Undergraduate Nursing Students' Satisfaction with Low- and High-Fidelity Simulation

by

Sumayah Kamal Fatane

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Abstract

Clinical simulation has been a long-standing and integral part of nursing education, and continues to make an important contribution to both nursing education and clinical practice. Few studies have focused on evaluating nursing students' satisfaction with different types of simulation, and in particular using valid and reliable instruments. A descriptive, cross-sectional and retrospective post-test study was conducted to examine nursing students' satisfaction with low-fidelity simulation (LFS) and high-fidelity simulation (HFS). Thirty-five 4th year nursing students who met the eligibility criteria completed the Satisfaction with Simulation Experience Scale (SSE) and a demographic questionnaire via Fluidsurvey. The SSE is an 18-item scale developed by Levett-Jones et al. (2011) and consists of three subscales: Debriefing and Reflection (D&R); Clinical Reasoning (CR); and Clinical Learning (CL). A paired *t*-test analysis revealed a significant difference in the CL subscale mean scores between LFS (M = 4.09) and HFS (M = 3.78), p = 0.008. There were no significant differences in mean scores for the total SSE, the D&R subscale, or the CR subscale between LFS and HFS. Participants were also asked to rank the top three aspects of their LFS and HFS experiences. The ranking question revealed that the opportunities to practice new skills, and to apply clinical reasoning and decision-making were among the top three ranked features for both LFS and HFS. Also included in the top three ranked items identified for LFS was the preparation of materials and orientation and for HFS was engagement and realism. Recommendations for clinical education programming in nursing education include: combining different types of fidelity in clinical simulation; providing additional HFS sessions and orientation for students; and providing more training and support for nursing instructors conducting simulation education.

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Chapter 1: Statement of the Problem

Comparing undergraduate nursing students' satisfaction with Low-Fidelity Simulation (LFS) and High-Fidelity Simulation (HFS) experiences is the focus of this research. This chapter will introduce the topic of simulation and describe LFS and HFS, including incorporation of clinical simulation in health care education, and its prevalence therein. The focus will then turn to how simulation can enhance the learning experiences of student nurses. Finally, the purpose and significance of this study will be outlined.

Simulation is defined as the creation of situations that are as real as possible for the purpose of education, training and evaluation (Edith Cowan University, 2011). The types of simulation range from LFS to HFS. Fidelity refers to the degree of reality replicated, and may range from partial replication of a realistic environment to an actual situation (Boulet & Swanson, 2004; Nehring & Lashely, 2009). Historically, simulation has been an integral part of nursing education, and continues to make an important contribution to both nursing education and nursing clinical practice. Few studies have focused on evaluating nursing students' satisfaction with different types of simulation, and in particular using valid and reliable instruments. Nursing students' satisfaction with their education correlates with their academic performance and success in clinical settings (Levett-Jones, McCoy, Lapkin, Noble, Hoffman, Dempsey, Arthur, & Roche, 2011).

Background and Significance of the Problem

Health care education generally involves theory-based knowledge taught in a classroom setting, technical skills practised in clinical skills laboratory settings, and clinical training in health care facilities. Mastering basic health care clinical psychomotor skills, such as measuring blood pressure and administration of intravenous medications, is fundamental to professional nursing practice. Furthermore, clinical reasoning and critical thinking are vital skills in health care professions. The old adage of “see one, do one, and teach one” has long been used in teaching clinical skills to nursing students; however, this method has drawbacks for both patients and students (Harder, 2009). This method may potentially compromise patient safety because students may not be capable of mastering new skills upon their first attempt with the patient, as they must practice these procedures to be competent.

In 2004, patient safety was recognized by the World Health Organization (WHO) as a key health issue around the world. In Canadian hospitals, preventable adverse events were estimated at 70,000 in the year 2000, among which 9,000 to 24,000 adverse events caused death (The Canadian Patient Safety Institute [CPSI], 2009). The Canadian Adverse Events Study reported that in the year 2010, 7.5% of patients admitted to hospitals experienced an adverse event (Manitoba Health, 2013a).

In 1994, at the Health Sciences Centre in Winnipeg, Manitoba, it was determined that 12 preventable infant deaths had occurred in their pediatric cardiac surgery program. Subsequently, the interest in patient safety in Manitoba increased (Manitoba Health, 2013b). A review of these infant deaths resulted in fifty-three patient safety recommendations, one of which emphasized learning from medical errors through an established system (Manitoba Health, 2013b). According to the American Association of Colleges of Nursing (2008), there is a need to change how nursing students are educated, and to emphasize safety and quality care.

The CPSI was formally announced in December 2003 through the First Ministers’ Accord on Health Care Renewal and the work of the National Steering Committee on Patient Safety in an effort to ensure patient safety and quality in health care across Canada (CPSI, 2005). One of the CPSI’s priorities to improve patient safety is to incorporate simulation in health care education and training, and to assess and evaluate current simulation practices in order to develop strategies to better benefit from technology-based education methods (CPSI, 2005).

