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WHAT ARE THE RELATIONSHIPS BETWEEN NURSING STUDENTS' CHARACTERISTICS AND HOW THEY PERCIEVE USING HIGH FIDELITY SIMULATION FOR ATTAINING PEDIATRIC LEARNING OUTCOMES?

BY

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The undersigned certify that they have read the thesis entitled

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Dedication

I would like to dedicate this thesis to my family: the family I was born into and the family that I have created. A lifetime of love and support from my parents, Gail and James Samms, and my sister, Jessica Webster, have allowed me the ability to work hard and reach my goals in life. The help and understanding from my husband, Shannon Hurley, and the love from my children, Shantel and James, have made this thesis possible.

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Abstract

There is growing interest regarding the use of high fidelity simulation within nursing education. Educators are beginning to incorporate this new teaching modality into various clinical courses. One area in particular is pediatrics, which requires nursing students to think outside the context of adult care, thus applying skills and knowledge specific to pediatric practice. A gap in knowledge was identified between the use of high fidelity simulation (HFS) in pediatric nursing education and students' perceptions of its usefulness for acquisition of knowledge and skills in this patient population group. A quantitative study utilizing a non-experimental research design was used to examine the relationships between specific nursing students' characteristics and how they perceive attaining course learning outcomes using pediatric HFS. The study informs educators what relationship exists between nursing students' perceptions of knowledge acquisition and the development of communication and psychomotor skills with the use of HFS in pediatric clinical courses.

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Chapter One: Introduction

Nursing faculty have a responsibility to provide students with beneficial learning experiences in which they can develop the knowledge and skills required to provide competent and safe care for their patients (Lambton, O'Neil & Dudum, 2008). However, nursing faculty today is faced with numerous challenges when providing the clinical experiences necessary for preparing students. One clinical area in particular that has been identified as a challenge is pediatric nursing. With declining in-patient rates and higher patient acuity levels, there is often limited or no opportunities to assign nursing students to pediatric patients (Bultas, 2011). To address this challenge, alternate teaching modalities such as high fidelity simulation (HFS) have been introduced into nursing curriculums.

Pediatric nursing requires nursing students to think outside the context of adult care, thus applying skills and knowledge specific to the pediatric population. With decreased pediatric inpatients, resulting in decreased student opportunities for hands-on clinical learning, HFS offers educators the opportunity to create multiple scenarios in which students can develop skills specific to this population. Research suggests that filling identified gaps in nursing education with the use of HFS learning experiences may allow students to gain critical thinking skills, leadership abilities, increased confidence, increased autonomy and prioritization skills (Baldwin, 2007; Garrett, MacPhee, & Jackson, 2010; Grady et al., 2008; McCaughey & Traynor, 2010; Parsh, 2010).

Purpose of Study

When implementing new teaching methods, research is needed to determine if it is beneficial for nursing students, and more specifically, if students perceive it as useful for meeting their learning outcomes. Thus, the purpose of this research study was to examine the relationship between the use of high fidelity pediatric manikins in simulation learning scenarios and nursing students' perceptions of its usefulness for knowledge acquisition and development of communication and psychomotor skills.

Research Questions

The primary research question was: "What are the relationships between nursing students' characteristics and how they perceive using high fidelity simulation for attaining pediatric learning outcomes?" The secondary research question was: "Is there a relationship between pediatric high fidelity simulation learning experiences and undergraduate nursing students' perceptions of its usefulness for their knowledge acquisition and development of communication and psychomotor skills?"

Definition of Terms

Pediatrics is an area of nursing concerned with the development and care of infants and children, from birth to 17 years. This specific area of nursing requires knowledge of normal psychomotor, psychosocial and cognitive growth and development (Mosby's, 2007).

Psychomotor skills are skills that are performed involving the integration of mental and muscular activities (Taylor, Lillis, LeMone & Lynn, 2011).

Nursing knowledge is knowledge that is warranted as useful and significant to nurses and patients in understanding and facilitating human health (Reed & Lawrence, 2008, 423).

Communication is any process in which a message is transferred to an individual, or individuals, and can be verbal or non-verbal (Mosby's, 2007). Therefore, communication skills are identified as the proficiency in which communication is transferred.

High fidelity simulation manikins are defined as, "full scale integrated simulators within the healthcare context combine life-like, anatomically correct manikins with computer programmes, permitting complex physiological and pharmacological responses such as respiratory and cardiovascular functions" (McCaughey & Traynor, 2010, p.827).

Assumptions

There are six assumptions identified in this study:

1) There are learning outcomes for nursing students when they experience HFS in a teaching-learning experience.
2) Knowledge and skills required for the delivery of nursing care for adult patients differs from pediatric patients.
3) Students who participate in HFS before clinical will have different perceptions than those who participate in HFS after their clinical experience.
4) Students are able to relate the use of pediatric HFS with attaining the learning outcomes in the course.
5) Students will determine attainment of the course learning outcomes based on

their perceptions.

6) Perceptions related to knowledge acquisition and the development of communication and psychomotor skills will vary between nursing students.

Significance of the Study

The research study explored nursing students' perceptions regarding learning outcomes associated with supplementing pediatric learning activities using high fidelity simulation which adds to the existing body of knowledge about the use of HFS as a teaching modality in undergraduate nursing education.

Chapter Two: Literature Review

There have been numerous studies exploring students' satisfaction and outcomes related to using high fidelity simulation (HFS) in nursing education. However, very little research exists regarding the use of HFS in pediatric nursing education. A review of the literature was conducted utilizing the databases: Cumulative Index to Nursing and Allied Health Literature and Scopus Journal Analyzer. Key words used to conduct the literature review included high fidelity simulation, simulation, manikins, mannequins, pediatric, pediatric education, nursing, nursing students, nursing curriculum, learning outcomes, nursing education, communication, knowledge, knowledge acquisition, psychomotor skills and student perceptions.

Following a review of the literature related to the research, major concepts emerged and thus this chapter will examine these: definition of simulation; types of simulators; history of simulation; use of simulation in nursing education; nursing education simulation framework; pediatrics in nursing curriculum; simulation in pediatric education; benefits of HFS; limitations of HFS; knowledge acquisition and simulation; communication and simulation; psychomotor skills and simulation; measuring students' perceptions of the benefits of simulation; and lastly, gaps in the literature.

Definition of Simulation

Simulation can be defined as a model, either educational or technological, of an actual or potential situation that is used to train (Venes, 2009). Simulation can be used to replicate not only the experience but also the environment that the

events or situation actually occur in (Hunt, Nelson & Shilkofski, 2006). Historically, nurse educators have valued learning in which direct application of theoretical knowledge occurs in real-life situations (Nagle, McHale, Alexander & French, 2009). Therefore, nurse educators have embraced simulation as a teaching and learning strategy in nursing programs. With technological advances, it is important that educators are aware of what is available. Within nursing education the main types of simulation used today are task trainers, part-task trainers, high, mid-range, and low fidelity patient simulators, as well as computer-based programs, virtual reality simulators and standardized patients.

Types of Simulators

Part-task trainers are models that are static and typically represent full or part body models that range from low to high technological features (Nagle et al., 2009). Students have a variety of advantages with this type of simulation such as, acquiring technical, procedural and psychomotor skills (Nagle et al., 2009). The student learning activities using these models can vary from venipuncture to suctioning. Learning with this type of simulation equipment can occur from the repetitive training of an isolated task (Nagle et al., 2009).

Patient simulators are life-sized manikins which can be low, medium or high fidelity. Fidelity is used to describe the simulation products that are used, referring mainly to the precision of reproduction of real life (Broussard, Myers & Lemoine, 2009; Kameg, Clochesy, Mitchell & Suresky, 2010). When discussing patient simulators low-fidelity refers to a full size manikin that can be used to introduce and practice skills prior to performing them on real patients (Broussard

et al., 2009). However, these manikins lack realism which is necessary for transfer of learning from lab to real-life situations to easily occur (Broussard et al., 2009). Medium or mid-range fidelity manikins are full scale body manikins that integrate computer technology to support both task training and clinical scenarios (Broussard et al., 2009; Nagle et al., 2009). These simulators are helpful for developing a deeper understanding of specific subject matters that can be complex (Broussard et al., 2009). They have abilities such as heart sounds and bowel sounds but are more limited than a high-fidelity manikin (Broussard et al., 2009; Nagle et al., 2009). High-fidelity manikins are also life-sized manikins but are programmed and computerized (Birkhoff & Donner, 2010; Brewers, 2011). These manikins can respond appropriately to the student's actions, having the ability to elicit observational responses to physical and pharmacological interventions (Broussard et al., 2009; Hunt et al., 2006). Faculty can control these manikins by either changing clinical indicators during the scenario in real time, or by using pre-programmed scenarios that require limited adjustments (Nagle et al., 2009). The manikins have numerous abilities such as vocal sounds, measurable blood pressure, the chest wall can rise, and obstetrical models can give birth (Broussard et al., 2009; Nagle et al., 2009; Rhodes & Curran, 2005).

High fidelity simulation (HFS) uses a computer-based program which displays scenarios on a computer and is used to teach clinical knowledge. These programs can display physiologic waveforms, such as pulse, respirations and oximetry, and allow learners to make decisions, testing their mastery of content (Nagle et al., 2009). They can also provide feedback to learners as they analyze

then respond to variables (Nagle et al., 2009).

Virtual reality simulators are computer devices that create three-dimensional representations of the world, allowing interaction using visual, audio and touch sensations (Krummel, 1998). The simulators can be used to simulate various procedures such as ultrasounds and intravenous catheter insertions. And lastly, standardized patients are trained actors that role-play. These actors are provided with an overview of the patient they are role-playing and can be used to teach assessment, communication and other important skills (Nagle et al., 2009). These actors are trained to reproduce psychological, emotional and physical manifestations while being observed, interviewed and examined by students (Hill, Davidson & Theodoros, 2010).

Simulation is not simply just about a manikin, a CD program or an actor. Simulation involves many facets that educators must recognize and consider for it to be used as an effective teaching method (Seropian, Brown, Gavilanes & Driggers, 2004). Issues such as cost (Bremner, Aduddell, Bennett & VacGeest, 2006; Childs & Sepples, 2006; Lee, Grantham & Boyd, 2008), the time required to use it (Broussard et al., 2009), and faculty acceptance of this teaching method (Bremner et al., 2006; Laster, 2007; Starkweather & Kardong-Edgren, 2008) need to be considered before making changes to nursing curriculum. New faculty have identified an increased anxiety level over using high fidelity manikins and fear that they lack knowledge of how to run scenarios (Akhtar-Danesh, Baxter, Valaitis, Stanyon & Sproul, 2009; Jefferies, 2005). Berkowitz, Peyre and Johnson (2011) identify how important faculty are to the simulation experience due to

faculty serving as content experts, evaluators, and coaches that need effective tools in order to ensure that everyone involved has the best learning experience possible. Simulation can be a useful teaching and learning tool, so educators must keep in mind that the selection of the best simulation strategy depends on the educational objectives (Nagle et al., 2009). Selecting the most appropriate simulation method will help achieve desired outcomes for both educators and students.

Students are just as important to simulation as faculty. Therefore, the topics of discussion and debriefing were identified as being of major importance to any simulated learning activity. Alinier, Hunt, Gordon and Harwood (2006) discussed the importance of debriefing during a post-scenario conference for educators to provide feedback and allow students to have the opportunity to process thoughts, clinical reasoning, and feelings. This is further corroborated by Brandon and All (2010), Childs and Sepples (2006), Haskvitz and Koop (2004), Leigh (2008), Waxman (2010) and Wotton, Davis, Button and Kelton (2010).

History of Simulation

The use of simulation learning as a teaching modality is not a new concept; the use of simulation can be traced back over centuries (Bantz, Dancer, Hodson-Carlton & Van Hove, 2007). The use of higher level simulation in learning first became prominent in the field of aviation in the 1930s (Haskvitz & Koop, 2004; Kaplan & Ura, 2010; Weinberg, Auerback & Shah, 2009). Other fields such as nuclear power and military training took advantage of this innovative learning modality soon after (Haskvitz & Koop, 2004; Weinberg et al.,

2009). The use of simulation within the military has expanded over a long period of time and is now being used to develop warfare reproductions (Bradley, 2006). Within nursing education, simulation has been used for decades in various basic forms, such as role-playing and static mannequins (Beauchesne & Douglas, 2011). However, medical education has only used HFS since the twentieth century with nursing education being the most recent to incorporate this teaching strategy (Kaplan & Ura, 2010).

