$), learning experience ($p \leq 0.036$), and value for clinical practice ($p \leq 0.05$). Students presented positive comments like, "I like the way we've been encouraged to meet students from other disciplines – some of my former views are already changing" and "Listening to others questions help you to see questions you may not have thought of yourself. It broadens your perspective."[42]

An online interprofessional education course with three modules was delivered to dietetic students during their four-year program. Eleven professional programs were included in the course, including dietetics, physiotherapy, occupational therapy, nursing, and midwifery. A questionnaire was distributed and completed by 20 final-year dietetic students. The questionnaire tested their satisfaction towards their interprofessional experience. Results showed that satisfaction increased as students progressed through the modules. Eighty percent of the students felt that participation in the course enhanced their understanding of the role of other professions and 75% of the students felt that participation increased their awareness of interprofessional issues. However, 75% of the dietetic students felt that the IPE course had no impact on the understanding of their role as a dietitian.[43]

Adult Learning Methods

Interprofessional education can be taught through a variety of methods, either in the classroom or an in an experiential setting.[5] O'Brien et al note that effective learning requires the participant to be an active member of clinical work, rather than a passive listener or reader.[41,45]

As shared in the section above, dietetic student's interdisciplinary education has occurred through a case study approach[44], classroom learning[42], and online learning.[43] According to Weinstein et al, newer educational technologies like online learning, distance technologies, networking innovations, and simulation overcome traditional barriers—like time and space—in teaching interprofessional education.[7]

Simulation

One method in which adults learn is through simulation. Simulation is defined as "a method of education that integrates with, and complements, other traditional and nontraditional training approaches, such as lectures, problem-based learning, and bedside teaching."[9] According to Hunt et al and Baker et al, simulation provides an ideal learning environment because it allows participants to practice both team- and task- related skills in a safe setting.[35,46,47]

Effective simulation training requires several important features, including feedback during the learning experience, repetitive practice, curriculum integration, an increasing degree of difficulty, adaptability to a variety of learning styles, clinical variation, and individualized/self-directed learning.[48]

After completing a formal needs assessment, Schaik et al developed an interprofessional simulation-based team training regarding pediatric resuscitations for physicians, nurses, pharmacists, and respiratory therapists at the University of California, San Francisco. Approximately 82 physicians and 470 nurses completed a mock code program in which participants enacted patient care scenarios as they may happen in a real-life pediatric resuscitation. The impact of the program's effect on physician self-efficacy was assessed using a pre-post study design. The effect on nurse self-efficacy was assessed using a cross-sectional, observational design with a survey based on a 5-point Likert scale. Both residents and nurse surveys contained an open-ended question, which served for qualitative data analysis. Quantitative analysis showed a beneficial effect on self-reported self-efficacy among both physicians and nurses. Statistical significance was found in the self-efficacy of leadership skills among residents in their third year. Qualitative data included comments like "I like having both the doctors and nurses there because it helped explain what role each person is responsible for in an actual code situation." Overall, the program was widely accepted with the staff at the University of California, San Francisco and participants reported that the program had a positive impact on self-efficacy in pediatric resuscitation.[35]

Paige et al studied simulation in the operating room in 2007. Three operating room teams, comprised of ten total participants, completed a standardized simulation. Participants completed a voluntary and anonymous training effectiveness questionnaire after the simulation. Results showed that all participants thought that the experience was worthwhile and they indicated they would participate again. 80% of the participants felt

that what they learned would change their current practices in the operating room. All the participants indicated that the session was effective in promoting interdisciplinary communication skills and crisis-related teamwork. 90% of the participants felt that the simulation training was effective in recognizing errors in the operating room.[49]

From pediatric resuscitation[35], to the operating room[49], and to end-of-life situations, simulation demonstrates yet again to be an effective method of teaching.[50] Thirty pharmacy students who enrolled in a 3-hour elective course titled "Interdisciplinary Approaches to Palliative and End of Life Care" were eligible to participate in high-fidelity simulation training, which included the death of a patient with end-stage renal disease using a high-fidelity simulator – a lifelike mannequin that simulates most body functions and can be programmed to have physiologic responses. Following the simulation, each student was given the opportunity to journal reflectively on his or her experience. A student satisfaction questionnaire was also completed before and after the simulation. Mean pre- and post- simulation scores regarding attitudes towards death and end-of-life competencies were analyzed. It was found that there was a significant decrease in mean attitude scores from pre-simulation to post-simulation, which indicated there was a significant improvement in attitude towards death. Additionally, changes from before the simulation to after the simulation showed significant improvements on self-perceived competencies in providing care at the end of a patient's life.[50]

Conclusion

Adult learning theory demonstrates that students learn when they (A) are independent, (B) have accumulated a wide variety of experiences to serve as a resource to new learning, (C) can integrate knowledge with their everyday life, (D) have a task-centered approach to learning, and (E) are motivated by internal incentives.[12,23,24] Self-efficacy can influence how individuals think, feel, motivate themselves, and act, and can lead to increased performance in a variety of settings.[10,21,22]

Interprofessional education can help prepare health professions students to work together to build a safer, more patient-centered, and more community/population oriented health care system.[7] It has been shown that interprofessional education helps students of various health professions better understand roles, functions, and improve overall comfort levels.[4] Several believe that interprofessional education can enhance communication, collaboration, and thus result in improvements in patient care.[36,37] Previous studies of dietetic students' involvement in interprofessional education have reported that students gain a deeper appreciation and understanding of other professions, as well as a perceived growth in communication skills.[43,44]

Simulation provides a delivery device for which to train students in interprofessional education. Simulation serves as an ideal learning environment because it allows for participants to practice both team- and task-related skills in a safe setting.[35] Delivering education through simulation can improve students' reported self-efficacy[35], improve self-perceived competencies[50], change current practices, and help better recognize errors.[49]

Chapter 3: Methodology

Introduction

This study describes the perceptions of dietetic students regarding their ability to communicate, to make decisions, and to understand the roles of other members in an interdisciplinary team before and after a case-study simulation experience in the Autumn 2012, Spring 2013, and Autumn 2013 semesters at The Ohio State University. The study uses quantitative data from student questionnaires before and after a simulation experience. Two questionnaires were used – a nonvalidated questionnaire for the Autumn 2012 and Spring 2013 simulations, and a validated questionnaire for the Autumn 2013 simulation. Qualitative data was provided by student reflections written one week after the simulation experience.

Research Design

A one-group pretest-posttest research design using mixed methods was utilized for this study. Students completed pretest and posttest questionnaires for the source of quantitative data. Qualitative data was gathered from reflection documents written by the students one week after the simulation.

Research Questions

The following questions were the basis for exploring the knowledge, perceptions, and attitudes of dietetic students after an interdisciplinary simulation experience. Following an interdisciplinary simulation experience:

1. Is there a difference in the perceptions of interdisciplinary communications and decision-making?
2. Is there a difference in dietetic student understanding of the roles of the members of the healthcare team?
3. Is there a difference in self-efficacy in caring for a patient?
4. What are the identified themes evolving from collaboration?

Planning and Preparation for Simulation

Planning for the interprofessional simulation occurred over a ten-month period with weekly meetings of faculty representing nursing, medicine, physical therapy, respiratory therapy, pharmacy, and dietetics at The Ohio State University. Time was spent in the planning meetings reviewing the current literature, developing the interprofessional simulation structure, and planning the cases of simulated patients Ann Arbor and Shirley Johnson to be used during the simulations. For the Autumn 2013 simulations, the case of Shirley Johnson was edited and renamed Jill Shuman. The complete case studies are listed in Appendix A, B, and C. Goals, objectives, schedules and evaluation methods were also developed during these meetings. The interdisciplinary faculty developed the following learning objectives and skill expectations:

- Objectives:
    - Create a climate of mutual respect and understanding.
    - Develop inter-professional communication skills.
    - Understand the roles and responsibilities of the other professions participating in the simulation.
    - Develop a multidisciplinary team plan of care to improve patient outcomes across the lifespan.

Preparation for Dietetic Students

Additionally, the dietetic faculty developed specific objectives for the dietetic students participating in the simulation. These learning and skill objectives include the following:

- Learning Objectives. The dietetic students will:
    - Use the knowledge of the nutrition care process and the role of the Registered Dietitian along with those of other professions to appropriately assess and address the health care needs of the patient.
    - Work in cooperation with individuals of other professions to maintain a climate of mutual respect and shared values.
- Skill Expectations. The dietetic students will:
    - Perform the Nutrition Care Process and use standardized nutrition language with appropriate evaluation of current nutrition support followed

by recommendations for advancement and monitoring of enteral feeding using evidenced-based guidelines.

- Assess the nutritional status of patient.
- Diagnose nutrition problems and create problem, etiology, signs and symptoms using (PES) statements.
- Plan and implement nutrition interventions to include prioritizing the nutrition diagnosis, formulating a nutrition prescription, establishing goals, and selecting and managing intervention.
- Monitor and evaluate problems, etiologies, signs, symptoms, and the impact of interventions on the nutrition diagnosis.
- Complete documentation that follows professional guidelines, guidelines required by health care systems and guidelines required by the practice setting.

- Communicate RD role and responsibilities clearly to other professionals.
- Use the full scope of knowledge, skills, and abilities of available health professionals to provide care that is safe, timely, efficient, effective, and equitable.
- After reading the medical record, consulting with the members of the health care team and interviewing the patient, if appropriate, the student will demonstrate the ability to:
    - Gather general information about the patient admission:
        - Identify social background (and socio-economic status).

        - Identify contributing factors to nutrition status.
        - Identify past medical status that is relevant to this admission.
        - Identify any pertinent family history – genetics if relevant.
    - Verify present medical status.
    - Identify pertinent medications – their reason for use and any drug/nutrient interactions.
    - Identify laboratory values that are consistent with diagnosis and those that contribute to nutrition assessment.
    - Obtain and assess anthropometric data.
    - Estimate energy and protein needs using appropriate standards/guidelines with consideration of patient medical diagnosis.
    - Note any physical or clinical assessment status including GI function and skin status.
    - Identify correct nutrition diagnosis.
    - Determine appropriate intervention according to standards of practice consistent with the patient's diagnosis.
    - Accurately document nutritional care provided.

For each case study, dietetic faculty developed specific preparation questions that are outlined below:

Case Study 1 (Ann Arbor) Preparation Questions:

1. What are the current evidence-based guidelines for initiation of nutrition support in the critically ill patient?
2. Identify the factors within Ann Arbor's medical record that either support the initiation of nutrition support or suggest that the patient should be NPO.
3. Ann Arbor was getting ready to be weaned:
    a. What factors support the continuation of enteral feeding?
    b. What factors support the discontinuation of enteral feeding and advancement of an oral diet?
4. How does trauma, metabolic stress and the inflammatory response affect nutritional requirements?
5. What is the recommended method to assess Ann Arbor's energy and protein requirements?
6. How does critical illness affect the ability to assess nutritional status?

Case Study 2 and 3 (Shirley Johnson/Jill Shuman) Preparation Questions:

1. What are the current guidelines for diagnosing malnutrition?
2. Identify factors within Shirley Johnson's medical record that support our ability to diagnose malnutrition. What type of malnutrition would you suggest she has? Is there any further evidence you would like to gather? How would you do this?
3. Prioritize Shirley's nutrition problems.
4. What are the nutritional needs for wound healing?

5. What are the effects of chronic alcohol abuse on nutritional status? What information do you need to assess these effects?
6. Identify the factors within Shirley Johnson's medical record that either support the continuation (or discontinuation) of enteral feeding.
7. How would you assess Shirley's knowledge for diabetes? How would you prioritize this within the context or her other problems?

Additional preparation for simulation for all students included a faculty dissemination and individual review of a PDF tool regarding the standardized ISBAR (Introduction, Situation, Background, Assessment, and Recommendation) approach for patient and interprofessional communication. The document of the ISBAR tool distributed to the students is located in the Appendix D.

Overview of Interprofessional Simulation Experience

During three semesters of 2012-2013 academic years, students representing nursing, medicine, physical therapy, occupational therapy, respiratory therapy, pharmacy, social work, and dietetics were organized into health care teams to participate in a 2½-hour interdisciplinary simulation. Interprofessional groups of ten to fifteen people including one or more representatives from various professions completed two intensive care scenario case studies through a bedside rounding simulation involving one patient actor and one patient mannequin simulator.

Each simulation was conducted multiple times each of the three semesters involving numerous interprofessional students and 11 faculty members. Students chose their own

times to participate in the interdisciplinary simulation, but all teams included representatives from a number of various professions. Before each simulation began, students completed a pre-simulation questionnaire.

Interdisciplinary simulations were organized as follows. Each simulation included a ten-minute introduction to the professions involved, a review of the learning and skill objectives, and an overview of the simulation schedule. Next, students from each profession were allotted time to gather pertinent information from the chart, the patient, and from students from the other health care professions. A bedside rounding simulation for each patient by the interprofessional group then followed. The team leader was either a medical student or nurse practitioner student. Each student member of the team presented his or her pertinent contribution to the patient story. A plan of care for each of the two patients was developed during these bedside discussions. After collaboratively creating a plan of care, students were given time to implement intervention and treatment plans. To conclude the simulation, a second bedside round was conducted to discuss the implementation of the plan of care. Here, student members discussed progress and future improvements. At this time, additional plans for each patient were proposed. Finally, the entire group participated in a debriefing session, led by one of the faculty members. Students then completed a post-simulation questionnaire.

Dietetic students were required to write a medical record chart note and compose a personal reflection of the experience as outlined by an assignment. These items were turned into dietetic faculty during the following week.

Sample

A convenience sample of seventy dietetic students participated in the interdisciplinary simulation experience for Autumn 2012, Spring 2013, and Autumn 2013. All students were required to attend the interdisciplinary simulation experience as part of their course work, however, participation in the research study was voluntary.

Consent

An IRB proposal was submitted and approved by the Institutional Review Board of The Ohio State University. Informed consent was received from all participants before the study commenced.

Instrumentation

Students were asked to complete a questionnaire before and after the simulation experience. The Autumn 2012 and Spring 2013 questionnaire was created for the sole purpose of this simulation and was not validated. The questionnaire included fourteen items based from the Interprofessional Education Collaborative Expert Panel national standards to survey the students' perceived importance of communication, importance and understanding of other healthcare team members' roles, and the future utilization of teamwork. Students were able to answer the questions with a fully anchored 5-point Likert scale ranging from "strongly agree" to "strongly disagree." The questionnaire is located in Appendix E.

In Autumn 2013, a modified Readiness for Interprofessional Learning Scale (RIPLS) questionnaire was distributed to the students before and after the simulation experience. The modified RIPLS questionnaire assessed the student's readiness to engage in interprofessional learning, namely, their perceptions of teamwork and collaboration, their own sense of professional identity, and their perceptions of patient-centeredness. Students were able to answer the questions indicating their agreement on a fully anchored 5-point Likert scale ranging from "strongly agree" to "strongly disagree."

The RIPLS questionnaire serves as a useful tool to assess outcomes related to perceptions and behaviors of participants, as well as measure team performance and behavior changes, after an interprofessional education experience.[5] Originally tested in 120 undergraduate students representing eight health care professions, the RIPLS questionnaire serves as a validated tool for measuring the readiness of future healthcare professionals to engage in interprofessional learning.[5,51] Since its original validation, other researchers have used the questionnaire for both undergraduate, graduate, and practicing professionals of various fields, including dietetics.[5,52]

Along with the modified RIPLS questionnaire, the Autumn 2013 questionnaire also included non-validated questions whereby students could rank their understanding of various professions from 1 (I do not understand at all) to 10 (I understand it well). The complete Autumn 2013 questionnaire including the modified RIPLS and additional non-validated questions is located in Appendix F.

All students completing questionnaires identified themselves by a four-digit number for pre- and post-questionnaire matching purposes. Students indicated their age and gender but were otherwise anonymous.

The researcher used SPSS (Statistical Package for the Social Sciences) version 21.0 (SPSS Inc., Chicago, Illinois) to analyze the data from the questionnaires. A paired-samples t-test was used to detect the individual differences for each of the items on the questionnaires. Statistical significance was indicated with a p-value of ≤ 0.05.

Qualitative Data

Students were required to write personal reflections regarding the simulation experience and turn in the reflections within one week after the simulation as part of their classwork. The directions for the reflection paper were as follows:

Complete a reflection and evaluation of the experience. Answer the following questions within your reflection:

1. Was the simulation or case study helpful in understanding the other professions' roles?
    a. Give examples of mutual respect and understanding.
2. Did the collaborative experience increase your confidence in caring for your patients?
3. Discuss your views on the inter-professional communication during the simulation.
    a. Was it effective?

b. Share examples of effective communication that occurred within the experience.

4. What do you take away from this experience?
    a. What surprised you?
    b. What will you do differently in practice as a result?
5. What was the most difficult part of the experience?

Students were encouraged to express thoughts and ideas freely. After receiving consent from participants, these personal reflections were utilized as qualitative data sources in the study. The researcher analyzed the reflections in order to obtain an in-depth look into each participant's attitude, perception, and overall experience of the interdisciplinary simulation. The researcher identified, analyzed, and described overarching themes in the reflection documents.

Assessing the Quantitative Data

Internal validity of the quantitative data is a cause for possible concern because of a possible testing effect due to the pretest-posttest design in this research; however, since there was no "right answer" in the questionnaire, testing effect is unlikely. Generalizability is threatened because of the use of a convenience sample of students from a Medical Dietetics program at one large Midwestern University. Additionally, a limitation of the study and threat to reliability is the fact that the Autumn 2012/Spring 2013 questionnaire was created for the sole purpose of the simulation and was not standardized. Therefore, in analyzing the data, the modified RIPLS questionnaire given

to participants in the Autumn 2013 simulation experience served as a validated tool for assessing student perceptions; the Autumn 2012/Spring 2013 questionnaire served as its supplement.

Assessing the Qualitative Data

Qualitative secondary data in the form of personal reflections from the students after the interprofessional simulations were used for the research. One researcher independently evaluated the qualitative data through inductive reasoning. The researcher spent sufficient time with the student reflection documents. Systematically, the documents were reviewed for common themes. All quantitative data analysis was performed after themes from the qualitative data were identified so that the quantitative data did not influence the researcher.

The credibility of the qualitative data was further enhanced through data triangulation. Through the qualitative reflection documents and two questionnaires, multiple sources of data were used for this study to better enhance the credibility.

Statistical Analysis

Statistical analysis of the quantitative data was performed through paired t-tests. A p-value of ≤ 0.05 was established to show statistical significance.

Chapter 4: Conclusions

Participant Demographics

Seventy students from The Ohio State University's Medical Dietetics program completed the interprofessional education simulation in Autumn 2012, Spring 2013, and Autumn 2013. Exact counts for students completing the simulation in Autumn 2012 and Spring 2013 were not obtained, however 37 dietetic students completed the simulation in Autumn 2013.

All of the students were enrolled in the Medical Dietetics program at Ohio State and had completed coursework within the college. Students were required to participate in the simulation for their coursework, though participation in the research study was voluntary.

Medical Dietetics students completed the simulations with other students studying in numerous health professions. In the Autumn 2012 and Spring 2013 simulations, Medical Dietetics students completed the simulations with students from the medicine, nursing, nurse practitioner, pharmacy, physical therapy, and respiratory therapy programs. In the Autumn 2013 simulations, students from those same programs – as well as occupational therapy and social work – participated in the simulations. In the Autumn 2013 simulations 10 students from medicine, 78 students from nursing, 18 nurse practitioner

students, 38 from pharmacy, 20 from physical therapy, 6 from occupational therapy, 10 from respiratory therapy and 4 from social work interacted with 37 students from Medical Dietetics for a total of 221 students.

Of the 30 Medical Dietetics students who completed the pre-and post-questionnaire in the Autumn 2012 and Spring 2013 simulations, 3 were male and 27 of the Medical Dietetics students were female. Student's ages ranged from 20 years to 43 years, with a mean age of $22.3\overline{6}$ years.

Of the 33 Medical Dietetics students who completed the modified RIPLS questionnaire in the Autumn 2013 simulations, 4 were male and 29 were female. Student's ages ranged from 19 years to 36 years, with a mean age of 22.8 years.

Sixty-two students completed reflections of their experience – 32 from the Autumn 2012 and Spring 2013 simulations, and 30 from the Autumn 2013 simulations.

Research Questions

The intention of the study was to evaluate the perceptions of medical dietetic students regarding their knowledge, attitudes, and beliefs of teamwork and decision-making, communication, roles/responsibilities of members of a health care team, and self-efficacy before and after an interdisciplinary simulation experience. The following research questions were the basis of the research study. Following an interdisciplinary simulation experience:

1. Is there a difference in the perceptions of interdisciplinary communication and decision-making?

2. Is there a difference in dietetic student understanding of the roles of the members of the healthcare team?
3. Is there a difference in self-efficacy in caring for a patient?
4. What are the identified themes evolving from collaboration?

Quantitative Analysis

The purpose of this study was to explore dietetic student reactions and to assess self-efficacy for dietetic students regarding their work with members of an interdisciplinary team before and after a simulation experience.