Simulation was first used in aviation over 80 years ago (Bland, Topping, & Wood, 2011). The aviation industry has used simulation to train pilots so they can handle emergencies competently (Murray, Grant, Howarth, & Leigh, 2008). Simulation as a learning strategy is an "authentic representation of reality" in which hypothetical opportunities are created by integrating practical complexities and theoretical concepts (Bland et al., 2011, p. 668). Bland et al. (2011) define the attributes of simulation as including the following: creating authentic experiences, engaging students in active learning, offering integration of different learning aspects, and providing opportunities to reflect on and repeat practice with feedback in a safe environment. Fidelity is defined as the degree of replicating reality that is multi-faceted, and may range from creating a totally artificial environment to an actual situation (Boulet & Swanson, 2004). It is essential to match the real situation as, consistent with cognitive psychology, it is easy to recall information if taught in an environment resembling the workplace (Khan, Pattison, & Sherwood, 2011).

Clinical Simulation

In health professionals' education, simulation programming has included many forms such as organ models, mannequins, animals, cadavers and, more recently, simulated or standardized patients and virtual-reality simulators (Ziv, Small, & Wolpe, 2000). The methods of simulation differ based on the important aspects of the environment which are to be reproduced and according to the assessment purpose(s), course objectives, and the skills that will be measured (Boulet & Swanson, 2004).

Human Patient Simulators (HPSs) are full-body human simulators or mannequins and are used to teach pharmacology, physiology, and comprehensive scenarios through testing one or more medical situations (Nehring & Lashley, 2004). HPSs, introduced in nursing education in the 1960s (Nehring & Lashley, 2004), are the focus of this study.

LFS less realistically replicates the features of a real patient than HFS (Nehring & Lashley, 2009). LFS models such as “task trainers” are commonly used to teach psychomotor skills and critical thinking (DeYoung, 2009). Additionally, LFS can include non-computerized full-body mannequins that resemble human patients, allowing students to practice basic nursing clinical skills in different clinical situations (Levett-Jones, McCoy et al., 2011). An example of LFS is the Resusci-Anne mannequin, which has realistic functions (Harder, 2009). LFS is fundamental in undergraduate nursing education. LFS includes static mannequins used in training health care students and professionals specific skills such as intravenous fluid infusion, and immersing learners in clinical situations (National League for Nursing Simulation Innovation Resource Center [NLN-SIRC], 2013).

Mid-, medium-, or moderate-level fidelity simulation (MFS) can also be a full-body mannequin, but one that has some physiological characteristics such as heart and breath sounds while still providing less realism (NLN-SIRC, 2013; Rudd, Freeman, Swift, & Smith, 2010) than HFS. An example of MFS is MedSim UltraSim (CPSI, 2005). This type of simulator provides some physiological functions such as heart sounds and can be used to train simple to complex psychomotor skills. Another example is Sim One, a fairly sophisticated mannequin, which was created by Abrahamson and Denson in the late 1960s. It can produce physiological parameters such as breath and pulse, and respond to interventions such as medication administration (Harder, 2009). MFS allows students to focus on two dimensions of simulated learning: practice the new skills learned and make decisions (NLN-SIRC, 2013).

HFS includes computerized, full-body mannequins that are capable of replicating real-life scenarios (Levett-Jones, McCoy et al., 2011) and providing pharmacological parameters and physiological changes in response to interventions, such as relating cardiovascular and respiratory responses to nursing interventions (Parker & Myrick, 2009). Laerdal SimMan is one example of a high-fidelity, instructor-driven mannequin. As such, HFS can be used in multidisciplinary training to provide an integrated and dynamic representation of complex patient conditions (CPSI, 2005). The effectiveness of HFS to develop students' cognitive skills such as clinical reasoning has been reported by Nehring and Lashely (2009).

Clinical Simulation Use in Nursing Education

Currently, health care education programs are directed towards adopting simulation-based education and clinical simulation appears to be increasing in prevalence (Harder, 2010; Nehring & Lashley, 2009; Rudd et al., 2010). LFS and HFS have been used primarily in undergraduate nursing education to teach/assess the following: acute and critical care skills (Landry, Oberleitner, Landry & Borazjani, 2006; Brady, Molzen, Graham, & O'Neill, 2006), critical thinking (Levett-Jones, Gersbach, Arthur, & Roche, 2011; Shinnick & Woo, 2012), obstetrical care (Bantz, Dancer, Hodson-Calton, & Van Hove, 2007; Robertson, 2006), and clinical competency (Beyea, von Reyn, & Slattery, 2007; Winslow, Dunn, & Rowlands, 2005). HFS is used to practice cardiac health care (Hravnak, Beach, & Tuite, 2007), to develop student clinical judgment skills (Dillard, Sideras, Ryan, Carlton, Lasater, & Siktberg, 2009; Lasater, 2006), and in clinical practice for orienting incoming nurses (Ackermann, Kenny, & Walker, 2007).