Since its incorporation into nursing education, nursing research has examined simulation's usefulness in student learning. Growing interest in simulation within nursing education has peaked within the last 5 years and can be attributed to concerns regarding medical errors, patient safety, limited clinical instruction time, increased competition for clinical experiences and decreased in-patient admissions (Kaddoura, 2010; Weinburg et al., 2009). Simulation learning research, through such mediums as virtual communities and high fidelity manikins, support it as a teaching modality (Baldwin, 2007; Eggenberger & Regan, 2010; Kaddoura, 2010; Parsh, 2010).

Use of Simulation in Nursing Education

The majority of students enrolled in nursing programs are young individuals recruited directly from high school (Billings & Kowalski, 2004). It is assumed that nursing students are at a level in their education where they have a knowledge background to build on and a desire to grow. Hence, simulated learning with high fidelity manikins builds on Knowles Theory of the adult learner. Knowles (1990) describes the adult learner as drawing from past

experiences, having identified learning needs, and being self-directed, problem centered and motivated to learn. Therefore, this research builds on the andragogical assumptions of the adult learner.

The majority of post-secondary student learners are from the "net generation". The net generation, also referred to as the millennial generation, have different learning preferences than students of other ages within the program. Net learners have always been digitally connected and expect digital learning environments; for example computers are now seen as tools not technology (Mangold, 2007). These students enjoy working in groups, want realistic work environments, seek immediate responses and can multi-task (Billings & Kowalski, 2004). Simulation supports learner centered education through experimentation and discussion, not through the traditional linear way of learning (Mangold, 2007). Another theoretical approach, the constructivism theory, supports moving learning from teacher-centered to a learner-centered approach (Kala, Isaramalai & Pohthong, 2010; Gergen, 1999). The use of high fidelity manikins supports a learner-centered approach to learning.

Every nursing student within the classroom and laboratory setting receives the same information by the educator. However, every student within the clinical setting does not receive the same experiences. Clinical education depends on multiple circumstances such as patient availability, clinical time, and clinical placements (Alinier et al., 2006; Bantz et al., 2007; Wilson, Shephard & Pitzner, 2005). Therefore, students may experience difficulty with the application of theory to practice, related to the decreased opportunities within their nursing

program to clinical situations in which they can apply their newly learned knowledge and skills (Cant & Cooper, 2009; Morgan, Cleave-Hogg, Desousa & Lam-McCulloch, 2006).

Simulated learning is an experiential type of learning which teaches students to learn in non-linear non-traditional methods. Experiential learning is when students begin to focus on knowing how rather than knowing all (Kala et al., 2010; Morgan et al., 2006). Students develop the skills and abilities to draw on past experiences, self-critique and become self-directed with the ability to synthesize information and link learned concepts (Brandon & All, 2010; Feingold, Calaluce & Kallen, 2004; Morgan et al., 2006). This newer teaching-learning strategy fits into Knowles' (1990) concepts of the adult learner and of the learning needs of the largest nursing student population, the net generation (Billings & Kowalski, 2004; Mangold, 2007; Revell & McCurry, 2010; Richards, 2001). Pauly-O'Neill, Prion and Lambton (2013) reported that their research supports a combination of classroom, simulation and clinical education for nursing students. Learning through simulation can benefit students when they transition from student to novice practicing nurses in high acuity complex care areas and have to experience new situations.

Nursing Education Simulation Framework

Jefferies (2005) developed a framework, the Nursing Education Simulation Framework (NESF), to guide the integration of HFS into nursing curricula. NESF identifies five main components: 1) teacher factors, 2) student factors, 3) educational practices, 4) simulation design characteristics, and 5)

outcomes (Appendix A). The teacher factor looks at the importance of their role and how they act as a facilitator to the learning opportunity, whereas the student factor considers the learner's level, their age and what is expected of the learning opportunity. Therefore, knowing the demographic profile of students is important for understanding this factor and implementing the best experience for the learner. For HFS to be effective, students must be self-directed and motivated towards their learning needs (Jefferies, 2005). Educational practices involve collaboration, feedback, active learning, student/faculty interaction, time on task, and high expectations for successful simulation experiences. Simulation design characteristics include objectives, fidelity, problem solving, student support and debriefing. Jefferies defines outcomes as learning (knowledge), skill performance, learner satisfaction, critical thinking and self-confidence. While most features of the framework serve to shape the simulation activity, the outcomes component serves to simply identify what is obtained (Bultas, 2011).

Three specific learning outcomes were identified in a pediatric HFS learning activity: communication, psychomotor skills, knowledge and self-confidence. The component of this model that is being explored in the current study is the student. Specifically, this study will examine aspects of the student that may contribute to the acquisition of those learning outcomes. Student characteristics including age, gender, experience with children, experience with pediatric nursing, and past experience with HFS will be examined.

Pediatrics in Nursing Curriculum

Pediatric nursing is unique in that parents or guardians are often key

partners in the care of the patient. Nursing students are often challenged in pediatric courses to expand their focus and care to the entire family (Bultas, 2011). Formation of the parent-nurse relationship is often as important as the development of the nurse-client relationship (Lambton et al., 2008). Students often face anxiety or experience complications by the presence of families who may question the appropriateness of an action or the student's skill level (Lambton et al., 2008). Situations such as these may lead students who are already apprehensive about their skills, to have a negative experience related to the pediatric setting.

Nursing skills are mainly taught generically, in the context of adult care, and coupled with application of knowledge in the clinical area (Mcnee, Clarke & Davies, 2005). Students experience difficulty in transferring clinical skills taught in a generic manner to children's practice (Mcnee et al., 2005). Nurse educators must be cognisant that teaching students to care for children requires focus on developing students to think in ways uncommon to adult practice (Lambton et al., 2008) such as the assessment of children versus adults. Students must be educated on how vital sign values change according to age, the various levels of cognitive development, and how to gain trust resulting in cooperation of a fearful child (Lambton et al., 2008). Each child is unique and therefore the care provided to them will be unique. The illnesses that acute care pediatric patients suffer from are broad and the application of clinical skills should match their age and development level (Mcnee et al., 2005).

Simulated scenarios utilizing high fidelity simulators as an adjunct to

pediatric education can help the quality of care which nursing students provide to patients. Simulated scenarios can help ensure students are adequately prepared for clinical, utilizing skills through hands-on learning in a safe risk-free environment through the use of life-sized, life-like manikins (Mcnee et al., 2005).

Simulation in Pediatric Education

There has been a major shift in Canadian health care delivery within the past decade. Canadian acute care hospitals had approximately 2.8 million inpatient hospitalizations in 2010–2011. This represents a decline of 31.4% since 1995–1996. The largest provincial decrease, in the number of days spent in hospital, from 1995-1996 to 2010-2011, was in Newfoundland and Labrador by 27.1% (Canadian Institute for Health Information, 2012). Coinciding with this data, it was found that over the past six years acute care pediatric admissions and lengths of stay have also decreased in Canada (Canadian Institute for Health Information, 2010).

The shift from hospital to community care created by the decrease of inpatient admissions has impacted the experiences that nursing students receive in the clinical setting, particularly in the pediatric environment (Bantz et al., 2007; Feingold et al., 2004; Kushner, 2010). Decreased numbers of pediatric inpatients have created challenges for nurse educators to meet students' pediatric nursing learning needs, such as knowledge acquisition, communication and psychomotor skills (Childs & Sepples, 2006; Kaplan & Ura, 2010; Laster, 2007; Parker et al., 2011; Weinberg et al., 2009; Wilson et al., 2004). Furthermore, increased acuity and complexity among the hospitalized pediatric population is also impacting

student learning (Bambini, Washburn & Perkins, 2009; Sarver, Senczakowicz & Slovensky, 2010). Often students may not even be permitted to perform procedures or exercise decision making skills because of patient safety concerns (Pauly-O'Neill & Prion, 2013; Pauly-O'Neill et al., 2013). Specifically, Pauly-O'Neill and Prion (2013) examined BSN student participation in pediatric critical events during simulation and hospital rotations. They state that unlike the dosing of adult medications, dosing for the pediatric patient is calculated based on weight. Therefore, experiences where different dosages are necessary and where different patient responses occur are seen as essential when caring for and practicing in the pediatric area.

Caring for complex patients can place increased demands on novice nurses and increase levels of anxiety (Sarver et al., 2010; Wotton et al., 2010). The study by Megel et al. (2012) found that HFS before clinical experiences in the pediatric setting helped decrease nursing students' anxiety. There has also been increasing pressure to move numerous students through various clinical rotations rapidly, decreasing the ability to provide good quality experiences (Mould, White & Gallagher, 2011). This, compounded with increased faculty to student ratio, adds to the number of complex issues facing nursing students today (Howard, Englert, Kameg & Perozzi, 2011; Kameg et al., 2010).

As a result of these concerns nursing schools have had to consider alternate methods to meet student learning needs (Bergus, Kreiter, Woodhead, Lawrence & Franklin, 2006; Parker et. al., 2011; Saver et al., 2010; Weinberg et al., 2009). The implementation of new innovative teaching modalities, such as

HFS, is one option that has been explored to address educational gaps, while also meeting current student desires for increased technology in the learning environment (Eggenverger & Regan, 2010; Kala et al., 2009; Mangold, 2007; McCaughey & Traynor, 2010; Morgan et al., 2006; Richards, 2001). Simulated learning scenarios can be created for diverse and complex clinical areas such as paediatrics, thereby meeting learning needs for different areas of student learning. This flexibility permits educators in all program years, from both the classroom and clinical setting, to create and or tailor learning scenarios to their particular area of interest, including pediatric clinical courses (Broussard et al., 2009; Carson-Sabelli, Fogg & Giddens, 2010).

Benefits of HFS

Benefits of HFS learning are identified within the literature numerous times. HFS provides educators the ability to implement various learning scenarios in which students can take on different roles and responsibilities. It is with the use of the manikin in the scenarios that the educator can change and alter the patient's condition depending on the students' interventions. It is not expected that students experience the identical scenario and carry out the same standardized care, but rather they gain critical thinking skills, leadership skills, increased confidence and autonomy, communication skills and enhanced prioritization skills resulting in competent safe care (Baldwin, 2007; Bambini et al., 2009; Childs & Sepples, 2006; Dillon, Noble & Kaplan, 2009; Eggenberger & Regan, 2010; Garrett et al., 2010; Grady et al., 2008; Kaddoura, 2010; Kaplan & Ura, 2010; Laster, 2007; McCaughey & Traynor, 2010; Parsh, 2010; Wong et al., 2008).

There are benefits for the educator as well. Having students complete skills, make decisions and have patient interactions in a risk-free environment enables student anxieties to decrease while instructors can focus in on the who, what and why of their actions (Bambini et al., 2009; Cant & Cooper, 2009; Feingold et al., 2003; Laschinger et al., 2008). The educator has the ability to stop the scenario as it is evolving to discuss the current situation or to repeat the scenario to allow students to make improvements in their care (Bremner et al., 2006; Cooper et al., 2010; Giovanni, Roberts & Norman, 2009; Goodman & Lamers, 2010; Thompson & Bonnel, 2008). It is difficult to control learning in such a manner in the real clinical setting.

Alinier et al. (2006) discuss the importance of debriefing during a post-scenario conference for educators to provide feedback and allow students to have the opportunity to process thoughts, clinical reasoning and feelings. This is supported by Brandon and All (2010), Childs and Sepples (2006), Haskvitz and Koop (2004), Leigh (2008), and Wotton et al. (2010). Even with its advantages, educators must be aware that the teaching aspect of this new teaching method requires dedication and interest.

Limitations of HFS

The limitations of using HFS are also presented in the literature. The issue of cost is frequently identified as a major concern, as simulated manikins are quite expensive to acquire, costing in the tens to hundreds of thousands of dollars (Garrett et al., 2010; Haskvitz & Koop, 2004; Kaddoura, 2010; Lee et al., 2008; Leigh, 2008). In a study conducted by Howard et al. (2011) it was identified that

funds should also be provided to increase the realism of the simulation events. The issue of storage and upkeep of the manikins has been discussed by Kaddoura (2010). His study indicated that the issue of having adequate space to house various interactive learning resources was a concern, both for hospital and educational settings.