The modified RIPLS questionnaire from the Autumn 2013 simulations served as the major source of quantitative data, since it is a validated tool for assessing students' ability to engage in interprofessional learning.[51] The modified RIPLS questionnaire also included non-validated questions added for this study, whereby students could rank their understanding of various professions from 1 (I do not understand at all) to 10 (I understand it well). 33 students (4 male, 29 female) with a mean age of 22 years, 9.6 months completed the modified RIPLS questionnaire. Seven students (2 male, 5 female) with a mean age of 23 years, 8.4 months left either their pre-simulation questionnaire or post-simulation questionnaire incomplete, so their matched data was not included in study results.

The questionnaire was distributed to the students before and immediately after the simulation experience. Three researchers, who entered data results into an Excel spreadsheet, completed data collection. Data was then analyzed using the Statistical

Package for the Social Sciences (SPSS) version 21.0 (SPSS Inc., Chicago, Illinois). Two-tailed paired-samples t-tests were chosen as a means for statistical analysis since it detects individual differences between continuous variables.

Students were instructed to rank their perception of how well they understood the role of various professions. A "10" represented that they understood the role well and a "1" represented that they did not understand the role at all. A two-tailed paired-samples t-test revealed that for medical dietetic students participating in an interprofessional education simulation experience, their understanding of the role of nursing was greater post-simulation (m=8.70, sd=1.447) than pre-simulation (m=7.64, sd=1.729), t(32)= -4.26, p= <0.001. Their understanding of the role of the nurse practitioner was greater post-simulation (m=8.73, sd=1.257) than pre-simulation (m=6.52, sd=1.822), t(32)= -6.521, p= <0.001. Their understanding of their own role as medical dietitians on the healthcare team was greater post-simulation (m=9.91, sd=.292) than pre-simulation (m=9.73, sd=.517), t(32)= -2.667, p= .012. Their understanding of the role of medicine was greater post-simulation (m=8.75, sd=1.666) than pre-simulation (m=7.81, sd=2.055), t(31)= -3.115, p= .004. Their understanding of the role of occupational therapy was greater post-simulation (m=7.78, sd=1.896) than pre-simulation (m=6.44 sd=1.966), t(31)= -4.013, p= <0.001. Their understanding of the role of pharmacy was greater post-simulation (m=9.09 sd=.914) than pre-simulation (m=7.36, sd=2.133), t(32)= -6.254, p= <0.001. Their understanding of the role of physical therapy was greater post-simulation (m=8.63, sd=1.264) than pre-simulation (m=7.28, sd=1.550), t(31)= -6.033, p= <0.001. Their understanding of the role of respiratory therapy was greater post-simulation (m=8.39,

sd=1.223) than pre-simulation (m=6.30, sd=2.143), t(32)= -6.036, p= <0.001. Statistical analysis indicated that the medical dietetic students increased their understanding for the roles of nursing, nurse practitioner, medical dietetics, medicine, occupational therapy, pharmacy, physical therapy, and respiratory therapy with p-values ≤0.05. This indicates that the increase is not due to chance or sampling error; therefore, we recognize that the simulation experience probably increased the understanding of these various professional roles.

Medical Dietetic students were instructed to complete the modified RIPLS questionnaire by circling the number that best corresponded with their opinion on 20 different items. "5" indicated strongly agree, "4" indicated agree, "3" indicated undecided, "2" indicated disagree, and "1" indicated strongly disagree.

On item #1 "learning with other students will make me a more effective member of a healthcare team," their perception was higher post-simulation (m=4.88, sd=.331) than pre-simulation (m=4.70, sd=.529), t(32)=-2.248, p=.032. On item #3 "shared learning with other health sciences students will increase my ability to understand clinical problems" their perception was higher post-simulation (m=4.97, sd=.174) than pre-simulation (m=4.76, sd=.435), t(32)=-2.514, p=.017. On item #14 "I would welcome the opportunity to work on small group projects with other health sciences students," their perception was higher post-simulation (m=4.52, sd=.755) than pre-simulation (m=4.24, sd=.902), t(32)=-2.324, p=.027. On item #15 "I would welcome the opportunity to shares some generic lectures, tutorials, or workshops with other health sciences students," their perception was higher post-simulation (m=4.73, sd=.452) than pre-simulation (m=4.39,

sd=.609), t(32)=-2.966, p=.006. On item #17 "shared learning before and after graduation from my program will help me become a better learner," their perception was higher post-simulation (m=4.73, sd=.452) than pre-simulation (m=4.45, sd=.711), t(32)=-2.502, p=.018. On item #20 "I feel confident providing care for a ventilated patient," their perception was higher post-simulation (m=3.67, sd=1.051) than pre-simulation (m=2.70, sd=.1.015), t(32)=-4.807, p<.001. These statistics indicate that perceptions of the above items are likely not due to chance or sampling error. Thus, we can conclude that among medical dietetic students, an interprofessional education simulation experience leads to increased favorable opinions that learning with other students allows medical dietetic students to be more effective members of the healthcare team, that shared learning increases medical dietetic students' ability to understand clinical problems, that shared learning helps students become better learners, that medical dietetic students welcome the opportunity to work on small group projects, share generic lectures, tutorials and/or workshops with other health sciences students, and that medical dietetic students feel more confident providing care for a ventilated patient.

On item #6 "shared learning will help me to understand my own professional limitations" students' perceptions were higher post-simulation (m=4.82, sd=.392) than pre-simulation (m=4.67, sd=.479), t(32)=-1.971, p=.057. For item #8 "shared learning will help me think positively about other health care professionals," medical dietetic students' perceptions were higher post-simulation (m=4.72, sd=.457) than pre-simulation (m=4.53, sd=.621), t(31)=-1.646, p=.110. For item #13 "shared learning with other health sciences students will help me to communicate better with patients and other

professionals," perceptions were higher post-simulation (m=4.78, sd=.420) than pre-simulation (m=4.63, sd=.554), t(31)=.169. For item #16 "shared learning and practice will help me clarify the nature of patients' or clients' problems," perceptions were higher post-simulation (m=4.70, sd=.467) than pre-simulation (m=4.48, sd=.619), t(32)=-2.031, p=.051. Though these items have a favorable positive increase in mean perceptions from pre-simulation to post-simulation, findings were not statistically significant.

On item #2 "patients would ultimately benefit if health sciences students worked together," medical dietetics students' perceptions stayed the same pre-simulation (m=4.85, sd=.364) to post-simulation (m=4.85, sd=.364), t(32)<.001, p=1.000. Though this item showed no difference pre- to post-simulation it is interesting to note that mean perceptions towards this item were already high – mean perception was very near "strongly agree." On item #10 "I don't want to waste time learning with other health sciences students," perceptions stayed the same pre-simulation (m=1.45, sd=.869) to post-simulation (m=1.45, sd=.938), t(32)<.001, p=1.000. Though this item showed no difference pre- to post-simulation, it is interesting to note that the mean perceptions towards this item were already low – mean perception was in between "disagree" and "strongly disagree."

For #4 "communications skills should be learned with other health sciences students," medical dietetics students' perception was lower post-simulation (m=4.82, sd=.392) than pre-simulation (m=4.88, sd=.331), t(32)=.702, p=.488. For item #5 "teamwork skills are vital for all health sciences students to learn," medical dietetics students' perception was lower post-simulation (m=4.88, sd=.331) than pre-simulation (m=4.91, sd=.292),

t(32)=.442, p=.662. On item #7 "learning between health sciences students before graduation would improve working relationships in the clinical environment," their perception was lower post-simulation (m=4.76, sd=.435) than pre-simulation (m=4.79, sd=.485), t(32)=.329, p=.744. For item #9 "for small-group learning to work, students need to respect and trust each other" their perception was lower post-simulation (m=4.82, sd=.392) than pre-simulation (m=4.88, sd=.331), t(32)=1.436, p=.160. For item #12 "clinical problem solving can only be learned effectively with students from my own program" their perception was lower post-simulation (m=1.61, sd=1.029) than pre-simulation (m=1.79, sd=1.219), t(32)=.882, p=.385. For item #18 "I am not sure what my professional role will be," perceptions were lower post-simulation (m=2.00, sd=1.199) than pre-simulation (m=2.33, sd=1.021), t(32)=2.000, p=.054. Though these items were scored lower post-simulation compared to pre-simulation, there was not a statistically significant difference.

For item #19, "I have to acquire much more knowledge and skills than other students in my own program," mean perceptions were higher post-simulation (m=2.82, sd=1.074) than pre-simulation (m=2.73, sd=.944), t(32)=-.452, p=.654. Though this item saw an increase in score, findings were not statistically significant.

For item #11, "It is not necessary for undergraduate and postgraduate health sciences students to learn together," medical dietetic students' perceptions were higher post-simulation (m=1.67, sd=1.137) than pre-simulation (m=1.61, sd=1.059), t(32)=-.279, p=.782. Though this item saw an unfavorable increase in scores, findings were not

statistically significant. It is also important to note that the mean perception was indicative of "disagree" to "strongly disagree" towards this item.

Data from the modified RIPLS questionnaire are summarized in Table 1 and Table 2.

	N	Pre- Simulation Mean and Standard Deviation	Post-Simulation Mean and Standard Deviation	P-Value
Nursing	33	7.64±1.729	8.70±1.447	<0.001*
Nurse Practitioner	33	6.52±1.822	8.73±1.257	<0.001*
Medical Dietetics	33	9.73±0.517	9.91±0.292	0.012*
Medicine	32	7.81±2.055	8.75±1.666	0.004*
Occupational Therapy	32	6.44±1.966	7.78±1.896	<0.001*
Pharmacy	33	7.36±2.133	9.09±0.914	<0.001*
Physical Therapy	32	7.28±1.550	8.63±1.264	<0.001*
Respiratory Therapy	33	6.30±2.143	8.39±1.223	<0.001*

Table 1: Results from: "Please enter your perception of how well you understand the role of the profession listed below. A 10 represents that you know the role well, 1 representing not at all…"

Circle the number that best corresponds with your opinion. "5" Strongly Agree, "4" Agree, "3" Undecided, "2" Disagree, "1" Strongly Disagree:	N	Pre-Simulation Mean and Standard Deviation	Post-Simulation Mean and Standard Deviation	P-Value
1. Learning with other students will make me a more effective member of a healthcare team.	33	4.70±0.529	4.88±0.331	0.032*
2. Patients would ultimately benefit if health sciences students worked together.	33	4.85±0.364	4.85±0.364	1.000
3. Shared learning with other health sciences students will increase my ability to understand clinical problems.	33	4.76±0.435	4.97±0.174	0.017*
4. Communications skills should be learned with other health sciences students.	33	4.88±0.331	4.82±0.392	0.488
5. Teamwork skills are vital for all health sciences students to learn.	33	4.91±0.292	4.88±0.331	0.662
6. Shared learning will help me to understand my own professional limitations.	33	4.67±0.479	4.82±0.392	0.057
7. Learning between health sciences students before graduation would improve working relationships in the clinical environment.	33	4.79±0.485	4.76±0.435	0.744
8. Shared learning will help me think positively about other health care professionals.	32	4.53±0.110	4.72±0.457	0.110
9. For small-group learning to work, students need to respect and trust each other.	33	4.88±0.331	4.82±0.392	0.160
10. I don't want to waste time learning with other health sciences students.	33	1.45±0.869	1.45±0.938	1.000
11. It is not necessary for undergraduate and postgraduate health sciences students to learn together.	33	1.61±1.059	1.67±1.137	0.782

Continued

Table 2: Results from Part Two of the Modified RIPLS Autumn 2013 Questionnaire

Table 2 continued

Circle the number that best corresponds with your opinion. "5" Strongly Agree, "4" Agree, "3" Undecided, "2" Disagree, "1" Strongly Disagree:	N	Pre-Simulation Mean and Standard Deviation	Post-Simulation Mean and Standard Deviation	P-Value
12. Clinical problem solving can only be learned effectively with students from my own program.	33	1.79±1.219	1.61±1.029	0.385
13. Shared learning with other health sciences students will help me to communicate better with patients and other professionals.	32	4.63±0.540	4.78±0.420	0.169
14. I would welcome the opportunity to work on small group projects with other health sciences students.	33	4.24±0.902	4.52±0.755	0.027*
15. I would welcome the opportunity to share some generic lectures, tutorials or workshops with other health sciences students.	33	4.39±0.609	4.73±0.452	0.006*
16. Shared learning and practice will help me clarify the nature of patients' or clients' problems.	33	4.48±0.619	4.70±0.467	0.051
17. Shared learning before and after graduation from my program will help me become a better learner.	33	4.45±0.711	4.73±0.452	0.018*
18. I am not sure what my professional role will be.	33	2.33±1.021	2.00±1.199	0.054
19. I have to acquire much more knowledge and skills than other students in my own program.	33	2.73±0.944	2.82±1.074	0.654
20. I feel confident in providing care for a ventilated patient.	33	2.70±1.015	3.67±1.051	<0.001*

The data from the modified RIPLS questionnaire is supported by data from the Autumn 2012 and Spring 2013 interprofessional education simulations. Though these semesters' simulations used a separate non-validated questionnaire to track changes in student perceptions, comparing the results to the modified RIPLS survey is of benefit.

Thirty students (2 male, 27 female) with a mean age of 22 years, 4.4 months completed the questionnaire. 10 students (4 male, 6 female) with a mean age of 24 years, 1.2 months left either their pre-simulation questionnaire or post-simulation questionnaire incomplete, so their matched data was not included in study results.

The questionnaire was distributed to the students before and immediately after the simulation experience. Researchers completed data collection by entering results into an Excel spreadsheet. Data was then analyzed using the Statistical Package for the Social Sciences (SPSS). Two-tailed paired-samples t-tests were chosen as a means for statistical analysis since it detects individual differences between variables.

Findings indicate that there was a statistically significance increase in student understanding of the role of nursing after the simulation ($m=4.23$, $sd=.728$) compared to before the simulation ($m=3.87$, $sd=.507$), $t(29)=-2.483$, $p=.019$. There was an increase in student understanding of the role of respiratory therapy after the simulation ($m=4.03$, $sd=.890$) compared to before the simulation ($m=3.53$ $sd=.776$), $t(29)=-3.181$, $p=.003$. There was an increase in student understanding of the role of physical therapy after the simulation ($m=4.21$, $sd=.686$) compared to before the simulation ($m=3.71$ $sd=.659$), $t(29)=-3.550$, $p=.001$. Not only did students better understand the roles of nursing, respiratory therapy and physical therapy after the simulation, they also better understood

their own role in patient care. Before the simulation, students perception of understanding their own role was lower (m=4.57, sd=.504) than after the simulation (m=4.87, sd=.346), t(29)=-2.757, p=.010.

There was also statistically significant difference in student opinion regarding shared learning. Students indicated a statistically significant increase from pre-simulation (m=3.93, sd=.785) to post-simulation (m=4.37 sd=.850), t(29)=-3.261, p=.003 in their enjoyment in working in teams. They indicated with a statistically significant increase that they learn more when they teach material to other team members from pre-simulation (m=4.10, sd=.885) to post-simulation (m=4.83, sd=.461), t(29)=-4.097, p<.001. They also indicated that they learn more about their own role when working with other professions – this number increased significant from pre-simulation (m=4.53, sd=.691) to post-simulation (m=4.83, sd=.471), t(29)=-2.068, p=.048. There was a statistically significant increase in the student's reported confidence in caring for a ventilated patient from pre-simulation (m=3.69, sd=.761) to post-simulation (m=4.24, sd=.872), t(28)=-3.134, p=.004.

Students understanding of pharmacy increased from pre-simulation (m=3.70, sd=.794) to post-simulation (m=4.07, sd=1.015), but this was not statistically significant as t(29)=-2.009, p=.054. Additionally, their perception of the item "Team decision-making is important to better patient care" increased from pre-simulation (m=4.76, sd=.786) to post-simulation (m=4.79, sd=.774), but this was not statistically significant either since t(28)=-.441, p=.663.

Student perceptions of the item "Working in interprofessional teams while in school helps prepare me for the real world" stayed the same pre-simulation (m=4.83, sd=.461) to post-simulation (m=4.83, sd=.461), t(29)<.001, p=1.000.

There was an unfavorable decrease in the item "Communication between professional members of the health care team is important" from pre-simulation (m=5.00, s<.001) to post-simulation (m=4.97, sd=.183), t(29)=1.000, p=.326 and in the item "It is important to understand other health care team members' roles" from pre-simulation (m=5.00, s<.001) to post-simulation (m=4.93, sd=.254), t(29)=-1.439, p=.161. Though there was a decrease in these items, means are still very closely near "strongly agree." Data from the Autumn 2012 and Spring 2013 simulations are provided in Table 3.

Please indicate your opinion regarding the following statements: "5" Strongly Agree, "4" Agree, "3" Undecided, "2" Disagree, "1" Strongly Disagree:	N	Pre-Simulation Mean and Standard Deviation	Post-Simulation Mean and Standard Deviation	P-Value
1. Communication between professional members of the health care team is important.	30	5.00±0.000	4.97±0.183	0.326
2. It is important to understand other health care team members' roles.	30	5.00±0.000	4.93±0.254	0.161
3. I enjoy working in teams.	30	3.93±0.785	4.37±0.850	0.003*
4. Team decision-making is important to better patient care.	29	4.76±0.786	4.79±0.774	0.663
5. Working in interprofessional teams while in school helps prepare me for the real world.	30	4.83±0.461	4.83±0.461	1.000
6. I learn more about my own role when I work with other professions.	30	4.53±0.681	4.83±0.461	0.048*

Continued

Table 3: Results from the Non-Validated Autumn 2012/Spring 2013 Questionnaire

Table 3 continued

Please indicate your opinion regarding the following statements: "5" Strongly Agree, "4" Agree, "3" Undecided, "2" Disagree, "1" Strongly Disagree:	N	Pre-Simulation Mean and Standard Deviation	Post-Simulation Mean and Standard Deviation	P-Value
7. I understand my own role in patient care.	30	4.57±0.504	4.87±0.346	0.010*
8. I understand the basics of nursing care.	30	3.87±0.507	4.23±0.728	0.019*
9. I understand the basics of respiratory care.	30	3.53±0.776	4.03±0.890	0.003*
10. I understand the basics of pharmacy care.	30	3.70±0.794	4.07±1.015	0.054
11. I understand the basics of physical therapy care.	28	3.71±0.659	4.21±0.686	0.001*
12. I have confidence in caring for a patient on a ventilator.	29	3.69±0.761	4.24±0.872	0.004*
13. I learn more when I teach the material to other team members.	30	4.10±0.885	4.83±0.461	<0.001*

Qualitative Analysis

The purpose of this study was to explore dietetic student reactions and to assess self-efficacy for dietetic students regarding their work with members of an interdisciplinary team before and after a simulation experience.

Sixty-two reflection documents were collected from Medical Dietetic students as a means for assessing student reactions following their interprofessional education experience. Thirty-two reflection documents were completed for the Autumn 2012 and Spring 2013 simulations and thirty reflection documents were completed for the Autumn 2013 simulations, for a grand total of sixty-two reflection documents.

An independent researcher completed a comprehensive review of the student reflections and spent substantial time coding and recoding the data. As the data was coded, the researcher attempted to answer the research questions. The data was coded prior to analysis of the quantitative to avoid researcher bias. Six hundred and fifty-four qualitative points were coded and 90 overarching-topic areas emerged. The 90 themes fit into four domains, respective of the research questions. These domains are:

1) Communication and Decision-Making

2) Understanding the Roles and Responsibilities of Team Members

3) Self-Efficacy in Patient Care

4) Emerging Themes

Of the 90 overarching-topic areas, 47 topic areas appeared less than or equal to three times (in <5% of the students reflections), so though their code is provided in the table, those themes are not discussed further within this manuscript.

Communication and Decision Making

Of all of the themes fitting into the domain "Communication and Decision Making," mutual respect, asking questions, overall helpfulness of the simulation, effective communication, and teamwork were identified as the major themes and are shown in Table 4.

Theme	Frequency
Respect	42
Ask Questions	30
Communication – Effective	28
Teamwork	22
Importance of interaction	21
"I've Got Your Back" – Reliance on others/Dependability	16
Teaching	13
Communication Challenges	12
Vocabulary Difficulties	12
Decision Making	7
Listening	6
Competing Interests	1
Others are Resources	1
Unanswered Questions	1

Table 4: Themes from the "Communication and Decision Making" Domain.

Several students identified that mutual respect was apparent during the simulations. "I found mutual respect and understanding to be apparent in every part of the simulation. During the intervals where we could assess the patients ourselves, there was plenty of time but only two patients. It was nice to see that nobody made themselves the top priority; rather, each discipline politely took their 'turn'," wrote one student. Another declared, "During simulation, all professions had a mutual respect and understanding for one another's roles."

Additionally, they also wrote about new or greater respect gained for other professions through the interprofessional education simulation experience and provide examples of where their deepening respect lies.

- "I have a deeper respect for the professions we worked with because I was able to see all the work that they do in patient care and recovery."

- "I gained so much respect for the other students in the different area of study because I think it is easy for us to get caught up in dietetics and focus on what we are learning about we don't realize that there are so many other students putting in the same amount of time as we do, learning about something completely different than us."
- "I have a large respect for nursing after this simulation. Nursing may not make the decisions on what to feed, when to feed, how much to feed, but they are usually the one who makes sure they get fed. They are with the patient the majority of the time while most of the other professions are only with the patient one or two times. I feel that nursing is not given enough credit for all the hard work that they put in. An observant and knowledgeable nurse will be the first to notice anything amiss with a patient."
- "I felt mutual respect with the pharmacist and all the others on the team, and I was assured they respected me in turn. It is this level of respect I hope earn in the future, and is my strong belief I can accomplish it."