Another concern highlighted in the literature is if educational institutions are fortunate enough to acquire the funding to incorporate alternate forms of learning, such as HFS, faculty must have the knowledge and desire to change from traditional teaching methods (Childs & Sepples, 2006; Feingold et al., 2003; Kala et al., 2010; Lee et al., 2008; Parsh, 2010). The role of the educator is very important within clinical simulation learning experiences. Kaddoura (2010) and Parsh (2010) both suggest that institutions should consider employing one individual to develop simulation scenarios and to consult on various debriefing scenarios. They also recommend that a person be dedicated to technical support issues. The need for two additional staff members adds limitations associated with the cost of implementing HFS into nursing curricula. Childs and Sepples (2006) indicated that careful planning, time and attention to detail are paramount in simulation being realistic and effective. Therefore, incorporating HFS into curriculum takes more than just purchasing the manikin itself.

Students have identified limitations such as realism with the manikins, transferability of learning and the size of groups in the learning scenarios. Some students have a difficult time with attempting to “make believe” or with making critical decisions with the use of manikins (Bantz et al., 2007; Leigh, 2008; Leigh

& Hurst, 2008). Childs and Sepples (2006) and Lim (2010) indicate that even though the manikins are very sophisticated, their voices are not. Therefore, students sometimes experience a scenario with a specific gender but the recorded voice stays the same, producing a situation where students find it hard to play a serious role. Feingold et al. (2004) also contended that work needs to continue on increasing realism for simulations.

While some research suggests positive HFS learning produces an easier transition from student to graduate nurse level, others feel that the transferability is questionable. Part of the literature argues if students anticipate an event to occur, they may have increased anxiety and learn to react to data alone, instead of patient cues such as facial expressions and unexpected movements (Bantz et al., 2007; Childs & Sepples, 2006; Feingold et al., 2004; Leigh, 2008). Alinier et al. (2006) and Childs and Sepples (2006) also discuss the key importance of small numbers of students involved in scenarios in order to keep people focused, have the ability to watch each individual's actions and to provide constructive feedback to everyone. It is clear that while HFS has many positives, clinical educators must also be aware of any limitations identified by current research to offer the best learning experiences possible.

Knowledge Acquisition and Simulation

HFS provides a learner-centered approach, an interactive environment offering the three domains of learning: cognitive, psychomotor and affective (Zulkosky, 2012). HFS allows for growth and experience in thinking though clinical problems (Dillon et al., 2009; Rhodes & Curran, 2005). Students are

encouraged to link concepts, apply theory to practice and make clinical decisions (Dillon et al., 2009). The ability to stop during a HFS scenario or reflect on the learning activity during a debriefing allows timely reflection which promotes pattern recognition and clinical reasoning (Wotton et al., 2010). The ability to do this is often absent in the clinical setting. The controlled environment in which HFS occur increases knowledge retention and transference to the clinical setting (Feingold et al., 2004).

Kirkman (2013) conducted a study where 42 nursing students were observed and rated based on their ability to perform a respiratory assessment before and after a respiratory lecture and after a simulation event. Observers utilized a paper and pencil seven item performance evaluation tool and data were then analyzed. The researcher found that transfer of learning did occur and was demonstrated by the students. However, it was also noted that combing didactic, HFS and traditional clinical into nursing students curriculum were all important because learning took place after all forms of teaching had occurred.

Lindsey and Jenkins (2013) studied 79 students in a nursing leadership course in their final semester of a BSN program. An 11 item multiple choice survey was utilized to assess all 79 students' pre-test understanding of rapid response, and questions included clinical judgment. Thirty-nine students were then provided with education about rapid response systems and 40 followed a more traditional intervention of a code blue situation, both utilizing simulation manikins. All students were post-tested after the simulation event and findings from their study indicated that simulation is effective in increasing both students

groups' knowledge and clinical judgment.

Ling, Chen, Yang and Tsui (2008) utilized an evaluation form consisting of 43 questions focusing on learning motivation, classroom participation, knowledge, skills and satisfaction. Their quantitative study used Likert-type questions with 67 participants. The mean scores for satisfaction were found to be significantly higher in simulation teaching related to learning motivation, classroom participation, knowledge and skills compared to traditional teaching.

Parker et al. (2011) conducted a pilot project in which learning outcomes and students' perceptions were examined among 41 undergraduate nursing students. Students were randomly assigned to either a traditional or hybrid (part simulation and part traditional clinical) clinical group for a child health course. Course grades were utilized along with two Likert-type scales, Student Satisfaction with Learning Scale and the Self-Confidence in Learning Using Simulations Scale. After the simulation experience, students reported high satisfaction with the experience overall; specifically, they reported higher confidence in their clinical skills.

Zulkosky (2012) completed a research study examining whether nursing students who participated in debriefing sessions after watching pre-recorded simulation videos obtained higher exam scores than those who just received traditional lectures. Results indicated no statistical correlation to higher exam scores for those who viewed the simulation video. However, all participants were familiar with the favored lecture format.

Communication and Simulation

Communication is an important skill which nursing students must master. Communicating effectively helps play a significant role in treatment compliance, recovery and patient satisfaction (Sleeper & Thompson, 2008). However, students often fear they may say the wrong thing or not know what to say in certain situations (Sleeper & Thompson, 2008). There are many barriers to teaching therapeutic communication nursing education (Kameg et al., 2010). Class size, time constraints and actual lack of practice are challenges educators face (Sleeper & Thompson, 2008). HFS is one teaching method where educators have the advantage of directly observing interactions between students and patient (Kameg et al., 2010). Using a HFS scenario, educators can provide immediate feedback to help improve communication skills (Kameg et al., 2010). Kaddoura (2010) identified this immediate feedback as a method that educators can use to demonstrate common causes of communication failure within the clinical setting, allowing students to evaluate and improve their skills. The literature supports that HFS helps develop interprofessional skills through the collaboration of nurses and physicians working together in scenarios (Reising, Carr, Shea & King, 2011). Guhde (2011) found in his research that students showed improved communication with team members after experiencing HFS. Laster (2007) also discussed how communication through direct feedback helped students cultivate critical thinking.

Psychomotor Skills and Simulation

Nursing students are educated on psychomotor skills in a laboratory

setting (Wotton et al., 2010). Once these skills are taught, students take this knowledge and enter the clinical setting. Students are often intimidated by performing their psychomotor skills because they are now in a real clinical setting, caring for a living patient, under the supervision of an instructor, while trying to make everything go right their first time (Brewer, 2011). These issues compounded with the fear that they are at risk of causing harm to a patient, can increase their anxiety (Brewer, 2011). The study by Megel et al. (2012) showed that practice with HFS before clinical in the pediatric setting decreases students' anxiety as they are able to practice psychomotor skills on the manikin. Following the HFS learning activity, students felt more comfortable completing the head to toe assessment on a pediatric patient.

Wotton et al. (2011) discussed how the transfer of skills from laboratory to clinical practice is questionable. The authors look at how traditional laboratories focus on hands-on skills but lack timely reflection, decreasing the opportunity for students to develop clinical reasoning. Broussard et al. (2009) supported this, discussing how learners often have difficulty making the transition from the traditional skills laboratory to the real patient setting. HFS learning offers many benefits to the teaching and acquisition of psychomotor skills. Students perform scenarios in a realistic environment with no fear of harming a real patient and they have the advantage of being able to repeats skills as many times as necessary (Brewer, 2011; Leigh, 2008). Repetition of skills is found to increase student confidence (Akhtar-Danesh et al., 2009; Leigh, 2008). HFS also allows for clinical opportunities that rarely occur, such as cardiac arrest, but require fast

accurate judgement when they do (Wilson et al., 2005). Childs and Sepples (2006) supported the use of HFS for psychomotor skills as it allows for quicker acquisition and increased satisfaction with learning. Laschinger et al. (2008) supported this but also discussed how HFS should be used in conjunction with traditional teaching methods.

Measuring Students' Perceptions of the Benefits of Simulation

There is a lack of research available on students' perceptions of the benefits of pediatric HFS. Therefore, current research was examined in relation to tools that could be adapted to obtain data related to students' perceptions of learning outcomes with pediatric simulation.

After a review of the literature and examination of various simulation teaching modalities, a questionnaire by Bailey and Bursey (2009) was found that measured students' perceptions of virtual clinical excursions using a software program delivered on computers. Fourteen students from an Atlantic Canadian nursing school in their first year participated in the study. Students participated in four exercises over a four week period consisting of 1) a quick tour and detailed tour, 2) critical thinking and nursing judgment, 3) applying the nursing process, physical examination and vital signs, and 4) principles applied in care of the older adult. Their findings indicated that 93% of students supported simulated learning as a valuable tool. The focus of the study was not specifically related to pediatric nursing but it did focus on computer programmed simulations. Cunning and Colbourne (2010) adapted the tool by Bailey and Bursey and conducted a study examining the use of virtual clinical excursions on computers to meet pediatric

clinical course objectives. Their results indicated that 68% of students supported simulated learning as a valuable tool.

Casida and Shpakoff (2012) utilized teaching evaluation tools completed from 2007-2010 by 209 senior nursing students to obtain data related to students' perceptions of simulation. The teaching evaluation tool was developed by a faculty member with extensive experience in simulation as a teaching strategy for curriculum development in critical care education. Consisting of 16 questions and a Likert type response scale the survey asked students about the effectiveness of simulation on learning outcomes. One question was open-ended asking about their overall experience with simulation. Their results support simulation as being effective in assisting students to increase their knowledge, skills and attitudes related to assessment and management of acutely and critically ill patients.

Howard et al. (2011) used a simulation evaluation survey to explore 151 nursing students' perceptions of HFS. They found that students believed simulation helped them better understand concepts, stimulated their critical thinking and that knowledge was gained and could be transferred to the clinical setting. Results also showed students perceived that simulation should not be substituted for clinical but rather be used in combination with this teaching modality.

Todd, Manz, Hawkins, Parsons and Hercinger (2008) designed a simulation evaluation instrument using the American Academy of Colleges of Nursing's core competencies, including categories of critical thinking, communication, assessment and technical skills. The tool was used by nursing

educators to assess the performance of senior nursing students during simulated clinical experiences. Content reliability was established from the literature and from the review of the tool by an expert panel. Reliability was established using sixteen simulation sessions with two trained evaluators at each session. Because this tool is more of a content validity questionnaire intended for the assessment of students' performance by faculty, rather than for students to assess their own learning, major modifications would be required.

Tosterud, Hedelin and Hall-Lord (2013) examined nursing students' perceptions of scenarios using different simulation methods and examined if students' education level influenced their perceptions. Eighty-six nursing students at various levels within the program participated. Students were divided into groups and completed a case study either with HFS, static manikins or pencil and paper. Results showed students were satisfied with the case scenarios regardless of the method used. The paper and pencil group were the most satisfied but the researchers suggest this may be because it was the most known and comfortable education method for them. Education level did not affect how students perceived simulation. These findings were supported in the study by Kelly, Hager and Gallagher (2014) where 150 senior undergraduate nursing students from three programs were surveyed to determine what matters most to students in the design and delivery of simulations. Kelly et al. (2014) concluded that regardless of years of nursing experience, age or gender, simulation was perceived to be beneficial across different student cohorts and tailoring to the education level is not needed.

A more applicable tool created by Lambton et al. (2008) consists of 10

questions utilizing Likert-type responses and three open ended questions. The survey questions were developed by three pediatric nursing content experts. After completing four simulated experiences, 47 junior-level baccalaureate nursing students in their pediatric nursing rotation completed the questionnaire. The focus of the tool was confidence, communication, collaboration, learning opportunities, error recognition and transfer of knowledge from simulation to clinical. Of all the concepts measured, the difference in ability to recognize medical error was statistically significant while the responses to the open-ended questions revealed an increase in overall self-confidence.

Gaps in the Literature

There are numerous articles on simulation in nursing education in the literature and a plethora of research studies on the use of HFS in nursing education. However, research on HFS and its use in pediatric nursing education is sparse (Broussard et al., 2009). Pediatric nursing is unique and requires different skills and knowledge. Studies have shown that pediatric clinical rotations can be the most stressful clinical for nursing students (Lambton et al., 2008; Oermann & Lukomski, 2001). Some believe that through the use of HFS, students not only experience the acquisition of knowledge, and have the ability to perform psychomotor skills, but also gain expertise to further develop this knowledge through deeper learning. Megel et al. (2012) supported this, indicating that even with the increased number of studies involving HFS, very few studies involve pediatric scenarios.

For educators, their most desirable outcome for students is to help them

become competent graduate nurses who provide safe and effective patient care (Ashcraft, Opton, Bridges & Caballero., 2013). An important issue for educators implementing new teaching strategies is to determine the best way to measure outcomes. More research is needed on using simulation in nursing education and identifying learning outcomes (Laster, 2007). Best practices related to simulation implementation, including differences in students' perceptions need to be further explored (Howard et al., 2011). Tosterud, Hedelin and Hall-Lord (2013) identified how difficult it is to develop instruments to measure learning outcomes related to the use of simulation. Wellard, Solvoll and Heggen (2009) support the belief that researching the use of simulation must include students' perceptions.

With the apparent gap in the literature, the researcher believed more research was needed regarding the use of HFS in pediatric nursing education. Gaining nursing students' perceptions regarding the use of HFS and the acquisition of knowledge, development of communication and psychomotor skills at a time when combined issues, such as stress, lack of patient availability and increased student enrolment exists, builds on the body of knowledge and directs future teaching strategies to deliver the best learning opportunities for students.

Chapter Three: Methodology

The research conducted was a quantitative study utilizing a non-experimental research design and was exploratory descriptive in nature. This design was intended to describe and document a phenomenon without any manipulation (LoBiondo-Wood & Haber, 2013; Loiselle & Profetto-McGrath, 2011). Descriptive research was appropriate to examine the selected phenomenon, as this type of research is often used to discover new meaning and to provide new knowledge about a topic when there is relatively little known (Dempsy & Dempsy, 2000). By using a descriptive research design, the relatively unknown phenomenon of students' perceptions of HFS with a pediatric client and its link to their learning outcomes of knowledge acquisition and development of communication and psychomotor skills was explored. Descriptive exploratory designs have been used to examine perceptions of HFS in other research as well (Feingold et al., 2004; Kaddoura 2010; Wilson et al., 2005).

Setting

The setting for the study was an Eastern Canadian undergraduate nursing program which had recently incorporated pediatric HFS into its curriculum. The nursing program has a four year regular stream and the students were all in their second semester of their third year when they enrolled in the pediatric clinical course. All students completed a HFS learning event involving five year old Hal as part of their pediatric clinical requirement. Students in the selected clinical course participated in five hours of HFS in the school's simulation laboratory.

Participants and Sample Size

A non-probability convenience sample of students enrolled in the pediatric clinical course at the nursing school was selected as the potential participants. Fifty-six students were enrolled in the pediatric clinical course during the period when the study was conducted and thirty-seven participants participated in the study.

Recruitment and Sampling

Recruitment of participants took place during week 13 of the pediatric clinical course. At that time, all students had completed the HFS scenario. The study, using a prepared script (Appendix B), was explained to the potential participants at the end of a theory class at the end of a semester. All students in the course received an information letter (Appendix C) inviting them to participate in the study.

Inclusion criteria to participate in the study included having completed the pediatric clinical course and having participated in the HFS. Exclusion criteria included any nursing students who withdrew from the pediatric clinical course before its completion, or students who did not complete the HFS scenario in the pediatric clinical course. Consent was implied by those who chose to complete the surveys.

Instruments

Demographic Survey. Demographic data were collected using a survey (Appendix D). The description of the participants gathered from the survey included age, gender, previous HFS experience, timing of their pediatric HFS learning activity, and previous experience in pediatrics and health care. This

information provided a profile of the participants which allowed for determining generalizability of the data and analysis of the relationships. The demographic data, such as when the participant participated in the HFS, were utilized to determine students' perceptions of the usefulness of pediatric HFS for knowledge acquisition, and communication and psychomotor skills.

Student's Perceptions Tool. Permission to utilize and adapt the survey tool created by Lambton et al. (2008) was obtained for the research study (Appendix E). The tool consisted of 10 survey questions utilizing Likert scale responses and three open ended questions modified to reflect pediatric nursing (Appendix F).

Data Collection

After obtaining ethical approval from Athabasca University (Appendix G) and the University where the study took place (Appendix H) all students in the pediatric clinical course were invited to participant in the study. The research coordinator and the researcher visited the students in the classroom setting at the end of their last lecture. The information letter and two surveys were distributed to the students. The study was explained to the students then a few minutes were provided for them to read the letter. Students had an opportunity to ask questions but no questions were asked. Students who wished to participate were asked to complete the two surveys. The researcher left the room and students were asked to place the surveys in the envelopes provided, seal them whether completed or not, and hand the envelope to the researcher coordinator when they left the classroom.

Data Analysis

Data collected from the demographic survey were analyzed using descriptive statistics, as this type of statistic describes the population profile (Macnee, 2004). The demographic data were used to establish inferences regarding relationships. The student's self- report survey utilized Likert-type questions and provided data that were evaluated. Statistical analysis was completed using Statistical Package for Social Sciences (SPSS) V.19.0 (Kinnear & Gray, 2011). By completing a statistical analysis, the validity and reliability of the data were assured (Plichta & Garzon, 2009). Screening and cleaning of these data were completed. Cleaning the data is the process of making certain that all variables have valid usable values (Plichta & Garzon, 2009). The Likert-type question responses were numbered for quantitative analysis: 1 for disagree and somewhat disagree, and 2 for agree and somewhat agree. The responses were grouped due to the low number of participants and responses in the survey. Responses were then examined in terms of positive (2) versus negative (1) responses as one step in the data analysis process. The alpha-level (α-level) for this step was defined as 0.05, indicating that the result cannot occur more than 5% of the time by chance (Plichta & Garzon, 2009). Each statistical test was examined to ensure testing was not automatically conducted at a 0.01 alpha-level in SPSS. Upon examining the data, it was concluded that using a 0.05 alpha-level was appropriate to avoid an error of reference, either a type I or type II error (LoBiondo-Wood & Haber, 2013).

The Cronbach's alpha test was conducted to determine the internal

consistency of the questions and subsequently the subgroups. This method is one tool used to measure responses from a Likert-type scale, thus fitting the proposed research (LoBiondo-Wood & Haber, 2013). The Cronbach's alpha was noted to be 0.77 indicating there is a relatively high level of internal consistency for the individual questions within the survey. Cronbach's alpha was also run on the survey questions as subscales and the internal consistency remained the same, 0.77.

To determine if a significant difference existed between the independent variables (age, gender, program stream, previous HFS experience, timing of their pediatric HFS learning activity, and previous experience in pediatrics and health care) and each of the dependant variables (participants' perceptions of knowledge acquisition, development of communication and development of psychomotor skills) an independent *t*-test was planned. Regression was also to be examined to determine if possible relationships between demographic data and survey results existed. However, these two tests were not performed due to the small homogeneous sample size, thus these tests would not provide reliable statistical data.

Questions requiring narrative responses were used to provide more insight into the Likert-type responses. Each qualitative question focused on the three main learning outcomes being researched (knowledge acquisition, psychomotor skills and communication) and students' perceptions of these outcomes following their simulation scenario. Responses to the three open ended questions were examined for commonalities of themes

Rigor

An important aspect to consider when doing research is rigor. Rigor refers to the strictness with which a study is conducted to enhance the quality, believability or trustworthiness of the study findings. In quantitative research, rigor is determined by four major standards: internal validity, external validity, reliability and objectivity (LoBiondo-Wood & Haber, 2013). Ideally, research results are transferable and generalizable and rigor is necessary for this to occur.

Validity is the degree to which an instrument measures what it is supposed to measure (LoBiondo-Wood & Haber, 2013). Using Cronbach's Alpha to examine the data helped determine internal validity. Also, the revision of questions and adapting them to the focus of the study also helped insure rigor was obtained. For external validity, generalizability is limited to the sample because of the effect of nonprobability convenience sampling. However, participants are believed to be a fair representation of undergraduate baccalaureate nursing students within Eastern Canada.

Reliability is the consistency and accuracy with which an instrument measures the target attribute. When utilizing descriptive statistics nothing is manipulated or controlled. The phenomenon studied is a "real life" situation (LoBiondo-Wood & Haber, 2013). Therefore, as previously discussed the reliability and validity of the tool by Lambton et al. (2008) was not evaluated but rather the tool was devised by content experts. This helped increase the validity of the tool.

For objectivity it is important to note that the selection process was

through convenience sampling and there was no manipulation from the researcher (LoBiondo-Wood & Haber, 2013). It is important to note that there was no pre-existing bias related to the proposed study. Also, objectivity was maintained in the conceptualization of the problem by completion of a detailed literature review and review of the theoretical framework, consisting of the underpinnings of the research.

Ethical Considerations

Ethical approval was obtained from Athabasca University's Research Ethics Board (Appendix G) and the Interdisciplinary Committee on Ethics for Human Research at the university where the research took place (Appendix H). The primary ethical concerns identified by the researcher were the protection, enhancement and overall well-being of the participants who are, or may be in the future, affected by the research (Ali & Kelly, 2008). The research did not pose any risk to the participants, as the survey collected data about their perceptions of past learning experiences. It is the belief that participants will be free from any future risks associated with participating in the research study.

Implied consent was obtained by participants completing the surveys. All potential participants were informed of the purpose of the study and how the information obtained would be used. It was emphasised that no risks or benefits would be associated with deciding to complete or not complete the survey. Participants were also informed that completing, or not completing, the survey in no way had a positive or negative affect on their overall outcome in the course. Completed surveys were not reviewed by the researcher until after the course

grades were distributed to all students. Anonymity of all participants was maintained. In order to maintain strict confidentiality all students were informed that no identifying data such as their student ID number or name should be put on their surveys. No identifying data were placed on any surveys. The surveys were distributed and collected by the research coordinator after the principal investigator left the room. The researcher was not an instructor in the pediatric course, nor had an affiliation with the course, and it was the researcher's belief that she would not be a future instructor of these students in the remainder of their program.

Once completed, all surveys were sealed inside a non-identifiable envelope and the research coordinator placed them in a locked cabinet, accessible only by the research coordinator, until all grades were distributed. All possible precautions were taken to ensure participants' confidentiality before, during and after the completion of the study. Once the grades were released, the research coordinator provided the sealed envelopes containing the surveys to the researcher. Data were assessed and analyzed at that time. Only the researcher and her supervisor had access to the data.

Chapter Four: Results

The study findings are presented in four sections. The first section presents a descriptive profile of the sample and key variables. The second section examines participant's perceptions of HFS for communication, knowledge and skill acquisition. The third section describes the relationship between participant characteristics and learning outcomes. Fourthly, the relationship between HFS and participants perceptions is examined followed by a qualitative analysis of the three open ended questions.

Participant Demographics

Thirty-seven nursing students who were enrolled in the Pediatric Clinical Course participated in the study. All participants were in their third year of a four year Bachelor of Nursing Program located in Eastern Canada. The majority of participants were female (n = 31; 84%), and six were male (16%). Also, the majority of participants were between 20 - 25 years old (n = 33; 89), with a small number being 26-30 years of age (n = 4; 11%). Of the study participants, 16 (44.4%) had worked or were currently working in the area of pediatrics whereas 20 (55.6 %) had no previous experience with children. One participant did not respond to the question. There were 28 (75.7%) participants who had experience with children in other clinical courses, while nine (24.3%) did not. Table 1 provides a summary of the sample's demographics.

Table 1

Participant Characteristics

Characteristics	*N**	*%*
Gender		
Female	31	83.8
Male	6	16.2
Age		
20-25 years	33	89.2
26-30 years	4	10.8
Work Experience		
Working/Worked in Pediatrics	16	43.2
Never worked in Pediatrics	20	54.1
Have own children		
Yes	2	5.7
No	33	94.3
Experience with children in other clinical courses		
Yes	28	75.7
No	9	24.3

*Sample size reflects missing data.

As one of the study variables, participants were asked if they had any previous exposure to children through having one's own, through work, volunteering or through family. With the exception of one student who reported no exposure to children, the remaining students had been exposed to children in some manner. The majority of participants indicated they were exposed to children via family, work or volunteer activities. Table 2 provides a summary for the participant's exposure or non-exposure to children.