Many wrote about asking questions during the interprofessional education simulation experience, writing that it helped them learn more about the patient and learn more about each profession's roles on the team. For example, one student wrote, "During rounds, everyone was able to share their piece and ask questions of others as appropriate" and another said, "By working with these other students 'behind the scenes' and during rounds, I was able to learn much more by asking questions and explaining my role in the clinical setting."

Students wrote about the benefits of asking questions in regards to decision making: "All professions were able to ask each other questions right then and there instead of having to run around searching for other professions in order to get answers before following through with a decision."

Asking questions helped many students understand the patient more fully. One student wrote, "At times we may have had a question as to why another profession made a decision that they had, but instead of assuming they were wrong, we would ask each other why a certain decision was made although we may not have initially understood it. This was part of the experience that was educational." Another said, "It also showed me that asking questions and working together is vital to the treatment of a patient."

Students wrote about feeling more at ease to ask questions when in a real-life hospital rounding situation. One student wrote, "This experience gave me much more confidence when working with other people to feel free to ask questions and if I didn't know the answers, to either ask someone else or go look it up," and another student said, "In my own practice, I will remember this simulation because it reminded me to be humble. I won't be too proud to ask a question because I feel like it's something I 'should' know. None of us knows everything, and that's why we all need to work as a team and share our knowledge about our respective specialties."

Asking questions relates to teamwork, which was addressed by several students. They spoke of teamwork by stating, "The team got along well, and worked well together," "It felt good to come together as a team and work on a case as we each had our own perspectives," and "It ensures that the patient is being cared for in every aspect from

every angle. It allowed all of the professions to work synergistically." One student wrote, "Working together as a team seemed to be very effective. It allowed us to utilize each other's knowledge and make decisions that were ultimately to better the care of the patient. It also allowed us to make decisions for the patient and be more efficient with the care rather than spending a large about of the time on the phone trying to communicate with the other professions."

They also wrote about dependability on other professions and that working as a team may prevent negative outcomes. Students wrote:

- "I did not realize how dependent each profession could be on another."
- "It really did help a lot because I realized that all of the pressure is not on me. I feel like I could actually feel the balance of carrying this weight of the case study together and not alone."
- "If we did not have every single detail accounted for, something might be overlooked that could lead to negative outcomes."
- "It was a way to make sure the inklings we had about certain parts of the patient care were truly covered by many angles, and concerns were brought up and worked out that would probably have been missed by only one discipline."
- "I believe that, like registered dietitians, all of the other health professionals play an essential role in the overall care of a patient. Each health professional focuses on treating different aspects of the patient's health, and when all of these professionals communicate and share their recommendations for a

patient, the patient can receive the best and most comprehensive care possible. No one health professional can treat a patient single-handedly; a holistic approach is needed to ensure that all aspects of a patient's health are considered in terms of his or her recovery."

When students talked about teamwork and dependability, they often wrote about communication. Students talked about effective communication during the simulation, stating:

- "The communication that took place throughout the simulation was very effective. I was amazed at how much we were able to accomplish during the short bed rounds. Having the opportunity to communicate with one another face to face helped us make changes to the care plan and provide the best care possible for the patient."
- "During the simulation the communication between the medical team members was extremely respectful and inquisitive about how each specialty's role could contribute to the patient's healing process. It was effective to have the opinions of other members of the healthcare team."
- "I found the communication among my group members to be effective. The key to effective communication was being open and receptive to others' ideas, rather than coming up with one idea and being unwilling to change it."

However, many students reported challenges in communications, most often due to the lack of confidence or unfamiliarity of others' roles. Communication challenges are summarized by text from multiple students, below.

- "The most difficult part, in my opinion, was just being nervous I was going to say the wrong thing out loud in front of everyone."
- "I was surprised how in-depth everything gets in rounds. I was shocked by details and the amount of detail that I didn't understand. When respiratory was talking, I was lost. When pharmacy was talking, I was lost. I was surprised at how knowledgeable each discipline was and how they knew exactly what to do, as well as doing it confidently."
- "The most difficult part of the experience was being able to recap and address the most important aspects of nutritional care to the rest of the team in a way that is understood and valued. I was slightly nervous to discuss the patient out loud with the entire team and really needed to focus on the most important issues so as to not take up too much of everyone else's time."
- "I have never experienced anything like this before and at times felt a little awkward as I was out of my comfort zone and unsure of the situation. Specifically, I found it difficult to communicate during rounds because I've never experienced anything like that before and I've never been taught how to communicate in that situation (i.e. who all are we addressing? How do we address them? Do we wait to be called on or do we speak up? Etc.)"

Communication challenges include vocabulary difficulties, which were reported 12 times. A few students reported that other disciplines have their own "language" or "lingo," writing:

- "I did not understand some of the terminology that was being used by the other professions, so at some points I had to request clarification."
- "Speaking to other medical disciplines in the appropriate language was somewhat difficult for me. In Med Diet, we sometime have our own lingo, as do the other disciplines. Ensuring that I was communicating in a clear concise manner to the other disciplines without floundering for appropriate vocabulary took some forethought before I opened my mouth…we do not have experience discussing patient conditions with other medical professionals and hence I found myself reaching to find the appropriate words."
- "I think the most difficult part of the simulation was providing my recommendations in terms that everyone understood. I noticed from the looks on people's faces that some were confused and needed further guidance as to what certain terms meant and how this would affect their role, especially the nurses."

Yet though these communication and language challenges existed, students still wrote about the importance of the interaction and communication with other members of the healthcare team, saying "From this experience, I have learned the importance of communication with other professionals," "our practice is not an island- it is clear that all the professions must work together for the greatest benefit to the patient," and "the ability to communicate with other professions is vital in providing the exceptional care that I hope to provide for the patients that I work with."

Students commented on their interactions in teaching other health professions students, saying: “it feels great to be able to educate them on what we do and vice versa,” “I was able to educate the other professions as well about the impact that metabolic stress has on albumin levels, the traditional use of the clear liquid diet, and food sources of Vitamin K that impact Warfarin administration,” and “there was also some education on tube feeding and how we wean a patient as well as the use of supplements.”

Overall, students reflected on the mutual respect displayed by the various health professions, the ability the simulation allowed them to have in asking questions, examples of effective communication and teamwork, their perceptions on the importance of interaction, and the dependability they felt they provided to others and others provided to them. Students also reported that there were some communication and vocabulary challenges during the simulation.

Understanding the Roles and Responsibilities of Team Members

Within the domain “*Understanding the Roles and Responsibilities of Team Members*,” students identified whether or not roles of other health care team members or their own roles were clarified through the interprofessional education simulation experience. They shared examples of interactions they had with other student team members to demonstrate the extent to which they interacted with others.

Theme	Frequency
Roles: Pharmacy - RD	39
Roles: Clarified	32
Helpful	27
Roles: own - understand	14
Roles: Nursing - RD	11
Roles: RD - RT	10
Roles: MD	8
Roles: NP - RD	5
Roles: others understood RD	5
Roles: others - doesn't understand	5
Roles: MD - Pharmacy	3
Roles: NP - Everyone	3
Roles: Nursing - Pharmacy - RD	3
Roles: MD - Pharmacy - RD	2
Roles: NP - Pharmacy - RD	2
Roles: Nursing - NP - Pharmacy	2
Roles: Nursing - NP - RD	2
Roles: own - doesn't understand	2
Roles: RD - Social Work	2
Roles: RD - Speech Therapy	2
Roles: RT	2
Roles: MD - NP - Pharmacy - RD - RT	1
Roles: MD - Nursing - OT - RD	1
Roles: MD (negative)	1
Roles: Nursing	1
Roles: Nursing - NP	1
Roles: Nursing - NP - Pharmacy - RD	1
Roles: Nursing - Pharmacy - RD - RT	1
Roles: Nursing - PT - RD	1
Roles: Nursing - RD - RT	1
Roles: Nursing (negative)	1
Roles: OT	1
Roles: OT - PT - RD	1
Roles: OT - RT - RD (unsure)	1

Table 5: Themes from the “Understanding the Roles and Responsibilities of Team Members ” Domain.

As demonstrated in Table 5, it appears as though students had various experiences of interactions with other health care students. While many medical dietetics students report a sole interaction with pharmacy, nursing or respiratory therapy, multiple other students report interactions with the nurse practitioner, occupational therapy, physical therapy, speech therapy, and social work – either in interactions alone or with multiple disciplines.

Though the interactions with other professions differ greatly for each student, students reported twenty-seven times that the interprofessional education simulation experience was helpful for understanding the roles of the other health professions and thirty-two times that various roles were clarified.

Students wrote about the overall helpfulness of the simulation in understanding the other professions' roles. They wrote:

- "This simulation was helpful in understanding the other professions' roles."
- "The multidiscipline simulation was definitely helpful in understanding the other professions' roles. Even though we are all students, it provided an example of how interactions take place in a clinical setting."
- "The whole thing was a great experience and was very helpful."
- "The simulation was helpful in understanding the other professions' roles in the hospital. It was a good way for us to interact with students outside of our specific majors, and mutual respect was maintained throughout the experience."

Not only did several students find that the experience helped them understand roles, many thought that the experience helped better clarify roles. These two themes are

similar, but it is believed there is a slight difference. Where beginning to understand others' roles is a serves as a baseline, clarification of roles takes the learning one step further. Students wrote about role clarification, stating:

- "The experience increased my confidence in caring for patients because it helped to clarify what the roles of the other professionals were."
- "This experience was extremely beneficial in that it enabled me to see what exactly all of the other professions did and what their role was in caring for a patient."
- "The multidisciplinary simulation successfully strengthened my education on the roles of other healthcare professionals that form a patient's medical team."
- "I not only learned a tremendous amount about the other professions that I could potentially work with but I also learned a great deal about my own field."
- "By participating in this simulation, I can now better identify those professionals' roles, and see how the role of the dietitian fits in and how I can work with these professionals to best meet the patients. In this way, I can now go into a real interdisciplinary experience with more confidence of how my piece fits into the puzzle."

This understanding and clarification of the roles is important since some students talked about how they do not understand other professions roles before the experience. They wrote, "To me the most difficult part was to determine who would be the best personnel to turn to if I have a particular question. I felt like I did not know the exact role

of other members in the healthcare team prior to the simulation experience," and "what I found to be particularly difficult about this collaboration was my initial lack of knowledge on what all the other professions did. For example, I was unaware that respiratory therapy would be the team to remove the feeding tubes from our mechanically ventilated patient, Ann, and that we would be relying on a speech therapist to complete a swallowing evaluation to make sure she was capable of tolerating solid foods."

Of all of the professions, students reported interactions with pharmacy the most. Examples of interactions between pharmacy students and medical dietetic students alone were the highest of any reported professional collaboration. Interactions of pharmacy and medical dietetic students along with students in other professions – like medicine, nursing, and nurse practitioner – were also reported. One student wrote, "I would say one of the best examples in our simulation was working with pharmacy. They were so polite in wanting to help us look up drug-nutrient interactions. They would ask us questions as we asked them questions. It was nice because I don't feel like either of us we're looking down on each other. It was a mutual relationship after one goal."

Another student demonstrated how consulting with pharmacy during the interprofessional simulation experience was different from that of his/her clinical experience by writing, "I think it best illuminated the exchange of information necessary between pharmacists and dietitians. I communicated most with the pharmacy students, which was different from my clinical experience when I mostly talked with the nursing staff."

One student wrote about how both professions benefitted from the interaction: “An example of mutual respect and understanding with other healthcare professionals was before rounds began. I spoke to pharmacy students thoroughly about the Medical Dietetics program and my role in the clinical setting. The pharmacy students were unaware of what Registered Dietitians did on a daily basis. This surprised me, but I was not afraid to objectively explain our role and how we interact with pharmacists. They understood my role better when I explained how we calculate TPN for patients. They were interested to hear about how we educate on drug-nutrient interactions. This mutual understanding of each other was a way to collaborate during rounds.”

Students made positive comments on other professions as well. For example, students talked about nursing saying “I approached the nursing students regarding one of the patient’s prescriptions that had a nutrient interaction. My initial thought was that I would only be reiterating knowledge they already knew. To my surprise, they were thankful that my partner and I had informed them because they had forgotten about that aspect of the medication” and “There was a lot of effective communication between the RDs and nursing. It seemed that we could both help one another with the patient care by asking one another to address different problems that fell within the scope of our respective scopes of practice.”

Students frequently commented on interactions with respiratory therapy. One student stated, “I had no idea of how respiratory therapy works for example so it was great to begin to understand what they do,” while another wrote, “It was especially helpful to

work with the RT students because they often used terminology I was unfamiliar with so it was useful to be able to interact with them to further understand their profession."

Not only did medical dietetics students better understand others roles, they felt that other professions better understood *their* role. One student talked about how nursing and pharmacy were impressed by RDs, writing "During the debrief session, the nurse students mentioned that they were surprised about the amount of knowledge RDs have regarding tube feeding, and the pharmacy students were glad to see the RDs were familiar with insulin regime." Another student supports this point by writing, "I think the other professions do understand the role of the RD better. One nursing student didn't even realize we participated that much in the care of the patient. She always assumed that it was the doctor making all of those decisions and she said it was cool to see and now know that it's a collaborative decision." Yet again, another student clarified by writing, "I do think other students have a better understanding of the role an RD can play in the healthcare team. Actually one of the main themes discussed in the round table following the simulation was how surprised some of the other students were by what the dietetic students knew."

Fourteen times students reported an increase in the understanding of their own role as medical Registered Dietitians, stating things like "I felt like this experience was extremely valuable for learning our position on a team in a hospital setting" and "I believe this experience gave me a much better understanding of my role and gave me more confidence in my ability to do my job."

Through a majority of the qualitative data, it was found that there was an increase in dietetic student understanding of the roles of the members of the healthcare team, as evidenced above.

Self-Efficacy in Patient Care

Within the domain "*Self-Efficacy in Patient Care*," students identified whether or not their self-efficacy in caring for a patient changed because of the interprofessional education simulation experience. Students reported if their confidence increased, if there was no change, if it needed to increase, if it increased but just a little, or if they had an overall lack of confidence. Findings of the themes and their frequencies are found in Table 6.

Theme	**Frequency**
Confidence - increased	46
Confidence - no change	4
Confidence - need to increase	2
Confidence - increased little	1
Confidence - lack of	1

Table 6: Themes from the "Self-Efficacy in Patient Care" Domain.

An increase in confidence was reported forty-six times, more so than any other reported confidence level. Many felt an increase in confidence in communicating with other professionals. On this they wrote, "This experience strengthens my confidence in talking to other professional in actual practice" and "I am now more confident in how I will interact with other medical professionals in the future." Students wrote of the value of in-person communication rather than through hospital notes and charting, writing,

"This experience definitely helped increase my confidence as a professional caring for patients. It showed me how much knowledge I actually have, and how much more valuable it can be when you communicate your ideas with your team verbally and not just through notes." Because of the in-person communication, students felt more confident making decisions. One student described decision making by writing, "I think that by talking to each other in person rather than just reading through notes in a chart, we all had a better idea of the "bigger picture" and this absolutely increased my confidence in the decisions that I was making."

Many felt that their confidence was increased because of being able to better identify the roles of their own and other professions, writing:

- "I think this experience did increase my confidence because I see how dietitians do play a pretty large role in patient care. I had never been on rounds during my clinical experience so seeing the role we play was helpful."
- "The experience increased my confidence in caring for patients because it helped to clarify what the roles of the other professionals were."

Because of the experience, many said that they are more confident and ready to care for patients. They wrote, "this experience has certainly increased my confidence when it comes to caring for my patients" and "this really upped my confidence in caring for a patient as a part of a larger team and not just one on one. I feel much more ready to care for patients in a clinical setting as a result of this simulation."

For some, the increase in confidence did not come right away. For example, one student wrote, "it did increase my confidence AFTER the fact. Walking in there I wasn't

confident, and while actually doing rounds I wasn't confident. But, now that I know what normally takes place and what I can bring to the table as far as formula suggestions, educational tools, etc. I feel more confident in my ability to care for a patient at the bedside." Another made important note of how the feedback received by the team increased his/her confidence saying, "the most difficult part of this collaboration was the rounding experience. I found that I did not have enough confidence in my ability to suggest an appropriate nutrition recommendation for the patients. While I have the knowledge to make appropriate and evidence-based recommendations, I still felt unsure of myself when delivering my recommendations to the rest of the healthcare team. However, the feedback I received from the rest of the team regarding the success of my recommendations helped bolster my sense of self-efficacy and increase my confidence in my ability to support the patients' recovery through proper nutrition therapy."

Though confidence increased for many, one said that his/her confidence increased only a little and that the confidence will continue to grow over the years: "The experience did make me a little more confident in my ability to assess, diagnose and treat patients, however, I believe my confidence will also grow as we continue our studies in the next couple years.

For some, there was a net no change in their reported level of self-efficacy due to the simulations. These students wrote:

- "At this point I already feel confident in caring for patients because of clinical rotations but I think it was certainly helpful for those in other disciplines who have not had clinicals yet. It is great prep work."

- "I wouldn't necessarily say the collaborative experienced increased my confidence in caring for patients. I definitely felt more comfortable when I was in my clinical rotation interacting with other health care professionals. This may be because I often feel less confident interacting with individuals my own age and feel more comfortable working with those older than me. The experience made me wish that I taken advantage of more opportunities in my undergraduate career getting to know other students in allied health professions."
- "In some ways the collaborative experience increased my confidence and in other ways it diminished it. I am no longer so afraid to talk to people in other specialties. I know that people are not so busy that they can't take the time to answer a question. I also now know that people do not get upset at you when you ask a question as well. This experience also made me realize how much I still need to learn, and in that regard it diminished my confidence. I didn't know what information was important enough to mention during rounding and what information the rest of the group didn't need to know."
- "The collaborative experience did not increase my confidence in caring for patients. I can write information and make it clear on paper but I was struggling with clearly communicating. I kind of felt dumb and underprepared. But I do feel that if I practiced speaking out what I have and get more organized I do think I might be more confident."

Overall, through the qualitative data from the medical dietetics student reflection documents, we see that there was a positive increase in self-reported self-efficacy in caring for a patient.

Emerging Themes

The domain "*Emerging Themes*," includes all other additional themes which do not fit the above three themes but may have important contributions to this study. Within this domain are additional thoughts from students regarding the interprofessional education simulation experience. Students shared thoughts that Registered Dietitians are the nutrition experts, that they see the benefits interprofessional care, that they enjoyed their experience, and that they can apply what they learned to their future practice. Included in this domain are student feelings of the overall experience. Some students commented on how they were uncomfortable at first, or felt that pretending was awkward, but that throughout the experience it got easier. Students also made comments that indicated they were stressed during the experience or that the experience and/or case was challenging. Students talked about the amount of time they were giving during the simulation to complete the case – some said that it was too slow/they were given too much time, but most others who commented on time said that it was too fast/there was not enough time. Of interesting to note is that one student shared insight into a "hierarchy"; however, seven reported that through the simulation they learned that they were "equals." Findings of the themes and their frequency are found in Table 7.

Theme	Frequency
RDs=Nutrition Experts	23
Sees benefit	22
Enjoyment	19
Future Application	14
Uncomfortable at first	13
"I'm important"	9
"They don't understand us!"	9
Comfortable	8
Hierarchy - none	7
Stress - during/challenging	7
Timing - too fast	7
Value - felt	7
Dynamic experience	6
Realistic - not	6
Future Learning Necessary - Self	5
Pretending - Awkward	5
"I've come so far"	4
Difficult case	4
Future Learning Necessary - For Others	4
Patient = person	4
Appreciation - greater	3
Feeding	3
Stress - before	3
Less intimidating than real life	2
Timing - too much	2
Realistic	1
Assumptions	1
Big picture	1
Hierarchy	1
Not in control	1
Surprised self	1
Timing - good	1
Timing - slow	1
Uncomfortable	1
Value - did not feel	1
Ventilator weaning & Feeding	1

Table 7: Themes from the “Emerging Themes” Domain.

Students shared thoughts that other professional students looked to them as the nutrition experts. Medical Dietetics students wrote:

- "Recognizing that the other disciplines truly looked to Med Diet as the nutrition experts was encouraging. Realizing that I would not be second-guessed and my opinion would be respected as the expert was both humbling and confidence building."
- "From being in the hospital and observing a lot of rounds take place, it was exciting to have 'my own' rounds and to be the official designated expert on the subject of nutrition. It was a little intimidating to be looked to as the expert on nutrition decisions in a room of other bright students, but it was, to my surprise, easier to be confident in that role than I expected."
- "There were several instances where other students came up to me seeking 'nutrition's' advice."
- "It was nice to be a source of knowledge for the others professions, especially the members of the nursing staff, who asked us numerous questions."
- **"**I will remember that I am the expert and my co-workers are looking to me not only to be accurate but confident, too, especially at bedside."