Table 2

Previous Exposure to Children

Variable	*N**	*%*
Exposure to Children through		
Extended Family	2	5.7
Extended Family, Work or Volunteering	16	45.7
Extended Family & Volunteering	2	5.7
Extended Family & Work	5	14.3
Extended Family, Work & Have Children	1	2.9
Work & Volunteering	7	20.0
Work, Volunteering & Have Children	1	2.9
No Exposure to Children	1	2.9

*Sample size reflects missing data.

Previous Experience with HFS

Most participants (*n* = 33, 89.2%) had previously been involved with HFS in some capacity, while four (10.8%) had no HFS experience prior to the pediatric clinical course. Of the 33 participants that were previously involved with HFS, seven (21.2%) had only experienced HFS once, while the majority had two previous experiences (*n* = 20; 60.6%). There were six who had three or more experiences (18.2%) and four did not answer this question on the survey, therefore were excluded from the analysis. Table 3 provides an overview of participants' prior experience with HFS before the pediatric simulation scenario.

Table 3

Prior Experience with HFS

Variable	*N**	%
Prior Experience with HFS		
Yes	33	89.2
No	4	10.8
Number of Prior Times Involved with HFS		
One	7	21.2
Two	20	60.6
Three or more	6	18.2

*Sample size reflects missing data.

Timing of HFS Scenario

All students completed the same HFS scenario but they completed it at different times during their pediatric clinical course. Eleven (29.7%) participants completed the event before their clinical rotation, 14 (37.8%) completed it during their clinical component, and 12 (32.4%) participants had the HFS learning event after their pediatric clinical hours were completed. Table 4 provides a summary of when participants had the HFS scenario in their pediatrics course.

Table 4

When HFS Scenario Was Completed

Variable	*N*	%
Before Clinical Started	11	29.7
During the Clinical Rotation	14	37.8
After Completion of Clinical	12	32.4

Student Perceptions

Due to the small sample size, the Likert scales for students' perceptions in the Student Survey (Appendix F) were collapsed into two groups: disagree and somewhat disagree were assigned to one group; and agree and somewhat agree were assigned to the other. Data analysis was conducted on each individual question as well as the subscales for each identified learning outcome (i.e., communication, knowledge acquisition and psychomotor skills). The next section will examine each individual item on the survey in relation to the identified outcomes.

Communication. Twenty-nine (78.4%) of the participants agreed or strongly agreed that they were better able to communicate with other nurses following the HFS scenario (M = 1.78). Thirty-three (89.2%) of the participants perceived that they were more confident when communicating with other nurses (M = 1.89). Finally, 33 (89.2%) participants perceived that they could communicate better with children and/or their families (M = 1.89) after their HFS scenario experience. Table 5 provides participants' perceptions of their communication skills following the HFS scenario.

Table 5

Communication Skills Following the HFS Scenario

Variable	*M**	*N***	*%*
Communicate Better With Other Nurses	1.78		
Agree/Somewhat Agree		29	78.4
Disagree/Somewhat Disagree		8	21.6
More Confident Communicating With Other Nurses	1.89		
Agree/Somewhat Agree		33	89.2
Disagree/Somewhat Disagree		4	10.8
Communicate Better With Children and Families	1.89		
Agree/Somewhat Agree		33	89.2
Disagree/Somewhat Disagree	4	10.8	

*Overall mean for each question
**Sample size varies due to missing data.

Knowledge acquisition. Of the 37 participants, the majority of participants (35; 94.6%) agreed or strongly agreed that they gained more pediatric knowledge and were better able to give age appropriate care as a result of HFS ($\underline{M}$ = 1.95). Thirty-four (91.9%) agreed to strongly agreed that the HFS scenario allowed them to gain more confidence in their ability to collect data on a pediatric patient and that they can recognize areas where error occurs more easily in the pediatric setting (M = 1.94). Nineteen participants (51.4%) agreed or somewhat agreed that the clinical setting on the pediatric unit provided greater opportunity to learn (M = 1.51), while 18 participants (48.6%) perceived that the pediatric HFS scenario provided a greater opportunity for pediatric learning. Table 6 provides participants' perceptions of knowledge acquisition from the HFS scenario.

Table 6

Knowledge Acquisition Following HFS

Variable	*N**	*%*	*M*	*SD*
More Confident with Collecting Data	34	91.9	1.92	.28
Gained More Pediatric Knowledge & Better Able to Give Care	35	94.6	1.95	.21
Can Better Recognize Where Errors Occur	34	91.9	1.94	.23
Pediatric Clinical Setting Provides Greater Opportunity to Learn	19	51.4	1.51	.51

*Sample size varies based on missing data.

Psychomotor skills. Thirty-six (97.3%) participants perceived that they were better able to assess a child and 33 participants (89.2%) believed that they were more confident in their skills in a pediatric clinical setting (M = 1.89). An interesting finding is that 33 participants (89.2%) perceived that they performed more skills in the HFS setting than on the pediatric clinical unit. Table 7 provides participants' perceptions of their psychomotor skills after the pediatric HFS scenario.

Table 7

Psychomotor Skills Following HFS

Variable	*N**	*%*	*M*	*SD*
Better Able to Assess a Child	36	97.3	1.97	.16
More Confident About Pediatric Skills	35	94.6	1.95	.23
Performed More Psychomotor Skills In Pediatric Simulation Labs	33	89.2	1.89	.32

*Sample size varies based on missing data.

Subscale Scores for Students' Perceptions of Learning Outcomes of Communication, Knowledge and Skill Acquisition

The student survey consisted of 10 questions utilizing a four point Likert type scale. However, due to the low number of participants the first two possible responses were collapsed for statistical analysis and given the number one to indicate those who had responded disagree and somewhat disagree. The same was done to the third and fourth response and these were assigned the number two to indicate responses of agree and somewhat agree.

The three main learning outcomes for this research study were knowledge acquisition, development of communication and psychomotor skills. Participants perceived their overall communication skills after the HFS scenario as positive (M = 1.89). When examining the knowledge acquisition subscale mean score, the results also indicated that students generally perceived that their knowledge acquisition through the use of HFS was positive (M = 1.83). The mean score of the psychomotor skills subscale suggest students perceived that the HFS scenario enhanced their psychomotor skills (M = 1.94). Table 8 displays the perception of using HFS for acquiring the learning outcomes by subscale.

Table 8

Perception of HFS for Skills Acquisition

Subscales	*M*	*SD*
Communication	1.85	.24
Age 20-25	1.84	.25
Age 26-30	2.00	.00
Previous Experience	1.90	.24
No Previous Experience	1.83	.33
Knowledge Acquisition	1.83	.22
Age 20-25	1.83	.22
Age 26-30	1.88	.14
Previous Experience	1.83	.22
No Previous Experience	1.91	.14
Psychomotor Skills	1.94	.19
Age 20-25	1.93	.20
Age 26-30	2.00	.00
Previous Experience	1.93	.20
No Previous Experience	2.00	.00

Correlation between Timing of the HFS Lab and Learning Outcome Acquisition

Participants attended the pediatric HFS lab during one of three time intervals: before the clinical component started, during their clinical rotation, or after they had completed the clinical component of the course. Pearson's correlational analysis was completed on participant demographics and individual items and subscales in the student survey where appropriate. A statistically significant negative weak correlation was found between the timing of the HFS and the development of communication skills subscale (r = -.361, p = 0.03). This finding supported that the timing of HFS impacts students' perceptions of

improved communication skills. This finding was further examined to determine if having HFS before, during or after clinical correlated with the subscale of communication. A significant positive correlation was found between having HFS before clinical and the development of communication skills (r = .392, p = 0.02). However, there was no correlation between the timing of during and after delivery of HFS with improved communication subscale. Table 9 displays the correlations for the subscales with timing of HFS, both overall and divided into before, during and after clinical rotation.

Table 9

Timing of HFS and Students' Perceptions of Learning Outcomes Acquisition

Timing of HFS	Communication *r* *(p)*	Knowledge *r* *(p)*	Psychomotor Skills *r* *(p)*
When HFS occurred	-.361 (.03)	-.244 (.16)	-.050 (.77)
Before Clinical	.392 (.02)	-.268 (.15)	-.009 (.96)
During Clinical	-.151 (.37)	-.112 (.52)	-.064 (.71)
After Clinical	-.226 (.18)	-.139 (.42)	-.075 (.66)

N = 37

Correlation between HFS and Individual Items

Table 10 displays the chi-square results that examined the difference between HFS and student's perceptions of individual items. All items on the

survey were significantly different ($p < .05$) suggesting students perceived that HFS significantly enhanced specific outcomes, with the exception of the question regarding if participants perceived having more learning opportunities on the clinical unit opposed to in the HFS lab.

Table 10

Relationship between HFS and Individual Items

Question	***p***
Communicate better with nurses	0.01
More confident communicating with other nurses	0.00
Communicate better with children or their families	0.00
Better able to assess a child	0.00
Gained more pediatric knowledge and better able to give age appropriate care	0.00
Better able to recognize more easily where errors can occur	0.00
More confident about skills	0.00
Performed more psychomotor skills in the pediatric simulation labs than in clinical setting	0.00
Pediatric clinical setting provided more opportunity to learn than being in the pediatric simulation lab	0.89

Qualitative Responses

The research tool utilized three open ended questions. These questions were analyzed and reviewed to determine if any reoccurring themes emerged. Table 11 shows the themes for each question.

Table 11

Themes in Qualitative Responses

Category	Theme	Responses
Area of practice that has Improved	Communication	Communicating in a way a child would understand and feel safe and comfortable (#25) Effectively communicate with young patients (#37)
	Emergency Response	It was good to experience a code without the stress of it being real. It was good to be able to reflect on it and watch the things you can do better next time to be better prepared for reality (#19) This simulation helped me learn a lot and how to act in an emergency situation. I found it very helpful because we do not get a lot of experience with children on the floor (#17)
	Assessment Skills	Increase in confidence with assessment skills (#6) Assessment of a pediatric client (#35)
	Medications	Gained more knowledge around medication dosages, also how quickly a child's health can change (#14)
	Intravenous	Initating IV Lines (#32) IV insertion and hooking up IV line (#23)
Difference noticed in Practice	Communication	Better communication skills in practice with a pediatric patient in the clinical setting (#34) Made me more confident in communicating with younger patients. Taught me to never promise things unless it is possible (#37)

Themes in Qualitative Responses

Category	Theme	Responses
Transfer of pediatric knowledge	Communication	Communication technique (#31) Age-appropriate communication skills (#32) How a child takes things literally and how scared they can be of some little things (#23)
	Assessment	Overall assessment skills (#2,6,15,17)
	Age-Appropriate Care	Providing care in a way that was appropriate to child's developmental level (#15)

Chapter Five: Discussion

The purpose of this study was to examine the relationship between the use of high fidelity pediatric manikins in simulation learning scenarios and nursing students' perceptions of its usefulness for knowledge acquisition and development of communication and psychomotor skills used in pediatric clinical practice. Two research questions were posed: 1) What are the relationships between nursing students' characteristics and how they perceive using high fidelity simulation for attaining pediatric learning outcomes?, and 2) Is there a relationship between pediatric high fidelity simulation learning experiences and undergraduate nursing students' perceptions of its usefulness for their knowledge acquisition and development of communication and psychomotor skills?

Student Characteristics and Perceptions

The first research question was examined through the analysis of relationships between nursing students' characteristics and how they perceived using HFS for acquiring pediatric learning outcomes.

Gender. Females were the majority (n = 31; 83.8%) of the participant sample. Due to the low number of male participants (n = 6; 16.2%) in the study, it was not conducive to examine the student characteristic of gender and its relationship to their perception of using HFS for attaining pediatric learning outcomes. The low male gender ratio of the participants in the current study is similar to statistics from Canadian Nurses Association (2013), who stated that 6.6% of all nurses in Canada in 2011 were males. Similarly, other research involving nursing students report a disproportionate number of males compared to

females (Blum, Borglund & Purcell, 2010; Hicks, Coke & Li, 2009; Tiffen et al., 2011; Zulkosky, 2012).

Age. The participants in the current study were all 30 years of age or less, with the majority (89.2%) being 25 years or younger. This is consistent with findings from other studies where authors reported that most participants were under 25 years of age (Kaddoura, 2010; Kelly, Hager & Gallagher, 2014; Smith & Roehers, 2009). Schlairet and Pollock (2010) stated that the traditional undergraduate nursing student is 25 years of age or less.

The participants in this study were divided into two age groups: 20-25 and 26-30 years of age. Overall, the 20-25 year age group perceived HFS as positive with only a few expressing a negative perception. Approximately 50% of each of the two age groups agreed or somewhat agreed that the clinical setting offered greater experiences than the HFS. There were only four participants in the 26 to 30 year old category. These four participants all stated that they agreed or somewhat agreed that HFS helped them with the learning outcomes of knowledge acquisition, communication and psychomotor skills. Because the number was so small, it is not possible to draw conclusions about differences between the two age groups.

Exposure to children. Only two of the participants (5.7%) had their own children, therefore findings are not statistically significant. However, 47.7 % (n=16) had exposure to children through extended family, work or volunteering.

Previous work with pediatric patients. Just over half of the participants had never worked in pediatrics (n=20, 55.6%), while sixteen participants did have

previous experience with pediatric patients (44.4%). However, the data showed that both groups had a positive attitude towards HFS with most agreeing or somewhat agreeing that this teaching modality helped with their learning outcomes.

Of the twenty participants who had no previous work experience with children, the majority (95%) believed they were more confident collecting data on the pediatric patient and better able to assess a child; 90% perceived they were more confident completing skills in pediatrics and gained more pediatric knowledge allowing for better assessment of a child; 85% reported: (1) increased confidence; (2) improved communication with children and families; (3) improved ability to recognize where errors occur more easily; and (4) performing more psychomotor skills in the HFS scenario; and 80% perceived they could communicate better with nurses following their pediatric HFS scenario.

Those who did have experience working in the area of pediatrics had similar perceptions of using HFS for attaining leaning outcomes. All participants within this group perceived that HFS: (1) enhanced their confidence with pediatric skills; (2) increased their ability to recognize where errors can occur more easily; (3) enhanced their pediatric knowledge, and; (4) better able to provide pediatric care and are better able to assess a child. The majority of this group (n = 15; 94%) considered themselves to be: (1) more confident communicating with nurses; (2) able to communicate better with children and families; and (3) reported performing more psychomotor skills in the HFS

setting. Fourteen participants (88%) believed they were more confident collecting data on pediatric patients. Both groups, those who had experience in pediatrics, and those who did not, generally perceived HFS as a positive experience. This finding supports the notion that using HFS scenarios are perceived by students as useful for improving their knowledge of pediatrics.

Previous HFS experience. The majority of participants (n = 33; 89.2%) indicated they had previous experience with HFS, and most (78.8%) had two or more past experiences using HFS. Participants with previous HFS experience perceived that they: (1) were better able to assess a child (*n* = 32); (2) gained more pediatric knowledge and could provide better care; (3) could recognize errors more easily and were more confident in their skills related to pediatrics (*n* = 31); (4) were more confident with their communication with nurses and with collecting data regarding a pediatric patient (*n* =30); (5) could communicate better with children and families; (6) performed more psychomotor skills in the laboratory setting (*n* = 29); and (7) simulation helped them communicate better with nurses (*n* = 26). This participant group also expressed positive attitudes towards HFS being useful for acquiring pediatric learning outcomes.

There was limited literature on the previous use of HFS and its effects on student perceptions of acquiring their learning outcomes. Kameg et al. (2010) did not find any significant differences between students who had previous experience with HFS and their communication skills. Zulkosky (2012) found no statistical significance between previous experience and Grade Point Average (GPA). Roh et al. (2011) also supported this in their study regarding nurses'

perceptions of self-efficacy and satisfaction after simulation where there was no statistically significant correlation for those nurses with previous simulation use.

Timing of HFS

Participants in this study experienced the HFS scenario during one of three time intervals: either before, during or after their clinical rotation. All three groups were similar in size. There were eleven students who completed simulation before going to clinical. All of these participants agreed that simulation: (1) helped them communicate better with other nurses; (2) increased their confidence in communicating with other nurses; (3) improved their communicate skills with children and their families; (4) increased their confidence in their ability to collect data on a pediatric patient; (5) improved their assessment skills to assess a child; (6) helped them gain more pediatric knowledge and improve their ability to provide age appropriate care; (7) improved their ability to recognize areas where error occurs more easily in pediatric setting; and (8) increased their overall confidence with their skills in a pediatric setting. Nine out of eleven agreed or somewhat agreed that they performed more psychomotor skills in the HFS lab and seven thought the clinical unit provided greater learning opportunities than the HFS scenario did.

There were fourteen participants who completed the HFS scenario during their clinical rotation on the pediatric unit. They all perceived they could better assess a child following the HFS scenario. Thirteen perceived that they: (1) are more confident collecting data on a pediatric patient; (2) gained more pediatric knowledge and are better able to provide pediatric care; (3) can recognize where

errors can occur more easily; (4) are more confident in their skills related to the pediatric patient; and (5) performed more psychomotor skills in the simulation event. Twelve participants perceived they could better communicate with children and families, and gained more confidence communicating with other nurses following the HFS scenario. Ten participants perceived they could communicate better with nurses. The majority of this group disagreed or somewhat disagreed that the clinical setting provided a better opportunity for learning than the HFS lab (n = 8).

Twelve participants completed the HFS scenario after their pediatric clinical rotation. The majority (n = 11) perceived that HFS allowed them to: (1) better assess a child; (2) improve their pediatric knowledge and better prepared them to take care of a pediatric child; (3) help them recognize where errors occur more easily; (4) become more confident completing skills in pediatrics; and (5) perform more psychomotor skills within the HFS lab than on the clinical unit. Ten believed they were: (1) more confident communicating with other nurses; (2) better able to communicate with children and families; and (3) more confident collecting data on the pediatric patient. Eight of those participants believed the event helped them communicate better with nurses. This group was split evenly with six perceiving that the clinical setting provided greater opportunities for learning than HFS and six perceiving the HFS provided greater opportunities for learning.

From the findings it is evident that those who participated in the HFS scenario before going to the actual clinical setting perceived that they had gained

confidence and skills associated with the learning outcomes of communication, knowledge acquisition and psychomotor skills. However, regardless of when the HFS lab took place, students generally perceived that they experienced an increase in knowledge and confidence related to these three learning outcomes.

All groups were split closely in their opinion as to whether the clinical setting provided a greater opportunity to learn than the HFS scenario. In addition to this finding it was noted that all three groups also perceived that they performed more psychomotor skills in the HFS scenario even though they were all split on whether clinical was a better learning environment. This was supported by the research by Howard et al. (2011) who reported that students believed simulation helped them better understand concepts, stimulated their critical thinking and that knowledge was gained and could be transferred to the clinical setting.

Communication. Most participants believed that they were better able to: (1) communicate to other nurses; (2) with children and/or their families; and (3) had increased confidence when communicating with other nurses, after they completed the HFS scenario. Each demographic characteristic of the participant group was examined in relation to their perceptions of HFS and communication skills after the scenario.

The majority of students had previous HFS experience and most of these students agreed that: (1) they were better able to communicate with children and families; (2) were more confident with their communication with nurses and; (3) reported they could communicate better with nurses. When participants

completed the HFS scenario, they worked alongside other nursing students, the nurses who acted as the mother of the pediatric patient, and the clinical instructor. Reising et al. (2011) stated that collaborating with other nurses in HFS helps nursing students develop interprofessional skills. The results from this study are supported by findings by Reising et al.as the majority of the students perceived the HFS scenario that they participated in helped increase their overall communication skills.

Even the small number of participants who had no previous experience perceived that they also improved in their communication skills from just one pediatric HFS scenario. The findings revealed that both groups, those who had no previous pediatric exposure and those who did, felt an improvement in their communication skills after completing the simulation scenario. This finding differs from that reported by Lambton, O'Neill and Dudum (2008) who found students had less agreement as to whether simulation improved their ability to communicate or not.

The findings were very similar between those who participated in the HFS scenario before, during or after their clinical rotation. The vast majority within all three groups perceived that they had improved skills after the HFS scenario. Current research supports this finding that there is improved communication and/or improved confidence with communication when using simulation (Guhde, 2011; Kaddoura, 2010).

It is important to also note that there was an identified statistical correlation between communication and when the HFS scenario took place (p =

.28). This may be because participants had more opportunity in the HFS scenario than they had on the pediatric floor, as some participants indicated that they did not have a pediatric patient during their clinical rotation. Lack of access to pediatric patients has been noted as a reality within pediatric nursing education.

Knowledge acquisition. Most participants agreed that they gained more confidence in their ability to collect data on pediatric patient, gained more pediatric knowledge and are better able to give age-appropriate care after the HFS scenario. However, participants were divided in their opinion on whether the clinical setting provided greater opportunities to learn than did the HFS. This may be related to the timing of when they participated in the HFS scenario and if they had experience with a pediatric patient during their clinical rotation.

Participants who had pervious simulation experience perceived that they had an increase in their knowledge on pediatrics following the HFS. Although the number was not statistically significant, the few participants who did not have previous experience with simulation also had the same belief related to their knowledge acquisition. The number of participants who had previous experience with children and those who did not, were almost equal. Both groups perceived their knowledge of pediatrics improved from participating in the HFS scenario. As well, participants from all three time intervals of when the HFS scenario occurred in their course perceived they had an increase in knowledge following the HFS scenario. The belief that students' skills and confidence increase after HFS is supported by the existing literature (Childs & Sepples, 2006; Laschinger et al., 2008; Schlairet & Pollock, 2010; & Sullivan-Mann, Perron & Fellner, 2009).

Psychomotor skills. All participants except one believed that after the HFS scenario they were better able to access a child, and all participants except two believed that they were more confident with their skills in the pediatric setting. The majority of the participants perceived that they performed more psychomotor skills in the HFS scenario than in the pediatric clinical setting. However, four participants disagreed or somewhat disagreed with this statement, supporting that they perceived they performed more psychomotor skills in the pediatric clinical setting. The four participants who selected the negative response were examined to determine when they completed their HFS scenario: no relationship was found with the timing of the HFS scenario. Casida &Shpakoff (2012), Hicks, Coke & Li (2009) and Radhakrishnan, Roche & Cunningham (2007) all reported students had improved psychomotor skills following HFS. Research by McCaughey and Traynor (2010) and Parker et al. (2011) found that students perceived their patient assessment skills were enhanced after simulation, coinciding with the perceptions found in this study.

Relationship between HFS and Student's Perceptions

The second research question was examined through data analysis using SPSS examining the relationship between pediatric HFS and undergraduate nursing students' perceptions of its usefulness for their knowledge acquisition and development of communication and psychomotor skills. This study found there is a positive relationship between high fidelity simulation learning experiences and students' perceptions of their knowledge acquisition and development of communication and psychomotor skills. All students did not agree with the

statement that “the clinical setting provided more opportunities than the simulation”. Results indicate 51.4% agreed or somewhat agreed that the actual pediatric unit in the clinical setting provided greater opportunities to learn, while 48.6% perceived that simulation provided a greater opportunity for learning about pediatric nursing. This strongly supports the research question with students supporting the use of simulation for obtaining pediatric learning outcomes. As noted in Table 10, each individual question on the three learning outcomes (knowledge acquisition, development of communication and psychomotor skills) supported the hypothesis ($p = 0.00$). Analysis of the individual questions and the subscales both produced the same results.

An examination of the literature found that nursing students generally believed that HFS should not be used as a single tool for nursing education but rather would be beneficial when used in conjunction with both clinical and classroom teaching (Howard et al., 2011; Kemeg et al., Kirkman, 2013; Kubin et al., 2013). The findings in this research study are supported by the existing literature. This is an interesting finding as the majority of participants in this study stated that they had performed more psychomotor skills in the pediatric HFS scenario.

Based on the results, it seems that students value whatever experiences were gained from the clinical setting. This idea is supported again through Table 10 where the chi-square test retains the null hypothesis indicating no significant difference between HFS learning outcomes and the students’ perception regarding whether the clinical area provided more opportunities. Pauly-O’Neill et al. (2013)

also had similar results as the students in their study had more experiences through simulation but evidently the findings indicated that the combination of clinical, classroom and simulation is most preferred and effective.