Students enjoyed their experience, stating, "The multidisciplinary simulation was a great experience," "I really enjoyed the multidisciplinary simulation," and "I really enjoyed the clinical patient simulation and feel that I gained a lot from the experience."

Though some enjoyed the experience, others felt uncomfortable at first. They said, "I was hesitant in giving my input at first because I was slightly unsure of myself, but as the

simulation progressed, I slowly gained confidence" and "At first I was very intimidated and nervous, but once the simulation started I was able to calm down and collaborate with the other professions."

Others felt that "pretending" during the simulation was "awkward." One student wrote, "The most difficult part of the experience was treating as a real situation. I think we did a pretty good job, but when you know that it is not real, it is tempting to "step out of character" and ask questions or clarify things in a less professional way. This was not too much of a problem, but it did prevent the situation from really feeling like the hospital."

A few students wrote about stress, anxiety, and nerves before and during the simulation. They wrote, "It was an incredible learning experience despite the nerves at the beginning," and "it was overwhelming to collaborate with such a large number of students from other fields at first, but I am glad I was exposed to it before working at the professional level."

One student felt that it took too much time for the rounding – "It [communication] also took a very long time to complete rounds and in this sense was perhaps a bit ineffective" but other students felt that the experience went too fast. "One of the most difficult parts was keeping up with the pace. I felt that everyone was moving fairly quickly through things. Being able to do everything I had learned in an expedient manner was challenging," one student wrote.

One student made a comment about a "hierarchy," writing, "I better understand the hospital hierarchy and the importance of everyone involved." However, others

mentioned that through the simulation they learned that they were equals. They wrote, "Every professional involved in the care of a patient is equally important and it is crucial that communication takes place whenever possible," "my role is equally as important compared to the other professions in supplying the best care for the patient possible," and "As a result of this simulation, I truly believe that no one discipline is more or less important in a patients care. Each discipline has their role, which may be more pertinent to a certain case, but we all have an important perspective to bring to the discussion."

Several students wrote about their perceptions of the benefits of completing interprofessional education simulations. They appreciated that it was a simulated case that they could have practice with, that since they were all students they were all on the same page, and that ultimately better patient care would be the result of increased communication and decision-making. They wrote:

- "It helped to act out a round and to be bold with decisions when a real life wasn't at risk."
- "The benefit I received from the simulation was that working with the other professions allows for better communication, allowed everybody to be on the same page, and provided the best care for the patient."
- "I'm really glad to have been a part of this experience, and I think any healthcare student would benefit from doing something similar. I assume almost all students in the healthcare field have to participate in some sort of clinical rotation. While that on-the-job experience is great, it can be difficult as a student because we

might not feel comfortable speaking up and asking questions especially when surrounded by a bunch of older and more experienced professionals"

- "In my opinion, collaboration among the professionals that comprise a healthcare team is essential to improve patient health outcomes. Proper communication among a patient's treatment team will ultimately benefit the patient in several ways, including: prevention of food-medication interactions, prevention of miscommunication regarding medication dosages, prevention of under- or over-feeding patients, prevention of misdiagnoses and inappropriate treatments, and regular monitoring and evaluation of the patient's health status, among many others."
- "With collaboration you are better able to see the whole picture, not just your part or the others important to your part. You are able to provide the appropriate care quicker because you are aware of changes being made while they are happening, not after the fact in a report. A person experiencing trauma is going through changes to all of their systems, so the care approach needs to attend to each system as part of a whole."
- "I feel as if these types of experiences will have a positive impact in future health care."

Many wrote that they intend to apply what they learned during the interprofessional education simulation experience to their future learning and practice as a Registered Dietitian. They noted that they would be more willing to communicate through listening, speaking, and asking questions. One student wrote, "In practice, I am going to make sure

I develop a good rapport with other professionals because they are a crucial resource in caring for the patients." Another noted, "In practice I will definitely work to communicate with other professionals as much as possible." Other students said:

- "I will not hesitate to speak up in round in actual clinical rotation because I know what I need to add to the discussion as the nutrition expert."
- "I believe I will be more likely to approach patient care with a team minded focus. I will keep my ear open more to what the other professions are saying at rounds and use that information to help my interventions. I will also be more likely to consult the other professions for their viewpoints."

Overall, students viewed themselves as the nutrition experts and felt that others viewed them in the same way. Students wrote in their reflections that they saw the benefit of participating in interprofessional education with other health care team members. They also wrote about how they enjoyed the experience. Students wrote about how they would apply what they learned to their future practice, and that though they felt uncomfortable or stressed at first, the experience became easier as time went on.

Discussion

Overall, this study demonstrates that interprofessional simulation changed dietetic student perceptions of communication, decision-making, roles, and self-efficacy in working with members of the healthcare team.

Is there a difference in the perceptions of interdisciplinary communications and decision-making?

Problem-based learning provides a way for students to resolve a problem through collaboration and listening to each other.[11] The case-based approach provided through the interprofessional simulations provided the opportunity for students to engage in those behaviors.

In the Autumn 2013 simulations, a statistically significant difference was found in the medical dietetic students' perceptions that learning with other students will make them a more effective member of a healthcare team ($p=.032$). Students also felt more strongly after the interprofessional simulation that shared learning with other health sciences students will increase their ability to understand clinical problems ($p=.017$). This may be supported by the Autumn 2012 and Spring 2013 results that show that students feel that they learn more when they teach the material to other team members ($p<.001$).

Though their perceptions did not increase to statistical significance following the Autumn 2013 simulation for the item "shared learning with other health sciences students will help me to communicate better with patients and other professionals," the mean perception before the simulation ($m=4.63$, $sd=.554$) and after the simulation ($m=4.78$, $sd=.420$) show that students feel favorably to this item both before and after the simulation experiences, since "4" indicated "agree" and "5" indicated "strongly agree" on the questionnaire.

Through the reflection documents, students felt that interdisciplinary communication experienced during the interprofessional simulation was effective. In their reflections

completed within one week of the interprofessional simulation experience, students wrote about effective communication twenty-eight times. They provided examples of effective communication and collaboration with other members of the healthcare team during the simulation. One student summarized the effective communication and collaboration by writing, "the communication that took place throughout the simulation was very effective. I was amazed at how much we were able to accomplish during the short bed rounds. Having the opportunity to communicate with one another face to face helped us make changes to the care plan and provide the best care possible for the patient." Another student shared specifically about one example of beneficial communication to enhance patient care, writing, "The inter-professional communication was effective in helping each of the different professions learn more about the case and ultimately provide better overall care for the patient. I saw this in the ability of all the different types of therapists, the nurses, and myself communicating about the patient who needed a swallow study. We were able to determine the need for the study and then how to begin to decrease EN feedings while increasing PO intake."

Medical Dietetics students felt mutual respect for other students, and felt that those students respected them as dietitians in return. One student summarized, "I felt mutual respect with the pharmacist and all the others on the team, and I was assured they respected me in turn. It is this level of respect I hope earn in the future, and is my strong belief I can accomplish it."

Teamwork and asking questions were themes identified that helped Medical Dietetic students participate in decision-making. "It [simulation] also showed me that asking

questions and working together is vital to the treatment of a patient," declared one student. Another wrote, "Working together as a team seemed to be very effective. It allowed us to utilize each other's knowledge and make decisions that were ultimately to better the care of the patient. It also allowed us to make decisions for the patient and be more efficient with the care rather than spending a large about of the time on the phone trying to communicate with the other professions."

These results are similar to that of other research which indicates that following interdisciplinary training, students perceive a greater understanding of the importance of communication and teamwork in patient care.[41,49] However, this study is unlike the study on dental and oral health students by Evans et al which resulted in a statistically significant decrease following an interprofessional education experience for the RIPLS item "team-working skills are essential for all oral health care students to learn."[53] The present study showed a very slight decrease in the same item, but did differences did not reach statistical significance.

Is there a difference in dietetic student understanding of the roles of the members of the healthcare team?

Following the Autumn 2013 interprofessional simulations, student understanding of the roles of the members of the healthcare team improved for all professions involved, including nursing ($p<.001$), nurse practitioner ($p<.001$), the student's own profession of medical dietetics ($p=.012$), medicine ($p=.004$), occupational therapy ($p<.001$), pharmacy ($p<.001$), physical therapy ($p<.001$), and respiratory therapy ($p<.001$). Additionally, for the Autumn 2012 and Spring 2013 interprofessional simulations, student understanding

of the roles of the members of the healthcare team improved for nursing (p=.019), respiratory (p=.003), physical therapy (p=.001) and for students' own role as dietitians (p=.010). In the Autumn 2012 and Spring 2013 questionnaire, there was a statistically significant increase in the item "I learn more about my own role when I work with other professions" (p=.048).

These quantitative results are strengthened by the qualitative results, which demonstrate that the simulation was helpful in enhanced understanding the roles of the members of the healthcare team. Through multiple various interactions with other members of the healthcare team, medical dietetics students reported twenty-seven times that the interprofessional education simulation experience was helpful for generating a baseline understanding the roles of the other health professions and thirty-two times that various roles were further clarified. In their reflection documents, students wrote, "The multidisciplinary simulation successfully strengthened my education on the roles of other healthcare professionals that form a patient's medical team" and "The multidisciplinary simulation was definitely helpful in understanding the other professions' roles. Even though we are all students, it provided an example of how interactions take place in a clinical setting."

These results are similar to previous studies which confirm that students report an increased knowledge and/or appreciation of other professions' roles and responsibilities.[4,41,43,44] Similarly, these results are like others that show that following an interprofessional training, the clarity of a student's own professional role is enhanced,[41]

but unlike other reports that claim that a student may lose his or her professional identity through interprofessional education.[5]

These study results differ from the systematic review from Hammick et al which note that while interprofessional education is useful for enabling collaboration, it is less able to positively influence the attitudes and perceptions towards others on the healthcare team.[54] This study is also unlike the study by Earland et al which found that 75% of dietetic students felt that a three-part online interprofessional education module had no impact on the understanding of their role as a dietitian.[43] This may be due to the fact that the Earland study used three online modules over a 4-year period; thus, students may not have felt that the modules had much weight in forming their own understanding of their professional role.

Is there a difference in self-efficacy in caring for a patient?

After the Autumn 2013 simulations, Medical Dietetics students reported an increase in confidence in caring for a patient on a ventilator ($p<.001$). This is similar to the Autumn 2012 and Spring 2013 simulations where an increase in confidence was also realized ($p=.004$). This was further validated by their written reflections. They wrote, "This experience definitely helped increase my confidence as a professional caring for patients. It showed me how much knowledge I actually have, and how much more valuable it can be when you communicate your ideas with your team verbally and not just through notes," "Working with other members of the team did increase my confidence in my role of taking care of the patient. When I saw that others were relying on me to make important decisions about the patient's nutrition therapy, I realized that I knew a lot more

than I thought and a lot more than they did about nutrition. This helped me realize that I play a vital role in the patients care and that I should take ownership of that role," and "The collaborative experience gave me chance to practice patient care in a real clinical situation and allowed me to communicate with various roles in the critical care setting. These practices increased my confidence greatly."

The increase in self-efficacy after an intervention is not unique to this study alone. Ammentorp et al found a statistically significant increase in overall self-efficacy for an intervention group of medical doctors and nurses after a 5-day communications course and Norgaard et all found a statistically significant increase among doctors, nurses, and nursing assistants in the self-efficacy of communication with patients and colleagues following a 3-day training course in patient-centered and interdisciplinary communication.[29,30]

Additional studies have shown that simulation enhances self-efficacy in practice, as our current study demonstrated. For example, simulation enhanced self-efficacy of performing pediatric resuscitation following an interprofessional simulation-based team training regarding pediatric resuscitations.[35] Furthermore, simulation enhanced self-efficacy in providing end of life care after a simulation training which included the death of a patient.[50] An increase in self-efficacy is crucial, as it has been demonstrated that beliefs in self-efficacy affect behaviors and outcomes, and play a large role in future improved performance and in meeting clinical competencies.[20–22,28]

However, this study is unlike that of Pike and O'Donnell examining nine nursing students' self-efficacy, which showed that the students reported low self-efficacy

following a clinical simulation experience.[21] However, this reported low self-efficacy was in relation to their communication skills rather than their perceptions in their ability to care for a patient, and thus suggest the need for a focus on communication skills teaching within clinical simulation – as our present study did.

What are the identified themes evolving from collaboration?

This research illustrates that medical dietetics students enjoy working with other members of the healthcare team in an interprofessional simulation setting. After the Autumn 2012 and Spring 2013 simulations, there was a statistically significant increase in student perceptions of "I enjoy working in teams" (p=.003). This is further supported by responses in the student reflections. Students wrote about enjoying the experience nineteen times, claiming, "the multidisciplinary simulation was a great experience," and "I really enjoyed the clinical patient simulation and feel that I gained a lot from the experience." This is similar to the positive overall experience reported by dietetic students in Whelan et al's 2005 study assessing dietetic student attitudes following seven interprofessional education sessions.[42]

After the Autumn 2013 simulations, students' perceptions increased significantly in the items "I would welcome the opportunity to work on small group projects with other health sciences students" (p=.027) and "I would welcome the opportunity to share some generic lectures, tutorials, or workshops with other health sciences students" (p=.006). Perhaps they would welcome the opportunity because they see the benefit in interdisciplinary interactions. Many students shared their ideas that better interdisciplinary communication could lead to better patient care and outcomes. Students

wrote, “I’m really glad to have been a part of this experience, and I think any healthcare student would benefit from doing something similar,” and “I feel as if these types of experiences will have a positive impact in future health care.” One student summed it up eloquently, writing, “In my opinion, collaboration among the professionals that comprise a healthcare team is essential to improve patient health outcomes. Proper communication among a patient’s treatment team will ultimately benefit the patient in several ways, including: prevention of food-medication interactions, prevention of miscommunication regarding medication dosages, prevention of under- or over-feeding patients, prevention of misdiagnoses and inappropriate treatments, and regular monitoring and evaluation of the patient’s health status, among many others.”

Students also indicated a statistically significant increase in the item “shared learning before and after graduation will help me become a better learner” ($p=.018$) following the Autumn 2013 simulations. The benefits of shared learning were also assessed in the Autumn 2012 and Spring 2013 questionnaire with item “I learn more when I teach the material to other team members,” of which rose significantly following the simulations ($p<.001$). Many students wrote in their reflections that they intend to apply what they learned during the interprofessional education simulation experience to their future learning and practice as a Registered Dietitian. They noted that they would be more willing to communicate through listening, speaking, and asking questions. The students wrote, “I will not hesitate to speak up in round in actual clinical rotation because I know what I need to add to the discussion as the nutrition expert,” and “I believe I will be more likely to approach patient care with a team minded focus. I will keep my ear open more

to what the other professions are saying at rounds and use that information to help my interventions. I will also be more likely to consult the other professions for their viewpoints." This is consistent with the research indicating that interprofessional learning assists students in interacting with other health care professionals in the future.[37,44,49]

Limitations

Though our study provides similar results to those of other studies of interprofessional education among healthcare professions, it is important to point out some of the limitations to this study. First, though the study assessed student self-efficacy in patient care both quantitatively and qualitatively, it only qualitatively assessed student self-efficacy in their communication and teamwork in collaborating with other members of the healthcare team. Quantitatively assessing their self-efficacy in participating in teamwork and collaboration would provide useful information.

Limitations to this study include a sample of convenience, which limits ability to generalize these results to all dietetic students. Another limitation to the study is that the questionnaires were given to the students following a student debriefing session of all professions, led by a faculty member. Though the debriefing session serves an important part in a simulation experience, for future research or simulations testing perceptions on interprofessional education, it is recommended that the post-simulation questionnaire be distributed before the group debriefing so that other students or faculty do not bias the student's own experience.

The qualitative research was assessed by one researcher alone, which may provide another limitation to the study. Though this researcher spent a significant amount of time coding and recoding the themes from the reflection documents and had quantitative data to support the findings, it would have been useful to have triangulation of multiple analysts on the qualitative data to further enhance the credibility of the study.

Additionally, though not reflected negatively in the data, it is important to mention that not all professions were present during each simulation session. Attempts should be made in future simulations to ensure all professions are present, so as to keep experiences among students as equivalent as possible.

Future Research

While this study validates that interprofessional simulation changes dietetic student perceptions of communication, decision-making, roles, and self-efficacy in working with the health care team, it is important to note that this does not necessarily mean that interprofessional simulation translates into improved patient care. While we would hope that it would, future research should be completed to determine if the self-efficacy that the students experience due to the simulations is carried into their professional roles to enhance patient outcomes.

Additionally, it may be of interest to include other healthcare practitioners in the simulations. The interprofessional team is not limited to those included in these simulations alone, so future studies may want to consider including the roles of dietary

technicians, dietary aides, nursing assistants, speech therapists, case managers, research coordinators, and all others who may be involved in patient care.

Chapter 5: The Impact of Interprofessional Simulation on Dietetic Student Perception of Communication, Decision-Making, Roles, and Self-Efficacy

Abstract

Introduction

Despite the research that supports interdisciplinary education as a component to delivering optimal medical care, many education programs still provide minimal exposure and interaction during student training. This study describes the effect of an interprofessional simulation experience on dietetic student perceptions of teamwork and decision-making, understanding roles of healthcare professionals, as well as the effect on self-efficacy for providing patient care.

Methods

This study used a pre/post-test design using a validated questionnaire and post-simulation student reflections.

Results

Two-tailed paired-sample t-tests assessed questionnaire items demonstrating that students felt that learning with other students will increase effectiveness of the health care team ($p=0.032$); that shared learning with other health professions will increase their ability to problem-solve ($p=0.017$); and that shared learning will help them become better

clinicians (p=0.018). There was a significant increase in support of small group projects (p=0.027) and generic lectures, tutorials, or workshops (p=0.006) shared with other health sciences students. Students had significant increases in their understanding for the roles of nursing, nurse practitioner, occupational therapy, pharmacy, physical therapy (p<0.001), medical dietetics (p=0.012), and medicine (p=0.004). Students indicated a statistically significant increase in the item "I feel confident in providing care for a ventilated patient" (p<0.001). This quantitative data is supported by previous Autumn 2012/Spring 2013 non-validated questionnaire data as well as qualitative reflections.

Conclusions

Interprofessional simulation is an effective method to increase dietetic student understanding of professional roles, increase dietetic student self-efficacy for clinical care, and provide a learning experience that may impact future care of patients.

Introduction

In 2000, the Institute of Medicine released the report *To err is human: Building a safer heath system* detailing the importance of interdisciplinary decision-making to avoid medical errors, many of which are the result of dysfunctional or nonexistent teamwork.[1,2] Ineffective communication among healthcare teams has been shown to be a common denominator behind many adverse events, medical errors, and delays in patient care of which result in negative effects on human lives, overall loss of trust in the healthcare system, and a cost of 17-29 billion dollars annually.[2–4]

Interprofessional education is crucial to delivering cost-effective, safe, and effective medical care; however, many health profession programs—including medical dietetics—still educate their students with minimal interaction and understanding of other health care professionals.[3,5] Of the programs that have been developed, very few address the impact of interprofessional education on dietetic students. The objective of this study was to describe the difference in dietetic student perceptions of teamwork and decision-making, understanding roles of healthcare professionals, and self-efficacy in patient care before and after an interprofessional simulation experience.

Methods

During the 2012-13 semesters at The Ohio State University, medical dietetic students gathered with students from nursing, medicine, physical therapy, respiratory therapy, pharmacy, occupational therapy, and social work to participate in a 2½-hour interprofessional simulation. Interprofessional groups of ten to fifteen people including one or more representatives from the above professions completed two intensive care scenario case studies through a bedside rounding simulation involving one patient actor and one patient mannequin simulator.

Each simulation included a ten-minute introduction to the professions involved, a review of the learning and skill objectives, and an overview of the simulation schedule. Next, students from each profession were allotted time to gather pertinent information from the chart, the patient, and from students from the other healthcare professions. A bedside rounding simulation for each patient by the interprofessional group then

followed. The team leader was either a medical student or nurse practitioner student. Each student member of the team presented his or her pertinent contribution to the patient story. A plan of care for each of the two patients was developed during these bedside discussions. After collaboratively creating a plan of care, students were given time to implement intervention and treatment plans. To conclude the simulation, a second bedside round was conducted to discuss the implementation of the plan of care. Here, student discussed progress and improvements. At this time, additional plans for each patient were proposed. Finally, the entire group participated in a debriefing session led by one of the faculty members.

Students completed a pre-and post-simulation questionnaires. The Autumn 2012 and Spring 2013 questionnaire was created for the sole purpose of this simulation and was not validated. The questionnaire included fourteen items based from the Interprofessional Education national standards. Students were able to answer the questions with a fully anchored 5-point Likert scale ranging from "strongly agree" to "strongly disagree." See Appendix E.

In Autumn 2013, a modified Readiness for Interprofessional Learning Scale (RIPLS) questionnaire was distributed to the students before and after the simulation experience. The modified RIPLS questionnaire assessed the student's readiness to engage in interprofessional learning, namely, their perceptions of teamwork and collaboration, their own sense of professional identity, and their perceptions of patient-centeredness. The RIPLS questionnaire serves as a useful tool to assess outcomes related to perceptions and behaviors of participants, as well as measure team performance and behavior changes

after an interprofessional education experience.[5–7] Again, students were able to answer the questions indicating their agreement on a fully anchored 5-point Likert scale ranging from "strongly agree" to "strongly disagree." Along with the modified RIPLS questionnaire, the Autumn 2013 questionnaire also included non-validated questions whereby students could rank their understanding of various professions from 1 (I do not understand at all) to 10 (I understand it well). The complete Autumn 2013 questionnaire including the modified RIPLS and additional non-validated questions is located in Appendix F.

All students completing questionnaires identified themselves by a four-digit number for pre- and post-simulation questionnaire matching purposes. Students indicated their age and gender but were otherwise anonymous.

One week following the simulation experience, medical dietetic students wrote reflection documents regarding their experience. Students were asked to answer a variety of questions and encouraged to express their thoughts and ideas freely. These documents serve as a source of qualitative data for the research. The researcher analyzed the reflections in order to obtain an in-depth look into each participant's attitude, perception, and overall experience of the interdisciplinary simulation. The researcher identified, analyzed, and described overarching themes in the reflection documents.

An IRB proposal was submitted and approved by the Institutional Review Board of The Ohio State University. Informed consent was received from all participants before the study commenced.

Statistical Analysis

The researcher used SPSS (Statistical Package for the Social Sciences) version 21.0 (SPSS Inc., Chicago, Illinois) to analyze the data from the questionnaires. A paired-samples t-test was used to detect the individual differences for each of the items on the questionnaires. Statistical significance was indicated with a p-value of ≤ 0.05.

Results

Participants

Seventy students from The Ohio State University's Medical Dietetics program completed the interprofessional education simulation in Autumn 2012, Spring 2013, and Autumn 2013. All students were enrolled in the Medical Dietetics program at Ohio State and had completed coursework within the college. Students were required to participate in the simulations for their coursework, though participation in the research study was voluntary.

Medical Dietetics students completed the simulations with other students studying in numerous health professions. In the Autumn 2012 and Spring 2013 simulations, Medical Dietetics students completed the simulations with students from the medicine, nursing, nurse practitioner, pharmacy, physical therapy, and respiratory therapy programs. In the Autumn 2013 simulations, students from those same programs – as well as occupational therapy and social work – participated in the simulations. In the Autumn 2013 simulations participants included 10 students from medicine, 78 students from nursing, 18 nurse practitioner students, 38 from pharmacy, 20 from physical therapy, 6 from

occupational therapy, 10 from respiratory therapy and 4 from social work interacted with 37 students from Medical Dietetics for a total of 221 students.

Participant demographics in terms of age and gender obtained from the Autumn 2012/Spring 2013 and Autumn 2013 questionnaires are located in Table 8.

Semester	**Questionnaire Completed**	**Number of Students with completed Questionnaires**	**Male**	**Female**	**Age Range (yrs)**	**Mean Age (yrs)**
Autumn 2012 and Spring 2013 (combined)	Autumn 2012/Spring 2013 Non-Validated Questionnaire	30	3	27	20-43	$22.3\overline{6}$
Autumn 2013	Modified-RIPLS Questionnaire	33	4	29	19-36	22.8

Table 8: Participant Demographics per Questionnaire

Quantitative Data

A two-tailed paired-samples t-test assessed each of the individual variables on the Autumn 2013 questionnaire demonstrates that students had statistically significant increases in their understanding of the roles of nursing ($p<0.001$), the nurse practitioner ($p<0.001$), medical dietetics ($p=0.012$), medicine ($p=0.004$), occupational therapy ($p<0.001$), pharmacy ($p<0.001$), physical therapy ($p<0.001$), and respiratory therapy ($p<0.001$). Additionally, students felt that learning with other students will make them a more effective member of the healthcare team ($p=0.032$), that shared learning with other health sciences students will increase ability to understand clinical problems ($p=0.017$), and that shared learning before and after graduation will help them become better

learners (p=0.018). Students indicated a statistically significant increase in items about welcoming small group projects (p=0.027) and sharing generic lectures, tutorials, or workshops (p=0.006) with other health sciences students. Finally, students indicated a statistically significant increase in the item "I feel confident in providing care for a ventilated patient" (p<0.001). Complete data from the Autumn 2013 questionnaire are located in Tables 1 and 2, found earlier within the text.

The data from the Autumn 2013 questionnaire is supported by data from the Autumn 2012/Spring 2013 questionnaire. Though these semesters' simulations used a separate non-validated questionnaire to track changes in student perceptions, comparing the results to the Autumn 2013 modified-RIPLS survey is of benefit. Findings indicate that there was a statistically significance increase in student understanding of the roles of nursing (p=0.019), respiratory therapy (p=0.003), and physical therapy (p=0.001). There was also statistically significant difference in student opinion regarding shared learning – students indicated a statistically significant increase in their enjoyment in working in teams (p=0.003), that they learn more when they teach material to other team members (p<.001), and that they learn more about their own role when working with other professions (p=0.048). There was a statistically significant increase in the student's reported confidence in caring for a ventilated patient (p=0.004).

Complete data from the Autumn 2012 and Spring 2013 simulations are provided in Table 3.

Qualitative Data

Sixty-two students completed post-simulation reflection documents. One researcher independently completed a comprehensive review of the student reflections and spent substantial time systematically coding and recoding the data. The data was coded prior to analysis of the quantitative to avoid researcher bias.

Six hundred and fifty-four qualitative points were coded and 43 overarching-topic areas emerged in over 5% of the documents. These 43 themes fit into four domains: 1) Communication and Decision-Making, 2) Understanding the Roles and Responsibilities of Team Members, 3) Self-Efficacy in Caring for a Patient, and 4) Emerging Themes. Major results from the Communication and Decision-Making domain demonstrated that students reported feeling and giving respect to others, comfort in asking questions, effective communication and teamwork, and the importance of interaction. Themes, their frequency, and text from the Communication and Decision-Making domain are located in Table 9.

Theme	Frequency	Example Text
Respect	42	"I found mutual respect and understanding to be apparent in ever part of the simulation. During the intervals where we could assess the patients ourselves, there was plenty of time but only two patients. It was nice to see that nobody made themselves the top priority; rather, each discipline politely took their 'turn'." "I have a deeper respect for the professions we worked with because I was able to see all the work that they do in patient care and recovery." "I felt mutual respect with the pharmacist and all the others on the team, and I was assured they respected me in turn. It is this level of respect I hope earn in the future, and is my strong belief I can accomplish it."
Ask Questions	30	"By working with these other students "behind the scenes" and during rounds, I was able to learn much more by asking questions and explaining my role in the clinical setting." "At times we may have had a question as to why another profession made a decision that they had, but instead of assuming they were wrong, we would ask each other why a certain decision was made although we may not have initially understood it. This was part of the experience that was educational."
Effective Communication	28	"The communication that took place throughout the simulation was very effective. I was amazed at how much we were able to accomplish during the short bed rounds. Having the opportunity to communicate with one another face to face helped us make changes to the care plan and provide the best care possible for the patient."

Continued

Table 9: Theme, Frequency, and Text from the "Communication and Decision Making" Domain

Table 9 continued

Theme	Frequency	Example Text
Teamwork	22	"It felt good to come together as a team and work on a case as we each had our own perspectives." "It ensures that the patient is being cared for in every aspect from every angle. It allowed all of the professions to work synergistically."
Importance of interaction	21	"Our practice is not an island- it is clear that all the professions must work together for the greatest benefit to the patient."
"I've Got Your Back" – Reliance on others/ Dependability	16	"It was a way to make sure the inklings we had about certain parts of the patient care were truly covered by many angles, and concerns were brought up and worked out that would probably have been missed by only one discipline." "I believe that, like registered dietitians, all of the other health professionals play an essential role in the overall care of a patient. Each health professional focuses on treating different aspects of the patient's health, and when all of these professionals communicate and share their recommendations for a patient, the patient can receive the best and most comprehensive care possible. No one health professional can treat a patient single-handedly; a holistic approach is needed to ensure that all aspects of a patient's health are considered in terms of his or her recovery."
Teaching	13	"I was able to educate the other professions as well about the impact that metabolic stress has on albumin levels, the traditional use of the clear liquid diet, and food sources of Vitamin K that impact Warfarin administration."

Continued

Table 9 continued

Theme	Frequency	Example Text
Communication Challenges	12	"I have never experienced anything like this before and at times felt a little awkward as I was out of my comfort zone and unsure of the situation. Specifically, I found it difficult to communicate during rounds because I've never experienced anything like that before and I've never been taught how to communicate in that situation (i.e. who all are we addressing? How do we address them? Do we wait to be called on or do we speak up? Etc.)"
Vocabulary Difficulties	12	"I did not understand some of the terminology that was being used by the other professions, so at some points I had to request clarification."
Decision Making	7	"I listened to what each had to say during rounds and adjusted my recommendations accordingly."
Listening	6	"As we collaborated from different disciplines regarding diabetes management we showed mutual respect by listening to fellow students and creating a course of action as a team."

From the Understanding the Roles and Responsibilities of Team Members domain, students generally felt that the experience was helpful in understanding and clarifying roles of other health care team members. They also reported improved understanding of their own profession as a result of the simulation. They reported examples of multiple interactions – with interactions between the dietetic and pharmacy students, the dietetic and nursing students, and the dietetic and respiratory therapy students occurring most often. Themes, their frequency, and text from the Understanding the Roles and Responsibilities of Team Members domain are located in Table 10.

Theme	Frequency	Example Text
Roles: Pharmacy - RD	39	"I would say one of the best examples in our simulation was working with pharmacy. They were so polite in wanting to help us look up drug-nutrient interactions. They would ask us questions as we asked them questions. It was nice because I don't feel like either of us we're looking down on each other. It was a mutual relationship after one goal."
Roles: Clarified	32	"The experience increased my confidence in caring for patients because it helped to clarify what the roles of the other professionals were." "This experience was extremely beneficial in that it enabled me to see what exactly all of the other professions did and what their role was in caring for a patient."
Helpful	27	"This simulation was helpful in understanding the other professions' roles." "The multidiscipline simulation was definitely helpful in understanding the other professions' roles. Even though we are all students, it provided an example of how interactions take place in a clinical setting."
Roles: own - understand	14	"I felt like this experience was extremely valuable for learning our position on a team in a hospital setting." "I believe this experience gave me a much better understanding of my role and gave me more confidence in my ability to do my job."
Roles: Nursing - RD	11	"I approached the nursing students regarding one of the patient's prescriptions that had a nutrient interaction. My initial thought was that I would only be reiterating knowledge they already knew. To my surprise, they were thankful that my partner and I had informed them because they had forgotten about that aspect of the medication."
Roles: RD - RT	10	"I had no idea of how respiratory therapy works for example so it was great to begin to understand what they do."

Continued

Table 10: Theme, Frequency, and Text from the "Understanding the Roles and Responsibilities of Team Members " Domain

Table 10 continued

Theme	Frequency	Example Text
Roles: MD	8	"The medical student that participated in this simulation was unsure of what steps needed to be taken to help control one of the patients diabetes therefore, the dietetics students offered assistance. As we collaborated from different disciplines regarding diabetes management we showed mutual respect by listening to fellow students and creating a course of action as a team."
Roles: NP - RD	5	"During rounds, the nurse practitioner began talking about Ann Arbor's feedings before realizing that we were standing right there and then she consulted us. It was cool to see that dietitians are kind of becoming a more recent and increasing addition to the rounding team. She later said she was not used to having us right there to consult with so that was cool to hear that she respected us."
Roles: others understood RD	5	"I think the other professions do understand the role of the RD better. One nursing student didn't even realize we participated that much in the care of the patient. She always assumed that it was the doctor making all of those decisions and she said it was cool to see and now know that it's a collaborative decision."
Roles: others - doesn't understand	5	"To me the most difficult part was to determine who would be the best personnel to turn to if I have a particular question. I felt like I did not know the exact role of other members in the healthcare team prior to the simulation experience."

An increase in confidence was reported forty-six times in the reflection documents. Themes, their frequency, and text from the Self-Efficacy in Caring for a Patient domain are located in Table 11.

Theme	Frequency	Example Text
Confidence - increased	46	"This experience strengthens my confidence in talking to other professional in actual practice." "I am now more confident in how I will interact with other medical professionals in the future." "This experience definitely helped increase my confidence as a professional caring for patients. It showed me how much knowledge I actually have, and how much more valuable it can be when you communicate your ideas with your team verbally and not just through notes." "The experience increased my confidence in caring for patients because it helped to clarify what the roles of the other professionals were." "This really upped my confidence in caring for a patient as a part of a larger team and not just one on one. I feel much more ready to care for patients in a clinical setting as a result of this simulation." "The most difficult part of this collaboration was the rounding experience. I found that I did not have enough confidence in my ability to suggest an appropriate nutrition recommendation for the patients. While I have the knowledge to make appropriate and evidence-based recommendations, I still felt unsure of myself when delivering my recommendations to the rest of the healthcare team. However, the feedback I received from the rest of the team regarding the success of my recommendations helped bolster my sense of self-efficacy and increase my confidence in my ability to support the patients' recovery through proper nutrition therapy."

Continued

Table 11: Theme, Frequency, and Text from the "Self-Efficacy in Patient Care" Domain

Table 11 continued

Theme	Frequency	Example Text
Confidence - no change	4	"At this point I already feel confident in caring for patients because of clinical rotations but I think it was certainly helpful for those in other disciplines who have not had clinicals yet. It is great prep work." "I wouldn't necessarily say the collaborative experienced increased my confidence in caring for patients. I definitely felt more comfortable when I was in my clinical rotation interacting with other health care professionals. This may be because I often feel less confident interacting with individuals my own age and feel more comfortable working with those older than me. The experience made me wish that I taken advantage of more opportunities in my undergraduate career getting to know other students in allied health professions."

The domain "Emerging Themes," includes all other additional themes that may have important contributions to this study. Students shared thoughts that Registered Dietitians are the nutrition experts, that they see the benefits interprofessional care, and that they can apply what they learned to their future practice. Included in this domain are student feelings of the overall experience. Some students commented on how they were uncomfortable at first, or felt that pretending was awkward, but that throughout the experience it got easier. Students also made comments that indicated they were stressed during the experience or that the experience and/or case was challenging. Students talked about the amount of time they were giving during the simulation to complete the case – some said that it was too slow/they were given too much time, but most others who commented on time said that it was too fast/there was not enough time. Of interesting to note is that one student shared insight into a "hierarchy"; however, seven reported that through the simulation they learned that they were "equals." Themes, their frequency, and text from Emerging Themes domain are located in Table 12.

Theme	Frequency	Example Text
RDs=Nutrition Experts	23	"Recognizing that the other disciplines truly looked to Med Diet as the nutrition experts was encouraging. Realizing that I would not be second-guessed and my opinion would be respected as the expert was both humbling and confidence building."
Sees benefit	22	"It helped to act out a round and to be bold with decisions when a real life wasn't at risk." "The benefit I received from the simulation was that working with the other professions allows for better communication, allowed everybody to be on the same page, and provided the best care for the patient." "In my opinion, collaboration among the professionals that comprise a healthcare team is essential to improve patient health outcomes. Proper communication among a patient's treatment team will ultimately benefit the patient in several ways, including: prevention of food-medication interactions, prevention of miscommunication regarding medication dosages, prevention of under- or over-feeding patients, prevention of misdiagnoses and inappropriate treatments, and regular monitoring and evaluation of the patient's health status, among many others."
Enjoyment	19	"The multidisciplinary simulation was a great experience." "I really enjoyed the multidisciplinary simulation."
Future Application	14	"In practice, I am going to make sure I develop a good rapport with other professionals because they are a crucial resource in caring for the patients." "In practice I will definitely work to communicate with other professionals as much as possible."
Uncomfortable at first	13	"At first I was very intimidated and nervous, but once the simulation started I was able to calm down and collaborate with the other professions."

Continued

Table 12: Theme, Frequency, and Text from the "Emerging Themes" Domain

Table 12 continued

Theme	Frequency	Example Text
"I'm important"	9	**"**My role as an RD as part of the team was more important than I realized, the other professionals did not know much of what I was talking about and it helped me to act with more confidence in my decision making."
"They don't understand us!"	9	"With experience in a wide range of healthcare settings I feel as though not all medical team members understand what an RD does and how he/she can contribute to a patient's healing process." "It always surprises me a little when other students are unsure of what a Dietitian is."
Comfortable	8	**"**The environment was collaborative and I did not feel uncomfortable asking questions."
Hierarchy - none	7	"Every professional involved in the care of a patient is equally important and it is crucial that communication takes place whenever possible."
Stress - during/challenging	7	"It was overwhelming to collaborate with such a large number of students from other fields at first, but I am glad I was exposed to it before working at the professional level."
Timing - too fast	7	"One of the most difficult parts was keeping up with the pace. I felt that everyone was moving fairly quickly through things. Being able to do everything I had learned in an expedient manner was challenging."
Value - felt	7	**"**During the entire assignment, I felt very valued as a dietitian."
Dynamic experience	6	**"**Each medical profession may have an individual role, or system of focus, but the patient must be treated as a whole. Every systems affects all other systems in some manner."
Realistic - not	6	**"**I found it sad to realize that this does not always go on in the hospital, because it could clearly help avoid many common mistakes that are made when most all communicating is done through progress notes and report."

Continued

Table 12 continued

Theme	Frequency	Example Text
Future Learning Necessary - Self	5	**“**Other things I will take away from this experience are that there is the realization that there are still a lot of things I don’t know and I have room to grow. I really want to get better at this and be useful for something.”
Pretending - Awkward	5	“The most difficult part of the experience was treating as a real situation. I think we did a pretty good job, but when you know that it is not real, it is tempting to “step out of character” and ask questions or clarify things in a less professional way. This was not too much of a problem, but it did prevent the situation from really feeling like the hospital.”
"I've come so far"	4	“This simulation increased my self-efficacy in caring for my patients because it made me realize how much knowledge we truly do have. I don’t think we realize how much we know and are capable of accomplishing until we are put into situations such as this simulation where we are forced to use the knowledge that we have gained this past semester.”
Difficult case	4	**“**With all of the information provided in the case study it was slightly difficult to sort through it all to figure out what information was pertinent to what we needed to do as dietitians.”
Future Learning Necessary - For Others	4	**“**As I said earlier, I felt that this was an overall successful learning experience and I highly recommend continuing this assignment for future classes to come. This is the experience needed that will grow team collaboration and should help develop the communication and team working skills of the dietetic students.”
Patient = person	4	**“**This experience definitely helped me become more sympathetic to patients as well. They see so many different people every day that it can be over whelming, and sometimes they just need someone to sit down and explain what is going on or to listen to their concerns. When I practice I will definitely remember to treat the patient like a person, NOT a condition.”

Discussion

Overall, this study demonstrates that interprofessional simulation changed dietetic student perceptions of communication, decision-making, roles, and self-efficacy in working with members of the healthcare team.

Communication and Decision-Making

Dietetic students perception of communication revealed that simulations offered an opportunity to ask questions, demonstrate mutual respect, and participate in team decision-making. Students from the Autumn 2013 simulations felt that learning with other students will make them a more effective member of the healthcare team ($p=0.032$). Students also felt more strongly after the interprofessional simulation that shared learning with other health sciences students will increase students' ability to understand clinical problems ($p=.017$). This is supported by the Autumn 2012 and Spring 2013 results that indicate that students feel that they learn more when they teach the material to other team members ($p<.001$).

These results are similar to those of other research which indicates that following interdisciplinary training, students perceive a greater understanding of the importance of communication and teamwork in patient care.[8,9] However, this study is unlike the study on dental and oral health students by Evans et al which demonstrate a decrease following an interprofessional education experience for the RIPLS item "team-working skills are essential for all oral health care students to learn."[10] Though, it is important to recognize that in this study, the dental students indicated more negative responses to this item than the dental technology students.

Understanding the Roles and Responsibilities of Team Members

Students reported a consistent increase in understanding the roles of the members of the healthcare team throughout all sources of data. Following the Autumn 2013 interprofessional simulations, student understanding for roles of the members of the healthcare team improved for all professions. In the Autumn 2012 and Spring 2013 interprofessional simulations, there was a statistically significant increase in the item "I learn more about my own role when I work with other professions" ($p=.048$). These quantitative results are strengthened by the qualitative results, which demonstrate that the simulation was helpful in enhanced understanding of the roles of the members of the healthcare team.

These results are similar to previous studies, which confirm that students report an increased knowledge and/or appreciation of other professions' roles and responsibilities after interprofessional education.[3,8,11,12] Similarly, these results are like others that demonstrate that following an interprofessional training, the clarity of a student's own professional role is enhanced,[8] but unlike other reports that claim that a student may lose his or her professional identity through interprofessional education.[5] This study's results differ from the systematic review from Hammick et al which note that while interprofessional education is useful for enabling collaboration, it is less able to positively influence the attitudes and perceptions towards others on the healthcare team.[13] However, the review Hammick et al did not include dietetic students, and among the healthcare professions included, results showed more positive than neutral or mixed results from interprofessional education. Additionally, this study is unlike the study by

Earland et al, which found that 75% of dietetic students felt that a three-part online interprofessional education module had no impact on the understanding of their role as a dietitian.[11] This may be due to the concern that in the Earland study, students were given three online interprofessional education modules over the course of 4 years, thus, students may not attribute their understanding of their professional identity to that course alone.