Qualitative Responses

Three qualitative questions were utilized to obtain insight regarding participants' perceptions of the use of HFS for learning in a pediatric course. The three questions focused on participants' perceived areas of improvement in their practice from using HFS, how HFS made a difference in caring for pediatric patients in the clinical setting, and the type of knowledge they were able to transfer from using HFS to clinical. It was noted that some participants did not answer one or more of the qualitative questions.

Areas of improvement in practice. All but three participants responded to this question. Those who did respond had similar responses. The most common themes are described below.

Communication. Most participants (n = 21) perceived that their communication skills improved, specifically with children. Participant #25 describes her improved communication with children as, "communicating in a way a child would understand and feel safe and comfortable". Participant #37 indicated the area of practice she improved in was "to effectively communicate with young patients" after the high fidelity simulation event. As most teaching within undergraduate nursing education program is in the adult context it is important to recognize that learning communication skills specific to pediatrics is important. HFS allowed participants to improve their communication skills with

this population group. Almost all participants had exposure to children in some way, either through work, volunteering or family, but felt that the HFS experience helped them acquire increased communication skills with children.

Emergency response. Participants perceived HFS helped improve their response and knowledge around emergency situations and specifically cardiac codes (n=15). Participate #19 stated, "It was good to experience a code without the stress of it being real. It was good to be able to reflect on it and watch the things you can do better next time to be better prepared for reality". The participant referred to how her practice improved by watching the video after the scenario allowing her to reflection on her participation in the emergency. Participant #17 also noted, "this simulation helped me learn a lot and how to act in an emergency situation. I found it very helpful because we do not get a whole lot of experience with children on the floor". Participants may perceive their practice improved because of the lack of any exposure to real pediatric emergency situations, thus having any additional exposure to situations that may rarely occur increased their perceptions of improvement for dealing with it in the future.

Assessment skills. The third most common theme (n=11) in response to what areas improved was related to an increased knowledge surrounding assessment skills of a pediatric patient. Participant #6 stated she had an" increase in confidence with assessment skills". Most participants, including #35 simply stated, "assessment of a pediatric client". This coincides with the findings from the surveys related to psychomotor skills where the vast majority of participants perceived they performed more skills in the pediatric HFS scenario than in the

clinical setting. If participants did not have exposure to a pediatric patient while in the clinical setting, the HFS scenario would provide them with opportunity for increasing their assessment skills.

Medications. Some participants (n = 8) indicated having gained experience with medications for pediatric patient in the HFS scenario. Participant #14 was even more specific and stated that she has gained more knowledge around medication dosages in particular. This participant also stated, "the pediatric simulation helps with knowing proper drug dosages, also how quickly a child's health can change". Medication dosages for the pediatric population are different than for the adult population, therefore with most of the educational focus on adult patients, students may feel less confident when completing pediatric medication dosages.

Intravenous skills. Another common theme for area of improved practice was with intravenous (IV) therapy. Some participants (n = 5) perceived the HFS scenario helped their IV skills. Participant #32 indicated knowledge was gained "initiating peripheral intravenous lines". Participant #23 stated that her practice improved on "IV insertion and hooking up an IV line".

Additional areas of improvement. Critical thinking, teamwork, charting, oxygen therapy, management and psychomotor skills were also identified as areas where participants' perceived their practice had improved from using HFS.

How HFS made a difference when caring for pediatric patients in clinical. In the second qualitative question, participants were asked how did the pediatric simulation learning scenarios make a difference for them when caring

for pediatric patients in clinical. It is noted that one group of participants (n = 10) had the HFS scenario after their clinical component and would not have had the opportunity to practice in the pediatric clinical setting following.

Communication. The most common theme from the responses was communication. Participant #34 stated, "it provided me with better communication skills for caring for a pediatric patient in the clinical setting". Participant #37 responded "it made me more confident in communication with younger patients. Taught me to never promise things unless it is possible". Participants' perception that communication was gained from their experience with HFS is supported by these responses.

Additional themes. The remaining responses, although less frequent, were increased confidence (n = 3), general experience with a child (n = 3), learning reactions of children (n = 2), critically thinking (n = 2), medications (n = 1), assessment (n = 1), and codes (n = 1).

Pediatric knowledge transfer. The last qualitative question asked participants what knowledge they were able to transfer to the pediatric clinical setting after the HFS scenario. It is important to note that not all participants returned to the pediatric clinical area following the HFS scenario.

Communication. Communication was the most common theme in the responses to this question with 18 participants providing it within their answers. Participant #31 indicated she transferred communication techniques and participant #32 stated "age-appropriate communication skills". Participant #23 responded she "transferred communication of pediatric patients because I learned

of their ability to take things literally and how scared they can be of some little things".

Assessment. There were eight participants who identified transferring pediatric assessment skills from the HFS scenario to the clinical setting. Most of the other participants stated that their overall assessment skills from the simulation scenario were transferred when they were in the clinical setting.

Age-appropriate care. Age-appropriate care was a common theme identified by five participants. Participant #15 described the knowledge she transferred as, "providing care in a way that was appropriate to child's developmental level".

Additional areas of knowledge transfer. Other areas of knowledge that participants indicated they transferred from the HFS scenario to the clinical setting were medications, codes, and teamwork.

Acquisition of communication skills. Communication was the most common theme in the responses to all three qualitative questions. Participants perceived that their communication skills with pediatric patients improved through their experience HFS, and was transferrable to the clinical setting. While Lambton and Dudum (2008) did not have strong evidence that simulation helped nursing students' communication skills or their ability to communicate with children, families, and other health care professionals, Resising et al. (2011) and Bambini et al. (2009) had different results. The research conducted by both Resising et al. and Bambini et al. reported that students felt that simulation scenarios utilizing high-fidelity manikins improved their communication skills.

Limitations

There were several limitations noted in this study. The sample size was small, posing a risk to significant statistical analysis. Due to the small sample size, most of the demographics of the participants were similar making a very homogenous group. This impacts the generalizability of the findings. Generalizability is the degree to which findings can be applied to similar individuals other than those who participated in the research (Polit & Beck, 2011). If conducted through multiple universities, the results may change due to the homogenous sample. It is believed that the sample is a fair representation of university nursing students within Atlantic Canada only.

Another limitation of this study is that participants all had unique and different experiences while in their pediatric clinical. Participation in the HFS scenario was at different intervals during the pediatric course so not all participants had the opportunity to work in the clinical setting following their HFS experience. It was also noted in the survey responses that some participants did not get experience with a real pediatric patient in the course as they were assigned to adult patients while on the pediatric unit, which might have an impact on their perceptions of being able to transfer skills learned in the HFS scenario, thus impacting the results.

The selected focus for the HFS scenario may have limited the results. Students participated in a single HFS scenario event pertaining to a child in a situation that becomes a critical emergency event. The stress of the critical event, unknown to students when it started, may have influenced participants' reactions

and perceptions of their learning overall. Having additional events or conducting this research with a single non-critical event may yield different perceptions regarding HFS.

All the participants were aware that the researcher was a former nursing instructor for some of the participants. This may have altered their perception of the learning experience with HFS regardless of the information they were provided indicating that the researcher would have no impact on their current or future course grades. This position of authority may have influenced some participants' perceptions and responses to the survey.

Conclusion

This study adds to the growing body of knowledge examining the relationships between nursing students' characteristics and their perceptions of acquiring pediatric focused learning outcomes using HFS. Secondly, it adds to the knowledge of the relationship between HFS learning experiences and undergraduate nursing students' perceptions of its usefulness specifically for knowledge acquisition and development of communication and psychomotor skills.

The results of this study did not provide a statistically significant association between student characteristics and their perception of using HFS for acquiring learning outcomes, with the exception of the group of students who received the HFS prior to their clinical experience, specifically in the subscale of communication. The statistically significant result showed that there was a weak positive correlation between receiving their HFS before clinical and the subscale

of communication. Their perception was that their HFS improved their communication skills if they had this experience prior to clinical. The other groups of students who received HFS during or after their clinical experiences did not perceive there to be any statistically significant improvement in their communication, knowledge and psychomotor skills because of the HFS event. Further research surrounding pediatric learning outcomes and the benefits of HFS for delivering pediatric nursing education is warranted.

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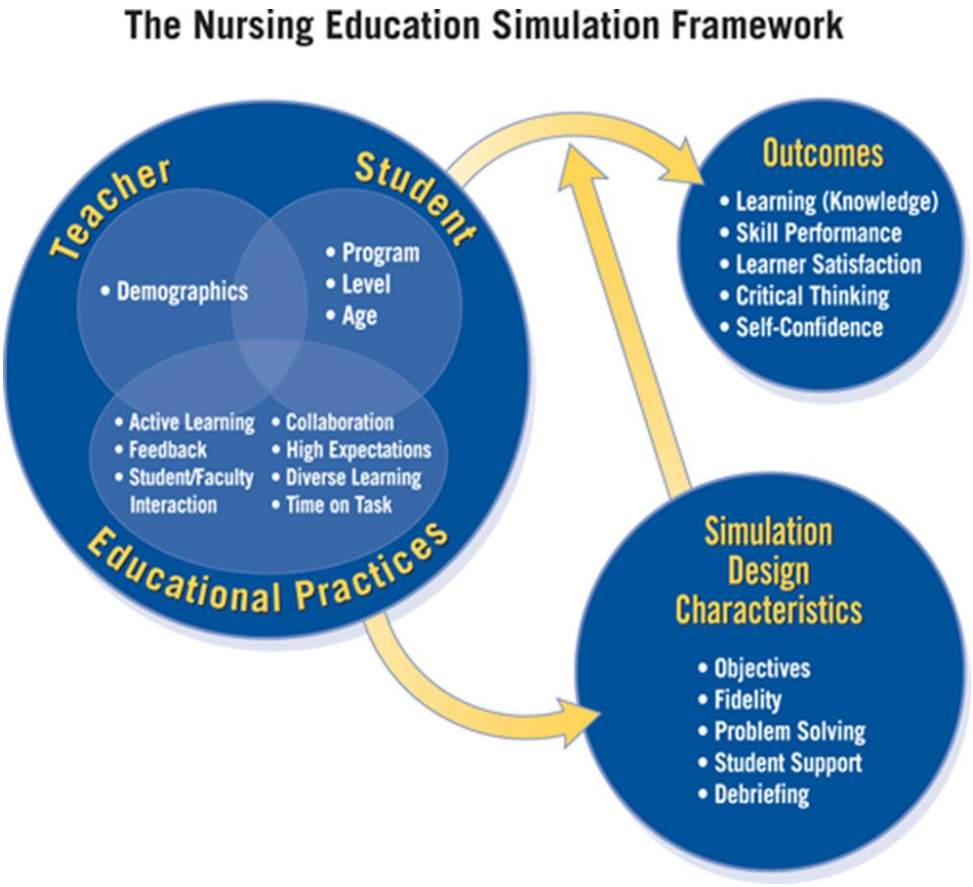
Appendix A : The Nursing Education Simulation Framework



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Appendix B: Recruitment Script

Thank you for meeting with me today.

I am a student in the Masters of Nursing program at Athabasca University and am at the thesis stage of my graduate studies. My research project is called "The Relationships Between Nursing Students' Characteristics and How They Perceive Using High Fidelity Simulation For Attaining Pediatric Learning Outcomes". Holly LeDrew, the research coordinator at Western Regional School of Nursing, is also here today to assist me.

The purpose of this research is to examine the relationships between undergraduate baccalaureate nursing students' characteristics and how they perceive using high fidelity simulation (HFS) for attaining pediatric learning outcomes. HFS is a newer teaching method that has progressively been incorporated into nursing education as a means of meeting increasingly high demands on educational programs. Increased enrolment and decreasing inpatient pediatric admissions have influenced this change. My study is being undertaken at a time when there is insufficient information available on this topic, as there are few studies to date. I anticipate the findings from my proposed study will provide information that can be used to support students and to facilitate learning by this newer teaching-learning modality.

I am also a faculty member at Western Regional School of Nursing and have taught many of you previously. This can potentially affect the relationship between you, the participants and me, the researcher, as you may perceive me as an authority over you. To the best of my knowledge, I will not be teaching you in future courses for the duration of your program, therefore I will not be in a position of authority or have an ability to determine your course grades. I also will reinforce the fact that participation in the study is completely voluntary and choosing to participate or not participate will in no way influence your academic achievements, past or future.