Self-Efficacy in Caring for a Patient

After the Autumn 2013 simulations, Medical Dietetics students reported an increase in confidence in caring for a patient on a ventilator ($p<.001$). This is similar to the Autumn 2012 and Spring 2013 simulations where an increase in confidence was also realized ($p=.004$). This was further validated by their written reflections. This study is similar to others that have demonstrated an increase in self-efficacy following a training course and/or simulation experience. [14–17] An increase in dietetic student self-efficacy is crucial, as it has been demonstrated that beliefs of self-efficacy affect behaviors and outcomes, and play a large role in future improved performance and in meeting clinical competencies.[18–21]

Finally, this study demonstrates that dietetic students enjoy working with other members of a healthcare team as evidenced by a statistically significant increase in the item "I enjoy working in teams" in the Autumn 2012/Spring 2013 questionnaire ($p=0.003$) as well as through the reflection documents. This is similar to the positive overall experience reported by dietetic students in Whelan et al's 2005 study assessing dietetic student attitudes following seven interprofessional education sessions.[22] In the Autumn 2013 questionnaire, students reported that they would welcome the opportunity

to work on small group projects (p=0.027) and share generic lectures, tutorials, or workshops with other health sciences students" (p=0.006). This is of importance, since there may be barriers in conducting interprofessional simulation with several health professions students. Barriers of interprofessional education reported in the literature include logistical issues – like coordinating a time and place to meet for students– as well as collaboration and commitment among faculty, financial burden, and need for case simulations to be applicable to each discipline.[5,23,24]

Emerging Themes

However, despite the potential barriers to interprofessional simulation, there appears to be overwhelming positive outcomes. Many students wrote in their reflections that they intend to apply what they learned during the interprofessional education simulation experience to their future learning and practice as a Registered Dietitian. They noted that they would be more willing to communicate through listening, speaking, and asking questions. The students wrote, "I will not hesitate to speak up during rounds in actual clinical rotation because I know what I need to add to the discussion as the nutrition expert," and "I believe I will be more likely to approach patient care with a team minded focus. I will keep my ear open more to what the other professions are saying at rounds and use that information to help my interventions. I will also be more likely to consult the other professions for their viewpoints." This is consistent with the research, indicating that interprofessional learning assists students in interacting with other health care professionals.[9,12,25]

Limitations to this study include a sample of convenience, which limits ability to generalize these results to all dietetic students. Additionally, a threat to reliability is the fact that the Autumn 2012/Spring 2013 questionnaire was created for the sole purpose of the simulation and was not standardized. Therefore, in analyzing the data, the modified RIPLS questionnaire given to participants in the Autumn 2013 simulation experience served as a validated tool for assessing student perceptions; the Autumn 2012/Spring 2013 questionnaire served as its supplement. To enhance the credibility of the study, these two questionnaires were assessed with student reflection documents as a means of data triangulation.

Furthermore, while this study validates that interprofessional simulation changes dietetic student perceptions of communication, decision-making, roles, and self-efficacy in working with the health care team, it is important to note that this does not necessarily mean that interprofessional simulation translates into improved patient care. While we would hope that it would, we agree with others in that future research should be completed to determine if the increase in self-efficacy the students experience as students is carried into their professional roles to enhance patient outcomes.[24]

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Appendix A: Case Study 1 – Ann Arbor

Ann Arbor: Interprofessional Case

Patient Summary: A 25-year-old woman is brought to the Emergency Department (ED) as an unrestrained driver in a single car crash with no loss of consciousness. On arrival to the ED the patient was alert and oriented times three, receiving 100% oxygen per non-rebreather mask. She complained of right chest pain, left upper quadrant pain, and left femur pain. Left femur was splinted. Vital signs were BP 80/56, HR 130, RR 28-32, and SpO_2 94%. Her cardiac rhythm was sinus tachycardia. She had one peripheral 18ga IV catheter with 1000mL 0.9% NS infusing wide open. The paramedics stated that eyewitnesses reported that the woman had been driving erratically and was unrestrained when she hit a tree.

On admission to the ED, the patient was called as a level 1 trauma. Baseline labs were drawn and she was typed and cross-matched for four units of packed red blood cells (PRBC). Lab results were Hgb 9.7, Hct 29, K 4.7, Na 136, Cl 105, BAC was 1.2 g/dL, and Beta Hcg was negative. ABG's: pH 7.47, pCO_2 30, pO_2 99, HCO_3 20, O_2 sat 94%. In addition, multiple x-rays, FAST (Focused Abdominal Scan for Trauma) ultrasound exam, and CT scans were obtained. These studies revealed no head trauma or cerebral bleed. However, the extensive studies did reveal right rib fracture with pneumothorax, kidney contusions, a lacerated spleen and a left open femur fracture. A chest tube was inserted in the ED. Tetanus immunization was given.

The patient was transferred to the Operating Room for an emergent exploratory laparotomy, open splenectomy, and ORIF of her left femur fracture. After surgery, the patient was transferred to the Intensive Care Unit (ICU). An arterial line was placed in her right radial. Triple lumen CVC was inserted on the right internal jugular. She has a right chest tube to underwater seal, nasogastric tube to low wall suction draining a small amount of green drainage. She has a urinary catheter with yellow urine. A dressing is in place over the left femur from the ORIF of her fracture.

Pt. intubated postoperatively due to respiratory distress syndrome, currently maintained on mechanical ventilation, and weaning protocol initiated.

History: *Onset of disease:* Transferred from ED four days ago.
Medical history: unremarkable
Surgical history: s/p appendectomy age 12; s/p ORIF Left femur; emergent exploratory laparotomy, splenectomy upon admission
Medications at home: None

Tobacco use: None
Alcohol use: Social
Family history:

Demographics: *Marital status*: single
Years education: 16+
Language: English only
Occupation: Works in retail.
Hours of work: days, weekends, and some nights
Household members: Lives with roommate
Ethnicity: Caucasian
Religious affiliation: unknown

Current History/Physical:
General appearance: Female intubated
Vital signs: Temp:100.8 Pulse: 108 Resp rate:
BP: 106/88 Height: 160 cm Weight: 110.9 kg
Heart: sinus tachycardia with frequent unifocal PVCs
HEENT: Head: WNL
Eyes: PEERLA
Ears: clear
Nose: dry mucous membranes
Throat: dry mucous membranes
Genitalia: Deferred
Neurologic: Opens eyes to name with movement to commands
Extremities: WNL
Skin: Warm and dry
Chest/lungs: Respirations are diminished with rhonchi – R chest tube to underwater seal; triple lumen CVC on right internal jugular; arterial line in right radial
Peripheral vascular: Diminished pulses bilaterally
Abdomen: Hypoactive bowel sounds x4

Nursing Assessment:	
Abdominal appearance (concave, flat, rounded, obese, distended)	obese
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	incontinent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P, hypo
LUQ	P, hypo
RLQ	P, hypo
LLQ	P, hypo
Stool color	
Stool consistency	
Tubes/ostomies	NG tube in place with drainage Chest Tube in place to pleuravac
Genitourinary	
Urinary continence	Foley catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	cloudy, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	CLM, DI
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15-16 = low risk, 13-14 = moderate risk, ≤12 = high risk)	15

CURRENT ORDERS

MEDICATIONS	Morphine 4 mg IVP every 3 hours prn for pain >7 Percocet 7.5mg/325mg Q6 hrs. per post-pyloric tube
	Promethazine (Phenergan) 12.5 mg IM/IV every 4 hours prn nausea
	Clindamycin 600 mg IVPB every 8 hours
	Ciprofloxacin 400 mg IVPB every 12 hours
	Acetaminophen (Tylenol) 650mg rectal every 6 hours prn if T >101.5
	Enoxaparin 40 mg SQ BID
	Famotidine 20 mg. IV every 12 hours
VASCULAR ACCESS	IV Management: A-line care per protocol Triple Lumen CVC care per protocol
IV THERAPY	0.9 NS with 20mEq KCL at 50 mL/hour in distal port of triple lumen CVC
	250 ml 0.9 NS per pressure bag to arterial line
DIAGNOSTIC PROCEDURE/TESTS	Chest Portable every morning. "Evaluate pneumothorax"
LABS	CBC, platelet on arrival to unit and every morning
	Chem 7, on arrival to unit and every morning
	PTT every morning
	Lactic acid on arrival to unit and every morning

	ABG on arrival to unit and per RT protocol
	Magnesium on arrival to unit and every morning
	Calcium on arrival to unit and every morning
	Pre-Albumin Q 5 days
	CRP every morning
NURSING	Vital Signs: every hour
	Notify physician if SBP > 180, or <90; DBP >100 or < 60; HR >110 or < 60; RR >24, or < 10; T > 101.5; Urine output < 30ml/Hr; O_2 sat < 90%
	Neuro checks every 2 hours X 24 hours
	Neurovascular check every 2 hours
TREATMENTS	Pulse Oximetry: continuous
	Cardiac Monitoring: continuous
	Daily morning weight
	I&O Q 8 hrs.
	Sequential compression device to right leg
TUBES/DRAINAGE DEVICES	Chest Tube: Tube Care per protocol, Drsg change Q 24 hours, To underwater seal
	Foley catheter to straight drain
	NG to LWS
ACTIVITY	Bed rest
CONSULTS	PT/OT eval and treat

	Nutrition consult
NUTRITION	NPO post-pyloric feed tube with continuous feeding Oxepa 45 mL/hr.
INCISION/WOUND CARE	Dry sterile dressing to left femur every morning Dry sterile dressing to abdomen every morning
O_2 THERAPY	Ventilator settings: Vt 600, RR 10, PEEP 8cm, FiO_2 40%, mode: assist control ventilation Change Vt to 400mL and wean per vent protocol
RESPIRATORY TREATMENT	Blood Gas-R/T PRN If O_2 Sats <92% and/or respiratory distress, 30 min. with each ventilator change
	Peak Airway Pressure (PAP) every hour

Intake/Output

Date		**Day 4**			
Time		0701-1500	1501-2300	2301-0700	Daily total
IN	P.O.	**0**	**0**	**0**	**0**
	I.V. (mL/kg/hr)	**400**	**400**	**400**	**1200**
	I.V. piggyback	**200**	**100**	**200**	**500**
	EN	320	250	260	830
	Total intake (mL/kg)	820	750	860	2430
OUT	Urine (mL/kg/hr)	**560**	**610**	**720**	**1390**
	Emesis output	50	25	25	100
	Other				
	Stool		**1**		
	Total output (mL/kg)	**610**	**635**	**745**	**1490**
Net I/O					**2430/1490**
Net since admission					

MD Progress Note

Day 4 post-op note:

Subjective: 25 yo female level 1 trauma involved in MVC four days ago. She is S/P splenectomy, ORIF of left femur. Pt. c/o pain 6-7 x. Family has been in and is staying at a local hotel. Patient alert and oriented X 3.

Vitals: Temp:98.8 Pulse:80-90 Resp rate: BP: 101/65

Urine Output: adequate

Physical Exam:

General: Neurovascular check normal.

HEENT: WNL

Heart: Right radial arterial line with last pressure reading of 101/65; normal sinus rhythm without ectopy.

Lungs: intubated with #7 ET tube, minimal whitish secretions suctioned. FiO_2 delivered at 40%

Abdomen: Hypoactive bowel sounds, abdominal tenderness. Midline abdominal dressing and left lateral femur dressing dry and intact.

Assessment/Plan: Chest tube to right side to underwater seal, no air leak, no crepitus. Chest tube dressing dry and intact. Diffuse abrasions and contusions to chest and abdomen- healing. NG in place to LWS with small amount green drainage. #16 Foley draining yellow fluid. She has a post-pyloric feeding tube in place with continuous feeding of Oxepa 45 mL/hr.

IVF: Triple lumen CVC in the right internal jugular with 0.9 NS with 20 KCl infusing at 50 mL/hr into the distal port

DX: Acute Respiratory Failure s/p MVA; splenectomy, ORIF of left femur
Plan: SBT, extubate if adequate, PT consult, continue nutritional support

Ventilator settings: Vt 600, RR 10, PEEP 8cm, FiO_2 40%, mode: assist control ventilation
Change Vt to 400mL and wean per vent protocol
Blood Gas-R/T PRN

If O_2 Sats <92% and/or respiratory distress, 30 min. with each ventilator change

_____MD

Physical Therapy Evaluation **Date: 11/15/12 MR:11111**

Examination
History:
Admitting diagnosis: s/p MVA unrestrained driver with no LOC 4 days ago; Post-op acute resp. failure requiring intubation
Surgical Procedure: s/p ORIF Left femur; emergent exploratory laparotomy, splenectomy upon admission; R side chest tube
PMH/PSH: s/p appendectomy age 12; otherwise unremarkable
Precautions: Clarification needed for weight bearing status on L LE
Social history/Environmental factors: Per chart and family at bedside. Pt. is a 25 y/o Caucasian female, who lives in a two-story apartment with a roommate. Bedroom and bathroom are on 2nd floor. Stairs: 2 steps to enter and 1 FOS with R railing to access 2nd floor. PTA: Pt. was I in all mobility and ADL's working in retail.

Systems Review/Tests and Measures:
Vitals: B/P 108/70; RR 16; pulse: 80
Mental Status: AxOx3; cooperative and able to follow 2 and 3 step commands consistently
Vision: no gross deficits noted
Hearing: no gross deficits noted
Speech: intubated
Pain: 5/10 indicates chest tube site and L ORIF site as locations of pain
Safety Awareness: not tested; nursing notes no pulling of lines
ROM: AROM and PROM tested for all extremities in supine in bed - R UE WFL – hesitant to move secondary to chest tube; L UE WFL; R LE WFL; L LE hip flex ~70°, hip ext to +10° with pain noted at end of range for flexion and extension, IR/ER NT secondary to pain, knee flex/ext 0-60° limited by hip pain, ankle WNL; cervical spine and trunk – NT
Strength: Tested in supine in bed grossly assessed – R/L UE 4-/5 throughout; R LE 4/5; L LE 3-/5 with pain noted with flex/ext; cervical spine and trunk – NT
Sensation/Tone: Grossly Intact for LT and proprioception B UE/LE; Tone - WFL

Skin Integrity: Intact/dry surgical dressing to L LE for ORIF and abdomen
Edema: minimal swelling noted L LE ORIF site
Bed Mobility: Mod assist x 1 to scoot up and down; Mod assist x1 to roll to R side with VC's to use UE's and R LE to assist (rolling to L NT secondary to ORIF)
Transfers: supine to sit – NT; no other transfers tested
Ambulation: NT
Endurance: NT

Evaluation:
Prognosis: Rehab potential - Good. Pt. is a 25 y/o female s/p MVA 4 days ago requiring intubation secondary to acute respiratory failure, exploratory laparotomy, R sided CT placement, splenectomy, and L femur ORIF. Based on this examination, the patient's age, prior level of function, + family support are positives for an ability to return to home. Current recommendation is discharge to acute inpatient rehab to address mobility and equipment needs secondary to patient living environment requiring stairs to access. Further assessment of mobility and endurance domains will be beneficial for continued improvement in pt.'s respiratory status and progression towards discharge to inpt. acute rehab.

PT diagnosis: Practice Pattern 4I Impaired joint mobility, motor function, muscle performance and ROM associated with bony or soft tissue injury and Practice Pattern 6F Impaired Ventilation and Respiration/Gas Exchange Associated with Respiratory Failure

Goals for Discharge:
STGs to be achieved in 3-5 days:
1. Pt. will be able to perform bed mobility activities with CGA with L LE only in order to position herself appropriately.
2. Pt. will be able transfer supine to sit on EOB CGAx1 in order for nursing to do a skin inspection daily.
3. Pt. will be able to perform L LE ROM WFL in preparation for gait activities.

LTGs to be achieved in 5-8 days:
1. Pt. will be I with all bed mobility activities.
2. Pt. will be able to transfer to a gerichair with min assist x1 using a standard walker and maintaining appropriate WB on L LE in order to watch her favorite TV show.
3. Pt. will be able to ambulate to and from bathroom maintaining appropriate WB status with mod assistx1 using SW w/o LOB.

Plan of Care:
Will follow 4-5 visits/week until d/c. Need to clarify WB status for L LE. Discussed findings with nursing, as well as patient and family at bedside with no questions at this time. Plan is for on-going treatment and education on exercise

tolerance/endurance, mobility, transfers, and safety awareness prior to discharge to inpatient acute care rehab.
Signature: Erin M. Thomas, PT, DPT License number 12322 Pager # 123-2334

Laboratory Results

	Ref. Range	
Chemistry		
Sodium (mEq/L)	136-145	140
Potassium (mEq/L)	3.5-5.5	3.6
Chloride (mEq/L)	95-105	101
Carbon dioxide (CO_2, mEq/L)	23-30	24
BUN (mg/dL)	8-18	11
Creatinine serum (mg/dL)	0.6-1.2	0.9
BUN/Crea ratio	---	12.2
Uric acid (mg/dL)	2.8-8.8 F 4.0-9.0 M	2.9
Glucose (mg/dL)	70-110	115 !↑
Phosphate, inorganic (mg/dL)	2.3-4.7	2.8
Magnesium (mg/dL)	1.8-3	1.9
Calcium (mg/dL)	9-11	9.1
Osmolality (mmol/kg/H_2O)	285-295	290.3
Bilirubin total (mg/dL)	≤ 1.5	1.4
Bilirubin, direct (mg/dL)	< 0.3	0.12
Protein, total (g/dL)	6-8	6.1
Albumin (g/dL)	3.5-5	3.1 !↓
Prealbumin (mg/dL)	16-35	15 !↓
Ammonia (NH_3, µmol/L)	9-33	11
Alkaline phosphatase (U/L)	30-120	130 !↑
ALT (U/L)	4-36	38 !↑
AST (U/L)	0-35	41 !↑
CPK (U/L)	30-135 F 55-170 M	141 !↑
Lactate dehydrogenase (U/L)	208-378	379 !↑
Lipase (U/L)	0-110	
Amylase (U/L)	25-125	
CRP (mg/dL)	< 1	224 !↑
Cholesterol (mg/dL)	120-199	210 !↑
HDL-C (mg/dL)	> 55 F, > 45 M	62 !↑
VLDL (mg/dL)	7-32	
LDL (mg/dL)	< 130	
LDL/HDL ratio	< 3.22 F < 3.55 M	
Triglycerides (mg/dL)	35-135 F 40-160 M	78
Coagulation (Coag)		
PT (sec)	12.4-14.4	13.2
PTT (sec)	24-34	26
Hematology		
WBC (× $10^3/mm^3$)	4.8-11.8	10.5

	Ref. Range	
RBC ($\times 10^6/mm^3$)	4.2-5.4 F 4.5-6.2 M	4.0 !↓
Hemoglobin (Hgb, g/dL)	12-15 F 14-17 M	10.1 !↓
Hematocrit (Hct, %)	37-47 F 40-54 M	35 !↓
Hematology, Manual Diff		
Neutrophil (%)	50-70	78.7 !↑
Lymphocyte (%)	15-45	52.5 !↑
Monocyte (%)	3-10	3.15
Eosinophil (%)	0-6	2
Basophil (%)	0-2	0
Blasts (%)	3-10	3
Segs (%)	0-60	15
Bands (%)	0-10	2
Urinalysis		
Collection method	---	
Color	---	Amber
Appearance	---	Clear
Specific gravity	1.003-1.030	1.0240
pH	5-7	6
Protein (mg/dL)	Neg	Neg
Glucose (mg/dL)	Neg	Neg
Ketones	Neg	Neg
Blood	Neg	Neg
Bilirubin	Neg	Neg
Nitrites	Neg	Neg
Urobilinogen (EU/dL)	< 1.1	< 1.1
Leukocyte esterase	Neg	Neg
Prot chk	Neg	Neg
WBCs (/HPF)	0-5	2
RBCs (/HPF)	0-5	2
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0
Arterial Blood Gases (ABGs)		
pH	7.35-7.45	7.38
pCO_2 (mm Hg)	35-45	46
SO_2 (%)	≥ 95	100
CO_2 content (mmol/L)	25-30	
O_2 content (%	15-22	
pO_2 (mm Hg)	≥ 80	150
HCO_3^- (mEq/L)	24-28	24

Appendix B: Case Study 2 – Shirley Johnson

Shirley Johnson: Interprofessional Case
Overview of case: Shirley Johnson is a 58-year-old white female admitted to Mirror Lake Medical Center four days ago after being found lying unresponsive on hardwood floor at her home by a sister. Pt. presented with RLL pain and weakness subsequently r/t injuries from her fall. The patient was found to have abrasions over RLE and appearance of ecchymosis, particularly over the dorsal aspect of right foot and toes, consistent with bruising. The patient also complained of pain in this area. Subsequently found to have an ischemic right leg, which required below-the-knee amputation. On Warfarin for afib. G-tube inserted in the OR due to poor intake and malnutrition. CXR consistent with LLL pneumonia. BP - 132/74, HR - 88, R - 20, Temp - 98.4, O_2 Sat - 96%. Pt. had been recently released from an outside hospital for an apparent drug overdose.

History: *Onset of disease:* Transferred to Mirror Lake Medical Center four days ago after falling at home. She had recently been discharged from outside hospital due to an apparent drug overdose. Pt. presented with RLL pain and weakness subsequently r/t injuries from her fall. The patient was found to have abrasions over RLE and appearance of ecchymosis, particularly over the dorsal aspect of right foot and toes, consistent with bruising. The patient also complained of pain in this area. Subsequently found to have an ischemic right leg, which required below-the-knee amputation.
Medical history: Atrial fibrillation, T2DM, HTN, substance abuse, hyperlipidemia, schizophrenia, bipolar disorder
Surgical history: unknown
Medications at home: see patient database
Tobacco use: yes 1ppd, quit 2 mos ago
Alcohol use: Hx of EtOH abuse
Family history: unknown

Demographics: *Marital status*: single
Years education: 16+
Language: English only
Occupation: not working at present
Hours of work: NA
Household members: married
Ethnicity: Caucasian

Current History/Physical:

Vital signs: Temp: 99.7 Pulse: 88 Resp rate: 20
BP: 132/74 Height: 154.9 cm Weight: 85.6 kg
Heart: Regular rate and rhythm, heart sounds normal
HEENT: Head: WNL
Eyes: PEERLA
Ears: clear
Nose: dry mucous membranes
Throat: dry mucous membranes
Genitalia: Deferred
Neurologic: Oriented to place and time
Extremities: s/p R BKA
Skin: Warm and dry
Chest/lungs: Breath sounds are diminished LLL
Peripheral vascular: Diminished pulses right
Abdomen: Bowel sounds x4 – G tube in place

Nursing Assessment:	
Abdominal appearance (concave, flat, rounded, obese, distended)	Obese, distended
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	Light brown
Stool consistency	Soft.
Tubes/ostomies	G tube in place
Genitourinary	
Urinary continence	Foley catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	CLM, DI
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC,A
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15-16 = low risk, 13-14 = moderate risk, ≤12 = high risk)	14

Current Orders: Shirley L. Johnson

MEDICATIONS	Atorvastatin (Lipitor) 20. mg PEG tube Q AM Centrum 1. Tablet PEG tube QAM Ciprofloxacin 750. mg PEG tube Q 12 H, Hold tube feeding 2 hours prior and 1 hour after administrati Ferrous Sulfate 220. mg PEG tube BID Insulin Sliding Scale Humulin R Sub Q Q6H 0-60 initiate hypoglycemia protocol 61-180 0 units 181-250 2 units 251-300 4 units 301-350 6 units 351-400 8 units Greater than 400, give 10 units and notify MD on cal 1200_____ Insulin Glargine (Lantus) 15 units Sub Q @ HS Lorazepam sliding scale IVP/PO/NG Q1H CIWA score: 8 – 14 1 mg 15 - 20 2 mg 21 – 30 3 mg 31 – 45 4 mg and notify H.O. Hold for respiratory rate < 8 or if unable to awaken pt. to light touch and normal voice. Quetiapine 200. mg PEG tube Q HS Warfarin 5. mg per tube Q evening ==========Unscheduled Pharmacy Orders======== Acetaminophen 325. mg Oral PRN Q4H PRN reason: Pain (mild-moderate) May administer 325-650 mg for pain Diphenhydramine 25. mg Oral PRN QHS For sleep Hydromorphone 1. mg SQ PRN Q3H PRN reason: Pain (moderate-severe)
VASCULAR ACCESS	maintain peripheral saline well
IV THERAPY	
NURSING	Falls prevention: Falls prevention safety checks Q1H Initiate basic fall prevention safety measures. Place yellow f risk band and FPP tag outside room . RN to determine if pt. toilet unattended. Conduct safety checks at least Q 1hr include FPP with hand-off; provide pt./ family education Teaching / Education: Warfarin Teaching - Unit nurse to review Warfarin therapy with client and family before

	discharge; Use approved educational material for warfarin teaching.
CONSULTS	PT to evaluate/treat Nutrition consult
DIAGNOSTIC TESTS/ PROCEDURES	Chest AP portable once
LABS	CBC, DIFF, PLATELET QAM LAB CHEM 7, CA, MG, PO4 QAM PT, INR, PTT QAM LAB GLYCOSYLATED HEMOGLOBIN X 1 IgG, FIBRINOGEN, ANTITHROMBIN III x1
BEDSIDE TESTING	ACCUCHECK Q6H IF ANY BLOOD GLUCOSE IS GREATER THAN 300 MG/DL, THEN REPEAT ACCUCHECK IN 2 HOURS. IF BLOOD GLUCOSE WAS GREATER THAN 300 MG/DL SECOND BLOOD GLUCOSE IS GREATER THAN 200 MG/DL, THEN NOTIFY HOUSE OFFICER.
ACTIVITY	POSITION TURN/REPOSITION EVERY 2 HR UP TO CHAIR TID HOB AT LEAST 30 DEGREES FOR TUBE FEEDING
NUTRITION	
ENTERAL FEEDINGS	Feeding Tube type: Gastric tube Interval: Continuous Start rate: 10 mL/hr Advance by 10 mL/hr every 12 hours Goal rate: 55 mL/hr Free water flush: 100 mL 4 times per day Product: Pivot 1.2 (1200 calories / Liter)
OUTPUTS	I and O Q 8H
TUBES/DRAINAGE DEVICES	Foley Cath: tube care per protocol Gravity drain
TREATMENTS	
INCISION/WOUND CARE	Wound care R BKA stump: Surgery will do dressings. Notify surgeon if dressing becomes saturated.
O2 THERAPY	
RT MEDS	Albuterol 0.083% inhaler PRN
RT THERAPY	Incentive spirometer Q 1H WA

Intake/Output

Date		11/21 0701 – 11/22 0700			
Time		0701-1500	1501-2300	2301-0700	Daily total
IN	P.O.	0	0	0	0
	I.V. (mL/kg/hr)				
	I.V. piggyback				
	EN	250	260	385	830
	Water flush	100	200	100	400
	Total intake (mL/kg)	350 (4.08)	460 (5.37)	485 (5.66)	1295 (15.1)
OUT	Urine (mL/kg/hr)	325 (0.47)	480 (0.70)	490 (0.71)	1295 (0.63)
	Emesis output				
	Other				
	Stool				
	Total output (mL/kg)	325 (3.79)	480 (5.06)	490 (5.72)	1295 (15.1)
Net I/O		+25	-20	-5	0

MD Progress Note
11/22 0840
Subjective: Shirley Johnson is a 57 y.o. white female s/p R BKA on the orthopedic service. HX: EtOH and benzodiazepine abuse; HTN, afib, bipolar disorder and schizophrenia. Developed LLL pneumonia, treated with Cipro 750 mg BID
Vitals: Temp: 98.4 Pulse: 88 Resp rate: 20 BP: 132/74
Physical Exam:
General: alert and oriented x 3; tolerating PT at this time
HEENT: WNL
Neck: WNL
Heart: atrial fibrillation
Lungs: LLL diminished– CXR consistent with LLL pneumonia
Abdomen: gastrostomy tube in place
Assessment/Plan:
DX: s/p BKA; LLL pneumonia treated with Cipro; atrial fibrillation
Plan: On warfarin for afib; continue PT; NPO and continue current enteral feeding……..……MD

Laboratory Results

	Ref. Range	
Chemistry		
Sodium (mEq/L)	136-145	137
Potassium (mEq/L)	3.5-5.5	3.6
Chloride (mEq/L)	95-105	96
Carbon dioxide (CO_2, mEq/L)	23-30	24
BUN (mg/dL)	8-18	21 !↑
Creatinine serum (mg/dL)	0.6-1.2	1.8 !↑
BUN/Crea ratio		11.6
Uric acid (mg/dL)	2.8-8.8 F 4.0-9.0 M	3.2
Est GFR, non-Afr Amer	---	
Est GFR, Afr-Amer	---	
Glucose (mg/dL)	70-110	214 !↑
Phosphate, inorganic (mg/dL)	2.3-4.7	2.3
Magnesium (mg/dL)	1.8-3	1.8
Calcium (mg/dL)	9-11	9.1
Anion gap	---	
Osmolality (mmol/kg/H_2O)	285-295	293.4
Bilirubin total (mg/dL)	≤ 1.5	1.2
Bilirubin, direct (mg/dL)	< 0.3	0.1
Protein, total (g/dL)	6-8	5.9 !↓
Albumin (g/dL)	3.5-5	2.6 !↓
Prealbumin (mg/dL)	16-35	12 !↓
Ammonia (NH_3, µmol/L)	9-33	11
Alkaline phosphatase (U/L)	30-120	119
ALT (U/L)	4-36	6
AST (U/L)	0-35	21
CPK (U/L)	30-135 F 55-170 M	121
Lactate dehydrogenase (U/L)	208-378	215
CRP (mg/dL)	< 1	95 !↑
Cholesterol (mg/dL)	120-199	189
HDL-C (mg/dL)	> 55 F, > 45 M	41 !↓
VLDL (mg/dL)	7-32	49
LDL (mg/dL)	< 130	99
LDL/HDL ratio	< 3.22 F < 3.55 M	2.41
Triglycerides (mg/dL)	35-135 F 40-160 M	245 !↑
HbA_{1C} (%)	3.9-5.2	7.9 !↑

	Ref. Range	
Coagulation (Coag)		
PT (sec)	12.4-14.4	12.5
INR	0.9-1.1	0.95
PTT (sec)	24-34	25
Hematology		
WBC ($\times 10^3/mm^3$)	4.8-11.8	12.3 !↑
RBC ($\times 10^6/mm^3$)	4.2-5.4 F 4.5-6.2 M	3.9 !↓
Hemoglobin (Hgb, g/dL)	12-15 F 14-17 M	10.5 !↓
Hematocrit (Hct, %)	37-47 F 40-54 M	35 !↓
Mean cell volume (μm^3)	80-96	72 !↓
Mean cell Hgb (pg)	26-32	25 !↓
Mean cell Hgb content (g/dL)	31.5-36	29.2 !↓
RBC distribution (%)	11.6-16.5	17.1 !↑
Platelet count ($\times 10^3/mm^3$)	140-440	219
Transferrin (mg/dL)	250-380 F 215-365 M	410 !↑
Ferritin (mg/mL)	20-120 F 20-300 M	15 !↓
Vitamin B_{12} (ng/dL)	24.4-100	25.5
Folate (ng/dL)	5-25	5.2
Hematology, Manual Diff		
Neutrophil (%)	50-70	61
Lymphocyte (%)	15-45	67.6 !↑
Monocyte (%)	3-10	6.1
Eosinophil (%)	0-6	2.4
Basophil (%)	0-2	1.2
Urinalysis		
Collection method	---	
Color	---	yellow
Appearance	---	cloudy
Specific gravity	1.003-1.030	1.019
pH	5-7	5.5
Protein (mg/dL)	Neg	+
Glucose (mg/dL)	Neg	+
Ketones	Neg	+
Blood	Neg	Neg
Bilirubin	Neg	neg
Nitrites	Neg	neg
Urobilinogen (EU/dL)	< 1.1	0.3

	Ref. Range	
Leukocyte esterase	Neg	neg
Prot chk	Neg	+
WBCs (/HPF)	0-5	1.1
RBCs (/HPF)	0-5	0
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Appendix C: Case Study 3 – Jill Shuman

Jill Shuman: Interprofessional Case
Overview of case: Jill Shuman is a 53-year-old white female admitted to Mirror Lake Medical Center four days ago after being found lying unresponsive on hardwood floor at her home by a sister. Pt. presented with RLL pain and weakness subsequently r/t injuries from her fall. The patient was found to have abrasions over RLE and appearance of ecchymosis, particularly over the dorsal aspect of right foot and toes, consistent with bruising. The patient also complained of pain in this area. Subsequently found to have an ischemic right leg, which required above-the-knee amputation. On Warfarin for afib. CXR consistent with LLL pneumonia. BP - 132/74, HR - 88, R - 20, Temp- 99.7, O_2 Sat - 96%. Pt. had been recently released from an outside hospital for an apparent drug overdose. A G tube was placed while at outside hospital due to historical poor intake and malnutrition.

History: *Onset of disease:* Transferred to Mirror Lake Medical Center four days ago after falling at home. She had recently been discharged from outside hospital due to an apparent drug overdose. Pt. presented with RLE pain and weakness subsequently r/t injuries from her fall. The patient was found to have abrasions over RLE and appearance of ecchymosis, particularly over the dorsal aspect of right foot and toes, consistent with bruising. The patient also complained of pain in this area. Subsequently found to have an ischemic right leg, which required below-the-knee amputation.

Medical history: Atrial fibrillation, T2DM, HTN, substance abuse, hyperlipidemia, schizophrenia, bipolar disorder
Surgical history: unknown
Medications at home: None
Tobacco use: None
Alcohol use: Hx of EtOH abuse
Family history: unknown

Demographics: *Marital status*: divorced
Years education: 16+
Language: English only
Occupation: not working at present
Hours of work: NA
Health Insurance: none
Household members: Single

Ethnicity: Caucasian

Current History/Physical:

Vital signs: Temp: 99.7 Pulse: 88 Resp rate: 20
BP: 132/74 Height: 154.9 cm Weight: 85.6 kg
Heart: Regular rate and rhythm, heart sounds normal
HEENT: Head: WNL
Eyes: PEERLA
Ears: clear
Nose: dry mucous membranes
Throat: dry mucous membranes
Genitalia: Deferred
Neurologic: Oriented to place and time
Extremities: s/p R AKA
Skin: Warm and dry
Chest/lungs: Respirations are diminished LLL
Peripheral vascular: Diminished pulses left
Abdomen: Bowel sounds x4 – G tube in place.

Nursing Assessment:	
Abdominal appearance (concave, flat, rounded, obese, distended)	distended
Palpation of abdomen (soft, rigid, firm, masses, tense)	soft
Bowel function (continent, incontinent, flatulence, no stool)	continent
Bowel sounds (P=present, AB=absent, hypo, hyper)	
RUQ	P
LUQ	P
RLQ	P
LLQ	P
Stool color	Light brown
Stool consistency	Soft
Tubes/ostomies	G tube in place
Genitourinary	
Urinary continence	Foley catheter
Urine source	catheter
Appearance (clear, cloudy, yellow, amber, fluorescent, hematuria, orange, blue, tea)	Clear, amber
Integumentary	
Skin color	pale
Skin temperature (DI=diaphoretic, W=warm, dry, CL=cool, CLM=clammy, CD+=cold, M=moist, H=hot)	CLM, DI
Skin turgor (good, fair, poor, TENT=tenting)	fair
Skin condition (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	EC,A
Mucous membranes (intact, EC=ecchymosis, A=abrasions, P=petechiae, R=rash, W=weeping, S=sloughing, D=dryness, EX=excoriated, T=tears, SE=subcutaneous emphysema, B=blisters, V=vesicles, N=necrosis)	intact, D
Other components of Braden score: special bed, sensory pressure, moisture, activity, friction/shear (>18 = no risk, 15-16 = low risk, 13-14 = moderate risk, ≤12 = high risk)	14

Current Orders : Shirley L. Johnson

MEDICATIONS	Atorvastatin (Lipitor) 20. mg PEG tube Q AM Centrum 1. tablet PEG tube QAM Ciprofloxacin 750. mg PEG tube Q 12 H, Hold tube feeding 2 hours prior and 1 hour after administration Ferrous Sulfate 220. mg PEG tube BID Insulin Sliding Scale Humulin R Sub Q Q6H 0-60 initiate hypoglycemia protocol 61-180 0 units 181-250 2 units 251-300 4 units 301-350 6 units 351-400 8 units Greater than 400, give 10 units and notify MD on call 1200_____ Insulin Glargine (Lantus) 15 units Sub Q @ HS Lorazepam sliding scale IVP/PO/NG Q1H CIWA score: 8 – 14 1 mg 15 - 20 2 mg 21 – 30 3 mg 31 – 45 4 mg and notify H.O. Hold for respiratory rate < 8 or if unable to awaken pt to light touch and normal voice. Quetiapine 200. mg PEG tube Q HS Warfarin 5. mg per tube Q evening Glucerna per G tube 20mL/hr continuous-advance to goal rate of 75 mL/hr ----------END OF ORDERS---------- ==========Unscheduled Pharmacy Orders========== Acetaminophen 650 mg Oral PRN Q4H PRN reason: Pain (mild-moderate) May administer 650 mg for pain Diphenhydramine 25. mg Oral PRN QHS For sleep Hydromorphone 1. mg SQ PRN Q3H PRN reason: Pain (moderate-severe)
VASCULAR ACCESS	Maintain peripheral saline well
IV THERAPY	
NURSING	Falls prevention: Falls prevention safety checks Q1H, initiate basic fall prevention safety measures, place yellow fall risk band and FPP tag outside room, RN to determine if pt can toilet unattended, conduct safety checks at least Q 1hr /

	include FPP with hand-off; provide pt/ family education. Teaching / Education: Warfarin Teaching - Unit nurse to reviev Warfarin therapy with client and family before discharge; Use approved educational material for warfarin teaching
CONSULTS	OT/PT to evaluate/treat Nutrition consult
DIAGNOSTIC TESTS/ PROCEDURES	Chest AP portable once
LABS	CBC, DIFF, PLATELET QAM LAB CHEM 7, CA, MG, PO4 QAM PT, INR, PTT QAM LAB GLYCOSYLATED HEMOGLOBIN X 1 IgG, FIBRINOGEN, ANTITHROMBIN III
BEDSIDE TESTING	ACCUCHECK Q6H IF ANY BLOOD GLUCOSE IS GREATER THAN 300 MG/DL, THEN REPEAT ACCUCHECK IN 2 HOURS. IF THE INITIAL BLOOD GLUCOSE WAS GREATER THAN 300 MG/DL AND IF SECOND BLOOD GLUCOSE IS GREATER THAN 200 MG.DL, THEN NOTIFY HOUSE OFFICER
ACTIVITY	POSITION TURN/REPOSITION EVERY 2 HR UP TO CHAIR TIB HOB AT LEAST 30 DEGREES FOR TUBE FEEDING
NUTRITION	
ENTERAL FEEDINGS	Feeding Tube type: Gastric tube Interval: Continuous Start rate: 20 mL/hr Advance by 25 mL/hr every 8 hours Goal rate: 75 mL/hr Free water flush: 100 mL 4 times per day Product: Glucerna 1.2 (1200 kcal/L)
OUTPUTS	I and O Q 8H
TUBES/DRAINAGE DEVICES	Foley Cath: tube care per protocol Gravity drain
TREATMENTS	
INCISION/WOUND CARE	Wound care R AKA stump: Surgery will do dressings. Notify surgeon if dressing becomes saturated.
O2 THERAPY	
RT MEDS	Albuterol 0.083% inhaler PRN.
RT THERAPY	Incentive spirometer Q 1H WA

Intake/Output

Date		**Day 4**			
Time		0701-1500	1501-2300	2301-0700	Daily total
IN	P.O.	0	0	0	0
	I.V. (mL/kg/hr)				
	I.V. piggyback				
	EN	250	260	385	830
	Water flush	100	200	100	400
	Total intake	350	460	485	1295
OUT	Urine	325	480	490	1295
	(mL/kg/hr)	(0.47)	(0.70)	(0.71)	(0.63)
	Emesis output				
	Other				
	Stool		**1**		
	Total output	325	480	490	1295
	(mL/kg)	(3.79)	(5.06)	(5.72)	(15.1)
Net I/O		+25	-20	-5	0

MD Progress Note

Day 4 post-op note:

Subjective: Jill Shuman is a 53 y.o. white female s/p R AKA on the orthopedic service.
HX: EtOH and benzodiazepine abuse; HTN, afib, bipolar disorder and schizophrenia.
Developed LLL pneumonia, treated with Cipro 750 mg BID
Vitals: Temp: 98.4 Pulse: 88 Resp rate: 20 BP: 132/74
Urine Output: adequate
Physical Exam:
General: alert and oriented x 3; tolerating PT at this time
HEENT: WNL
Neck: WNL
Heart: atrial fibrillation
Lungs: diminished LLL– CXR consistent with LLL pneumonia
Abdomen: gastrostomy tube in place
Assessment/Plan:
DX: s/p BKA – now with possible infection; LLL pneumonia treated with Cipro; atrial fibrillation
Plan: Continue warfarin for afib; continue PT; currently on enteral feeding and encourage PO intake ……MD

Physical Therapy Evaluation **Date: "yesterday" MR:22222**

Examination

History:

Pt. is a 53 y/o Caucasian female s/p R AKA due to ischemic event to RLE after a fall at home.

Admitting diagnosis: Ischemic R LE resulting in R AKA 4 days ago; malnutrition s/p G-tube placement; developed LLL pneumonia after admission.

PMH: Per chart - Recently treated and released for apparent drug overdose. History: + EtOH and benzodiazepine abuse; HTN, afib, bipolar disorder and schizophrenia; T2DM, hyperlipidemia

PSH: Per chart – unknown

Precautions: Fall risk

Social History/Environmental factors: Per chart and pt. report – Pt. is unemployed, single, lives alone. She has a sister that lives in the immediate area but she is unavailable to provide consistent assistance due to work constraints. Pt. lives in a one-story ranch house with 2 steps to enter from garage. PTA pt. was I in all ADL's and mobility requiring no assistive device for ambulation.