Students who agree to participate in the study will be asked to complete two surveys. The first survey consists of demographic data questions, such as age, gender, the program you are a student in, your previous experience with children and with learning using high fidelity simulation. The second survey asks questions specifically to your learning experiences in the simulation scenarios. The surveys will take approximately 15 minutes to complete. If you agree to participate information cannot be withdrawn once collected due to the data collection process. Also, by completing and submitting the surveys you will be indicating your consent to participation and for the data to be included in the research study.

Go ahead and read the information letter I have passed out. I will provide a few minutes for reading then see if there are any questions. You may keep the information letter but please do not place any marks or identifying data on the survey papers you are handing back in as I want to keep the anonymity of each student throughout the research process.

You have all had the opportunity to read the letter. Are there any questions? Once I leave the room for students wishing to participate in this study, you can complete the two surveys then put them into the envelope provided to you. If you do not wish to participate, wait for a few minutes, then place the surveys into the envelope provided to you and seal it. This way I nor the research coordinator will know who participated or did not participate. I will now leave the room but please pass your envelope to the research coordinator as you leave the classroom. Thank you so much for your time.

Should you require any further information from me, I am available at (709) 785-1746, or to speak with my thesis supervisor, please call Mariann Rich at 1-866-751-2431 or (780) 436-6637.

*If you agree to participate information cannot be withdrawn once collected due to the data collection process. Also, by completing and submitting the surveys you will be indicating your consent to participation and for the data to be included in the research study.

**For any questions or concerns regarding your rights as a research participant please contact Health Research Ethics Authority: 709-777-6974 or info@hrea.ca

Appendix C: Information Letter to Participants

Athabasca University

Study Title: "What Are the Relationships Between Nursing Students' Characteristics and How They Perceive Using High Fidelity Simulation For Attaining Pediatric Learning Outcomes?"

January 10th, 2013

Dear Nursing Student:

I am inviting undergraduate nursing students to share their experience of simulated pediatric scenarios using high fidelity simulation in their pediatric clinical course. The experiences will be collected by using two surveys which will take approximately 15 minutes to complete.

The first survey collects demographic information about you as a student and includes questions on gender, age, program you are in, previous experience with children, and previous experience learning using high fidelity simulation. The second survey consists of 10 questions surrounding your perceptions regarding confidence, communication and other aspects regarding your simulation experience. The data collected will be reviewed by the researcher after the completion of the course, and results will be analyzed for statistical purposes to examine student characteristics and their perceptions of the use of high fidelity simulation for attaining pediatric nursing competencies.

Participation in the survey is voluntary. Whether you decide to participate or not, it will not impact your course grade in any way. Names of participants will not be attached to the surveys. The researcher will ensure every method will be taken to guarantee confidentiality of all participates.

If you decide to participate, you can complete the surveys, seal them in the envelope provided, then pass the envelope to the research coordinator when you leave the classroom. The surveys will be locked up in a cabinet by the research coordinator and opened by the researcher after final course grades have been posted. If you agree to participate information cannot be withdrawn once collected due to the data collection process. Also, by completing and submitting the surveys you will be indicating your consent to participation and for the data to be included in the research study.

This study has been granted approval by Athabasca University Research Ethics Board and the Health Research Ethics Authority. Approval has also been obtained from Western Regional School of Nursing to conduct this study. If you have any questions or comments regarding the study please feel free to contact my supervisor (mrich@athabsacau.ca; 1-866-751-2431), the AU Research Ethics Board (research@athabascau.ca ;1-800-788-9041 ext. 6651) or myself (ehurley@grenfell.mun.ca; 637-5000 ext 6704) at any time.

Thank you for your time.

Sincerely,

Erica Hurley, BN RN
RN
Principal Researcher
ehurley@grenfell.mun.ca
(709)637-5000 ext 6704

Mariann Rich, PhD (C),

Supervisor
mrich@athabsacau.ca
1-866-751-2431

This study has been reviewed by the Athabasca University Research Ethics Board. If you have any questions concerning your rights as a possible participant in this research, please contact Athabasca University Research Ethics Board at 1 (780) 675 6718 or rebsec@athabascau.ca.

Appendix D: Demographic Survey

Please circle your answers. You may select more than one answer for some questions. Please do not place any indentifying data or other marks on these papers. All answers are confidential.

1. Gender:

A) Male B) Female

2. Age:

A) 20-25 years B) 26-30 years C) 31-35 years

D) 36-45 years E) 46 yrs or older

3. What program are you currently enrolled in?

A) Bachelor of Nursing (Collaborative) Program: four-year degree

B) Bachelor of Nursing (Collaborative) Fast-Track Program: two year degree

4. Have you been involved with any high fidelity simulation (HFS) learning events before?

A) YES B) NO

5. If you answered YES to question 4, how many times have you been involved with HFS in the past?

A) 1 B) 2

C) 3 D) 4 or more_____

6. If you answered YES to question 4, what role(s) were you in when you participated in HFS in the past? Select all that apply.

A) Health Care Employee B) Volunteer Capacity

C) Nursing Student (Undergraduate) D) Other_____

7. If *YES* to question 4, how many contact hours have you had previously with HFS learning?

_____

8. Have you ever or are you currently employed in a health care setting?

A) YES B) NO

9. If *YES* to question 8, in what role?

A) Licensed Practical Nurse B) Personal Care Attendant

C) Other_____

10. Have you or do you work in the area of pediatrics?

A) YES B) NO

11. Please select all statements that apply to you.

A) I have my own children

B) I have exposure to children in my extended family

C) I have worked or with children

D) I have volunteered with children

E) I have had no exposure to children in my personal or work life

12. Have you had experience with children in any other clinical course?

A) YES B) NO

13. If YES to question 12 can you name the course(s) and in what capacity?

_____

_____

14. When did you complete your pediatric simulation scenario?

A) Before clinical started

B) During my clinical rotation

C) After my clinical was completed

15. What role did you play in your pediatric simulation scenario?

_____

Appendix E: Permission Letter to Use Survey

Judith lambton <lambtonj@usfca.edu>
Fri 10/5/2012 11:36 AM
Masters
To:
Hurley, Erica J.;
Yes absolutely. I am happy to help in any way.

------Original Message------

From: Hurley, Erica J.

To: lambtonj@usfca.edu

Subject: Tool

Sent: Oct 4, 2012 11:49 AM

Hello Ms. Lambton,

I am a Master of Nursing student with Athabasca University. I am in the proposal process of my thesis work and my research question is "Is there a relationship between pediatric high fidelity simulation learning experiences of undergraduate nursing students and the acquisition of pediatric nursing knowledge, and development of communication and psychomotor skills?". I reviewed your work, particularly your article "Simulation as a Strategy to Teach Clinical Pediatrics Within a Nursing Curriculum" and I believe your research tool would be applicable to my research. I am writing to inquire if you would grant permission to adapt the tool for my proposed research? I can send the requested revisions that I would make upon request. Also, if you have any questions or concerns you can also contact my supervisor via the information provided below. I look forward to hearing from you in the near future. Thank you.

Erica Hurley, BNRN
709-785-1746

Mariann Rich
Assistant Professor
Centre for Nursing & Health Studies
Athabasca University
Ph: 780-436-6637
Toll free: 1-866-751-2431

Appendix F: Student Perception Survey

Having participated in the high fidelity simulation labs in this pediatric clinical course, please circle the one response below each statement which most relates to you. If you agree to participate the information collected cannot be withdrawn due to the data collection process. Also, by completing and submitting the surveys you will be indicating your consent to participation and for the data to be included in the research study.

1. I communicate better with other nurses following the pediatric simulation learning scenarios.

   Agree Somewhat agree Somewhat disagree Disagree

2. I feel more confident about communicating with other nurses on the care of pediatric patients.

   Agree Somewhat agree Somewhat disagree Disagree

3. I feel I can communicate better with children or their families.

   Agree Somewhat agree Somewhat disagree Disagree

4. I feel more confident about my ability to collect data on pediatric patients.

   Agree Somewhat agree Somewhat disagree Disagree

5. I am better able to assess a child.

   Agree Somewhat agree Somewhat disagree Disagree

6. I have gained more pediatric knowledge and am better able to give age-appropriate care.

   Agree Somewhat agree Somewhat disagree Disagree

7. I can recognize areas where error occurs more easily in a pediatric setting.

   Agree Somewhat agree Somewhat disagree Disagree

8. I feel more confident about my skills in a pediatric clinical setting.

   Agree Somewhat agree Somewhat disagree Disagree

9. I have performed more psychomotor skills in the pediatric simulation labs than in the pediatric clinical setting.

   Agree Somewhat agree Somewhat disagree Disagree

10. Being in the pediatric clinical setting provides greater opportunity to learn than being in the pediatric simulation lab.

    Agree Somewhat agree Somewhat disagree Disagree

11. What areas of your practice have improved through your participation in the pediatric simulation lab?
12. How did the pediatric simulation learning scenarios make a difference for you when caring for pediatric patients in clinical?
13. What kinds of pediatric knowledge were you able to transfer from the pediatric simulation learning scenario to real pediatric patients?

Thank you for your participation.

Appendix G: Approval from AU REB

MEMORANDUM

DATE: **December 14, 2012**

TO: Erica Hurley

COPY: Mariann Rich (Supervisor)
Janice Green, Secretary, Athabasca University Research Ethics Board
Dr. Simon Nuttgens, Chair, Athabasca University Research Ethics Board
Eileen Paluck, Ass't to Dean, CNHS

FROM: Dr. Sharon Moore, Chair, CNHS Research Ethics Review Committee

SUBJECT: **Ethics Proposal #CNHS-12-07-Hurely-E:** **"***"What Are the Relationships Between Nursing Students' Characteristics and How They Perceive Using High Fidelity Simulation For Attaining Pediatric Learning Outcomes?"*"

Thank you for providing the additional information requested by the Centre for Nursing & Health Studies (CNHS) Research Ethics Review Committee.

I am pleased to advise that the above-noted project has now been awarded **APPROVAL TO PROCEED**. **You may begin your research immediately once you have your relevant health regions' ethics approval in place. Please forward that approval for file purposes only, once you have received it.**

This approval of your application will be reported to the Athabasca University Research Ethics Board (REB) at their next monthly meeting. The REB retains the right to request further information, or to revoke the interim approval, at any time.

As implementation of the proposal progresses, if you need to make any significant changes or modifications prior to receipt of a final approval memo from the AU Research Ethics Board, please forward this information immediately to the CNHS Research Ethics Review Committee via Dr. Sharon Moore sharon.moore@athabascau.ca for further review.

If you have any questions, please do not hesitate to contact sharon.moore@athabascau.ca .

We wish you all the best with your project.

Appendix H: Approval from Setting REB

Health Research Ethics Authority

Ethics Office
Suite 200, Eastern Trust Building
95 Bonaventure Avenue
St. John's, NL
A1B 2X5

December 19, 2012

Mrs. Erica Hurley
15 Davis Drive
P.O. Box 36
Mount Moriah, NL A0J 1J0

Dear Mrs. Hurley:

Reference # 12.279

Re: **What are the relationships between nursing students' characteristics and how they perceive using high fidelity simulation for attaining Pediatric learning outcomes?**

Your application received an expedited review by a Sub-Committee of the Health Research Ethics Board and **full approval** was granted effective **December 18, 2012.**

This approval will lapse on **December 17, 2013**. It is your responsibility to ensure that the Ethics Renewal form is forwarded to the HREB office prior to the renewal date. *The information provided in this form must be **current to the time of submission** and submitted to the HREB **not less than 30 nor more than 45 days** of the anniversary of your approval date.* The Ethics Renewal form can be downloaded from the HREB website http://www.hrea.ca.

This is to confirm that the following documents have been reviewed and approved or acknowledged (as indicated):

- Application, approved
- Recruitment Script, approved
- Information Letter to Participants, approved
- Demographic Survey, approved
- Survey for Students, approved
- Letter of Support from School of Nursing, approved
- Proposal, approved

The Health Research Ethics Board advises THAT IF YOU DO NOT return the completed Ethics Renewal form prior to date of renewal:

- *Your ethics approval will lapse*

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