Systems Review/Tests and Measures:

Vitals at rest: BP 136/78, RR 22, Pulse 89 O2 sat 90% on room air.

Mental Status: AxO x3; reluctantly cooperative requiring encouragement for all activities; able to follow 2 and 3 step commands consistently

Vision: no gross deficits noted

Hearing: no gross deficits noted

Speech: no gross deficits noted

Pain: 8/10 at rest in R residual limb; pt. moans continually throughout examination; pt. c/o "pins and needles" sensation, "I can still feel my leg"

Safety Awareness/Judgment: Pt. is very cautious and protective at times with R residual limb however exhibits poor judgment in current ability to perform transfers and ambulation safely according to nursing attempting to get up to a chair without assistance.

ROM: Grossly assessed in supine – AROM B UE's WFL's; L LE WFL; R residual limb WFL except hip ext lacking 10 ◦ from neutral. Pt. demonstrates guarding posture with all movement on R residual limb.

Strength: Grossly assessed in supine B UE's – 4-/5; LE's – L 4-/5, R LE 3/5 (pt. did not allow testing with resistance due to pain) Noted marked muscle wasting in all extremities**.**

Sensation/Tone: Grossly intact for LT and proprioception B UE/LE's; Tone: WFL

Skin Integrity: Intact/dry surgical drsg to R residual limb (surgeon to do 1st drsg change) unable to assess wound at this time.

Edema: moderate swelling on R residual limb no pitting edema, +2 inch increase in mid-thigh circumference on R compared to L.

Bed Mobility: rolling to left mod assist x 1 with support of R LE, pt. would not attempt to roll to R secondary to pain, able to scoot up in bed with min assist x1 using bilateral bed rails and L LE requiring support of R LE

Transfers: mod assist x1 supine to sit, mod assist x1 to scoot to EOB, sit to stand mod assist x1 with verbal cuing for R LE to be vertical; max assist x1 for stand pivot to recliner chair.
Balance: Maintains static sitting balance at EOB with min assist using B UE support; dynamic sitting balance – requires mod assist and UE support to weight shift to R (pt. tends to resist this movement), able to weight shift to L with CGA and UE support. Required max assist to maintain balance when lifting B UE's from support surface; Standing balance with standard walker – static mod assist x1; dynamic standing balance with standard walker NT secondary pt. fear of falling.
Posture: Sitting – keeps weight shifted to L; Standing- demonstrates guarding with R LE - pt. tends to hold R LE in a flexed position at both the hip and knee when in standing, with a marked forward head and rounded shoulder posture that improves with verbal cuing
Ambulation: Pt. unable to weight shift and take steps using a SW.
Endurance: NT

Evaluation
Prognosis: Rehab potential is fair. Pt. is a 53 y/o deconditioned female s/p R AKA with multiple co-morbidities that have adversely affected her strength, balance, posture, transfers, gait, and cardiovascular systems. Pt. has limited family support to assist with pt. education and transition to home. Pt. will need assistance with bed mobility, transfers, and ambulation secondary to poor safety awareness and insight into level of deficits creating a high risk for falls. Currently poor pain control is impeding pt's ability to focus on mobility tasks. Additional testing is needed to assess the pt's level of endurance, dynamic standing balance, and ambulation skills.

PT diagnosis: PT Guide pattern 4J Impaired Motor Function, Muscle Performance, Range of Motion, Gait, Locomotion, and Balance Associated with Amputation.

Goals for Discharge:
1. Pt. will transfer to and from recliner using SW with min assist x1 within 1 week.
2. Pt. will be able to stand with SW and reach for an item w/o LOB within 1 week.
3. Pt. will walk 10 feet using a SW with mod assist for balance to stand at the sink within 2 weeks.
4. Pt. will maintain static sitting balance at EOB with 1 hand UE support for 2 min. within 1 week.
5. Pt. will independently demonstrate ability to use alternative pain control techniques as needed within 1 week.
6. Pt. will maintain R LE in a vertical position while standing at the sink within 1 week.
7. Pt. and family will independently demonstrate residual limb wrapping within 2 weeks to maintain shape for fitting with prosthesis.

Plan of Care:
Pt. will be seen 4-5x/wk until d/c. Interventions to include desensitivity training for R residual limb and deep breathing exercises to assist with pain control with a plan to discuss pain medication options for pain control with nursing and pharmacy; ROM and strengthening exercises for all extremities to improve posture, balance, transfers, and gait. Recommendations include elevated drop arm BS commode, gait belt and SW at BS with posted instructions for up with supervision and assistance only. Recommend d/c to SNF to continue improvement with mobility, transfers, and gait to achieve an acceptable level of safety awareness and judgment to allow pt. to return to home.

Occupational Therapy Evaluation Date "yesterday"
Examination
History:
Jill M. Shuman is a 53 year old Caucasian divorced female.
Admitted 4 days ago after being found lying unresponsive on hardwood floor at her home by her sister. She was admitted with ischemic R LE resulting in R AKA; malnutrition s/p G-tube placement; developed LLL pneumonia after admission. Potential fall risk Per chart - Recently treated and released for apparent drug overdose. History: + EtOH and benzodiazepine abuse; HTN, afib, bipolar disorder and schizophrenia; T2DM, hyperlipidemia. Per chart and pt. report – Pt. is unemployed, divorced, and lives alone. She has a sister that lives in the immediate area but she is unavailable to provide consistent assistance due to work constraints. She also has one grown daughter. Pt. lives in a one story ranch house with 2 steps to enter from garage. PTA, pt. was I in all ADL's and mobility.
Vitals at rest: BP 136/78, RR 22, Pulse 89 O2 sat 90% on room air.
Mental Functions: Global and Specific
Consciousness and orientation: AxO x3
Temperament and personality functions: emotional stability and impulse control to be evaluated; reluctantly cooperative requiring encouragement for all activities
Attention: able to sustain attention for 2-3 minutes during activity
Memory: no gross deficits noted; able to follow 2 and 3 step commands consistently
Perceptual: no gross deficits noted
Higher-level cognitive functions: Pt. is very cautious and protective at times with R residual limb but exhibits poor judgment in current ability to perform transfers and ADL activities safely according to nursing attempting to get up to a chair without assistance.
Sequencing: unimpaired in ADL tasks
Sensory Function and Pain
No gross deficits noted in visual, hearing, vestibular, taste, smell, proprioceptive or touch functions in B UE/LE's
Pain: 8/10 at rest in R residual limb; pt. moans continually throughout examination; pt. c/o "pins and needles" sensation in absent limb, and states "I can still feel my leg". She often rubs the residual limb

Neuromusculoskeletal Functions
ROM: Grossly assessed in supine – AROM B UE's WFL's; L LE WFL; R residual limb WFL except hip extension lacks 10 ◦ from neutral. Pt. demonstrates guarding posture with all movement on R residual limb.
Strength**:** Grossly assessed in supine B UE's – 4-/5; LE's – L 4-/5, R LE 3/5 observed mvn't against gravity(pt. did not allow testing with resistance due to pain). Noted marked muscle wasting in all extremities**.**
Tone: Tone: WFL
Edema**:** Moderate swelling on R residual limb no pitting edema, +2 inch increase in mid-thigh circumference on R compared to L.
Balance**:** Maintains static sitting balance at EOB with min assist using B UE support (for how long) ; dynamic sitting balance – requires mod assist and UE support to weight shift to R (pt. tends to resist this movement), able to weight shift to L with CGA and UE support. Required max assist to maintain balance when lifting B UE's from support surface; Standing balance with standard walker – static mod assist x1; dynamic standing balance with standard walker NT secondary pt. fear of falling.
Posture**:** Sitting – keeps weight shifted to L; Standing- demonstrates guarding with R LE - pt. tends to hold R LE in a flexed position at both the hip and knee when in standing, with a marked forward head and rounded shoulder posture that improves with verbal cuing
Endurance**:** NT Tolerated 40 evaluation
ADL Status
Bed Mobility**:** rolling to left mod assist x 1 with support of R LE, pt. would not attempt to roll to R secondary to pain, able to scoot up in bed with min assist x1 using bilateral bed rails and L LE requiring support of R LE
Transfers**:** mod assist x1 supine to sit, mod assist x1 to scoot to EOB, sit to stand mod assist x1 with verbal cuing for R LE to be vertical; max assist x1 for stand pivot to recliner chair.
Personal hygiene and grooming: Independent with grooming hair, nails, brushing teeth in supported sitting with set-up.
Bathing: dependent in bed bath due to mod assist with dynamic sitting balance and max assist when lifting B UEs from support surfaces; unable to transfer to shower chair and dependent in showering. What about a sponge bath laying down or head elevated?
Dressing: Requires min assist with UE dressing due to decreased static and dynamic sitting balance and requires cues to decrease forward head and rounded shoulder posture. Requires mod assist and UE support for LE dressing due to poor dynamic sitting balance.
Eating: Pt. is independent with self feeding (at EOB?) using 1 arm in supported sitting; max assist with cutting foods, opening packages
Toileting: dependent with toilet transfer and clothing management. Pt. reports fear of falling when standing.

Evaluation:
Rehabilitation potential is fair. Due to multiple comorbidities and limited family support, this patient will need assistance with bed mobility, transfers, bathing, eating, dressing and toileting.
Goals: ST 1 week goals

1. Pt. will independently sponge bathe including set-up at the sink in a chair w/o LOB within one week.
2. Pt. will dress her upper body independently while seated after set-up within one week.
3. Pt. will don lower body clothing independently while lying in bed after set-up within one week.
4. Pt. will completing pericare on the toilet with min assist to maintain balance with no evidence of LOB within one week

Goals: LT at the time of discharge

1. Patient will don/ doff upper and lower body clothing seated in a chair independently and safely.
2. Pt. will require min assist with donning/doffing residual limb sock/stocking.
3. Patient will be independent with completing pericare safely and thoroughly while maintaining balance on the toilet.
4. Pt. will require min assist with set up and adapted equipment (shower chair, handheld shower) with showering

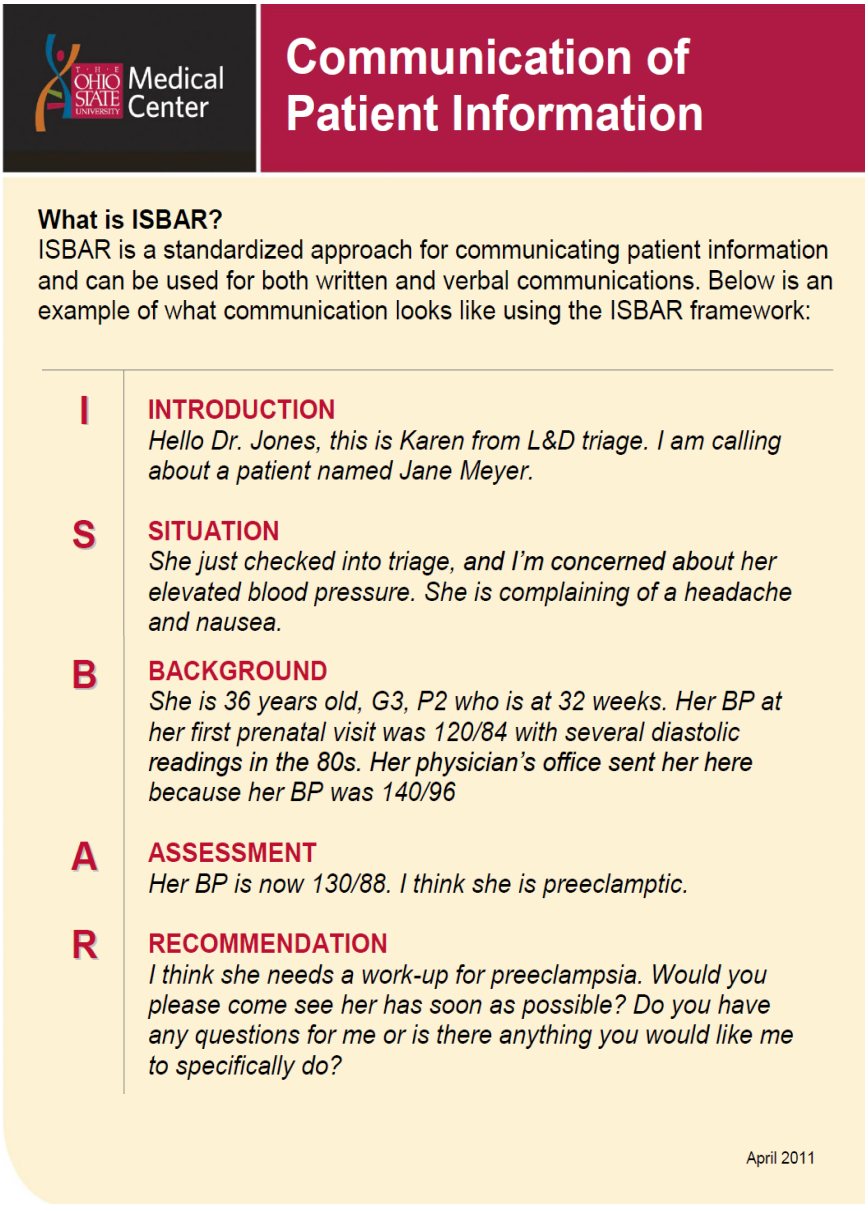
Laboratory Results

	Ref. Range	
Chemistry		
Sodium (mEq/L)	136-145	137
Potassium (mEq/L)	3.5-5.5	3.6
Chloride (mEq/L)	95-105	96
Carbon dioxide (CO_2, mEq/L)	23-30	24
BUN (mg/dL)	8-18	21 !↑
Creatinine serum (mg/dL)	0.6-1.2	1.8 !↑
BUN/Crea ratio		11.6
Uric acid (mg/dL)	2.8-8.8 F 4.0-9.0 M	3.2
Est GFR, non-Afr Amer	---	
Est GFR, Afr-Amer	---	
Glucose (mg/dL)	70-110	214 !↑
Phosphate, inorganic (mg/dL)	2.3-4.7	2.3
Magnesium (mg/dL)	1.8-3	1.8
Calcium (mg/dL)	9-11	9.1
Anion gap	---	
Osmolality (mmol/kg/H_2O)	285-295	293.4
Bilirubin total (mg/dL)	≤ 1.5	1.2
Bilirubin, direct (mg/dL)	< 0.3	0.1
Protein, total (g/dL)	6-8	5.9 !↓
Albumin (g/dL)	3.5-5	2.6 !↓
Prealbumin (mg/dL)	16-35	12 !↓
Ammonia (NH_3, μmol/L)	9-33	11
Alkaline phosphatase (U/L)	30-120	119
ALT (U/L)	4-36	6
AST (U/L)	0-35	21
CPK (U/L)	30-135 F 55-170 M	121
CRP (mg/L)	<10 mg/L	135 !↑
Lactate dehydrogenase (U/L)	208-378	215
Cholesterol (mg/dL)	120-199	189
HDL-C (mg/dL)	> 55 F, > 45 M	41 !↓
VLDL (mg/dL)	7-32	49
LDL (mg/dL)	< 130	99
LDL/HDL ratio	< 3.22 F < 3.55 M	2.41

	Ref. Range	
Triglycerides (mg/dL)	35-135 F 40-160 M	245 !↑
HbA_{1C} (%)	3.9-5.2	7.9 !↑
Coagulation (Coag)		
PT (sec)	12.4-14.4	12.5
INR	0.9-1.1	0.95
PTT (sec)	24-34	25
Hematology		
WBC ($\times 10^3/mm^3$)	4.8-11.8	12.3 !↑
RBC ($\times 10^6/mm^3$)	4.2-5.4 F 4.5-6.2 M	3.9 !↓
Hemoglobin (Hgb, g/dL)	12-15 F 14-17 M	10.5 !↓
Hematocrit (Hct, %)	37-47 F 40-54 M	35 !↓
Mean cell volume (μm^3)	80-96	72 !↓
Mean cell Hgb (pg)	26-32	25 !↓
Mean cell Hgb content (g/dL)	31.5-36	29.2 !↓
RBC distribution (%)	11.6-16.5	17.1 !↑
Platelet count ($\times 10^3/mm^3$)	140-440	219
Transferrin (mg/dL)	250-380 F 215-365 M	410 !↑
Ferritin (mg/mL)	20-120 F 20-300 M	15 !↓
Vitamin B_{12} (ng/dL)	24.4-100	25.5
Folate (ng/dL)	5-25	5.2
Hematology, Manual Diff		
Neutrophil (%)	50-70	61
Lymphocyte (%)	15-45	67.6 !↑
Monocyte (%)	3-10	6.1
Eosinophil (%)	0-6	2.4
Basophil (%)	0-2	1.2
Urinalysis		
Collection method	---	
Color	---	yellow
Appearance	---	cloudy
Specific gravity	1.003-1.030	1.019
pH	5-7	5.5
Protein (mg/dL)	Neg	+
Glucose (mg/dL)	Neg	+

	Ref. Range	
Ketones	Neg	+
Blood	Neg	Neg
Bilirubin	Neg	neg
Nitrites	Neg	neg
Urobilinogen (EU/dL)	< 1.1	0.3
Leukocyte esterase	Neg	neg
Prot chk	Neg	+
WBCs (/HPF)	0-5	1.1
RBCs (/HPF)	0-5	0
Bact	0	0
Mucus	0	0
Crys	0	0
Casts (/LPF)	0	0
Yeast	0	0

Appendix D: ISBAR Tool



Appendix E: Non-Validated Autumn 2012/Spring 2013 Questionnaire

The questionnaire given to the students before and after the simulation experience was based on a fully anchored 5-point Likert scale ranging from "strongly agree" to "strongly disagree." The questionnaire reads as follows:

Please indicate your opinion regarding the following statements:

1. Communication between professional members of the health care team is important.
2. It is important to understand other health care team members' roles.
3. I enjoy working in teams.
4. Team decision-making is important to better patient care.
5. Working in interprofessional teams while in school helps prepare me for the real world.
6. I learn more about my own role when I work with other professions.
7. I understand my own role in patient care.
8. I understand the basics of nursing care.
9. I understand the basics of pharmacy care.
10. I understand the basics of physical therapy care.
11. I understand the basics of respiratory therapy care.
12. I have confidence in caring for a patient on a ventilator.
13. I learn more when I teach the material to other team members.

Appendix F: Modified RIPLS Autumn 2013 Questionnaire

Please enter your perception of **how well you understand the role** of the profession listed below. A 10 represents that you understand the role well, 1 representing not at all. Please **circle** your current opinion.

Understand it well					**Undecided**				**Not at all**
Nursing:									
10	9	8	7	6	5	4	3	2	1
Nurse Practitioner:									
10	9	8	7	6	5	4	3	2	1
Medical Dietetics:									
10	9	8	7	6	5	4	3	2	1
Medicine:									
10	9	8	7	6	5	4	3	2	1
Occupational Therapy:									
10	9	8	7	6	5	4	3	2	1
Pharmacy:									
10	9	8	7	6	5	4	3	2	1
Physical Therapy									
10	9	8	7	6	5	4	3	2	1
Respiratory Therapy:									
10	9	8	7	6	5	4	3	2	1
Social Work:									
10	9	8	7	6	5	4	3	2	1

Readiness for Interprofessional Learning Scale (RIPLS)

The purpose of this questionnaire is to examine the attitude of healthcare students towards interprofessional learning.

Have you ever completed the RIPLS before? ____no _____yes (if yes, how long ago? _____)

Please complete the following questionnaire. *Circle* the number that best corresponds with your opinion.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Learning with other students will make me a more effective member of a healthcare team.	5	4	3	2	1
2. Patients would ultimately benefit if health sciences students worked together.	5	4	3	2	1
3. Shared learning with other health sciences students will increase my ability to understand clinical problems.	5	4	3	2	1
4. Communications skills should be learned with other health sciences students.	5	4	3	2	1
5. Teamwork skills are vital for all health sciences students to learn.	5	4	3	2	1
6. Shared learning will help me to understand my own professional limitations.	5	4	3	2	1
7. Learning between health sciences students before graduation would improve working relationships in the clinical environment.	5	4	3	2	1
8. Shared learning will help me think positively about other health care professionals.	5	4	3	2	1
9. For small-group learning to work, students need to respect and trust each other.	5	4	3	2	1
10. I don't want to waste time learning with other health sciences students.	5	4	3	2	1
11. It is not necessary for undergraduate and postgraduate health sciences students to learn together.	5	4	3	2	1
12. Clinical problem solving can only be learned effectively with students from my own program.	5	4	3	2	1
13. Shared learning with other health sciences students will help me to communicate better with patients and other professionals.	5	4	3	2	1
14. I would welcome the opportunity to work on small group projects with other health sciences students.	5	4	3	2	1
15. I would welcome the opportunity to share some generic lectures, tutorials or workshops with other health sciences students.	5	4	3	2	1
16. Shared learning and practice will help me clarify the nature of patients' or clients' problems.	5	4	3	2	1
17. Share learning before and after graduation from my program will help me become a better learner.	5	4	3	2	1
18. I am not sure what my professional role will be.	5	4	3	2	1
19. I have to acquire much more knowledge and skills than other students in my own program.	5	4	3	2	1
20. I feel confident providing care for a ventilated patient.	5	4	3	2	1