Simulation is also used for evaluating students' professional competencies. It is imperative to evaluate nursing students' competencies in order to evaluate and improve health care practice and safety measures (Nehring & Lashely, 2009). Students' performance via self-report measures comprises the evaluation piece. In addition, simulation is used for continuing education and licensing of professional health care staff (DeYoung, 2009; Nehring & Lashely, 2009).

Institutional Perception of Simulation-Based Teaching

More emphasis is placed on the obligation for pedagogical adaptations of the health care education system. With the current emphasis on safe and quality health care and the shortage of human and financial resources in the health care system, undergraduate nursing programs are challenged to provide sufficient learning experiences to promote clinical skills acquisition and professional development of their students. In fact, many nursing programs and nurse educators have recognized the importance of adequately preparing students using innovative educational technology such as scenario-based simulation education (Nehring & Lashley, 2009). Nehring and Lashely (2004) reported on an international survey of collaborating nursing schools and simulation centres that utilize high-fidelity human patient simulators from Medical Education Technologies, Inc. Human Patient Simulator. Participants were from 33 programs from the United States, Japan, Australia, England, New Zealand, and Germany. Critical care nursing and nurse anesthesia programs were offered by the simulation centres, and 64% of the sample had acquired their human patient simulator since 1999. About 90.5% of the time the human simulator was used to teach health assessment and 85.7% to teach critical events.

The National Council of State Boards of Nursing conducted a national simulation study from 2011 to 2013 to generate evidence of the effectiveness of intermediate fidelity simulation (IFS) and HFS as a teaching method in nursing education (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014). Students from ten pre-licensure nursing programs across the United States were allocated to one of three study groups: traditional clinical experience, simulation replaced 25% of traditional clinical hours, and simulation replaced 50% of traditional clinical hours. The results indicated no significant differences in clinical competency ($p = 0.688$), comprehensive nursing knowledge ($p = 0.478$), or clinical competence and readiness for clinical practice at six weeks, ($p = 0.706$), three months ($p = 0.$

511), and six months (*p* = 0.527). The authors concluded that the study results indicate up to 50% of clinical placements could be replaced by simulation and provide similar learning outcomes.

In Canada, the CPSI was established in 2003 and identified a number of priorities to improve patient safety, and using simulation was one of these priorities (CPSI, 2005). The CPSI and an Edmonton-based management consulting firm collaborated and developed a 4-step approach to the assessment of patient simulation in Canada. These steps included a review of research, literature and websites on simulation; developing and distributing an online survey to leaders of patient simulation centres or programs; conducting a telephone interview with Canadian and international patient simulation leaders; and developing a current state report from the aggregated survey. A total of 17 simulation centres were identified and 14 participated in the online survey. The vast majority of the centres offered graduate and undergraduate simulation programs and 86% of centres offered continuing professional education programs. Of the 14 simulation centres that participated in the online survey, 13 used HFS and 6 used LFS. For the practical application of simulation, a majority of the centres (71%) used simulation to assess and evaluate competencies of medical professionals and 43% used simulation for other applications such as pathopharmacology and staff orientation.

Gore, Van Gele, Ravert, and Mabire (2012) reported the results of a survey conducted by the INACSL for the purposes of assessing the INACSL membership's current simulation practice in nursing, and whether there were similarities or differences between the simulation practice in the United States and other countries. A total of 254 members: 48 international and 206 respondents from the United States participated in the survey. The results showed that 44% of American and 52% of international participants use a theoretical framework or conceptual model. The majority of members reported that their simulation practice was based on the participants' objectives and level of experiences. Most United States' respondents conducted a debriefing in equal time to simulation, while most of international respondents conduct a debriefing in twice the simulation time. The United States' participants reported higher utilization of simulation for summative evaluation, and were more likely to include simulation as clinical hours compared to international members.

Impact of Simulation

The main purpose of simulation education is to learn through trial and error, and develop students' problem-solving skills (Infante, 1985). Students in labs investigate, examine, reinforce classroom theoretical knowledge, and acquire cognitive and psychomotor skills. Simulated clinical situations allow students to practice new skills and procedures in a safe and supported environment without compromising patient safety. Simulation helps students develop their clinical skills such as psychomotor skills, critical thinking and decision making to help them become competent nurses and provide safe and competent health care to their patients (Prentice & O'Rourke, 2013). Consequently, simulation-based teaching has been emphasized in health care education (Alinier, Hunt, & Gordon, 2004; CPSI, 2005; WHO, 2011).

Nursing students should be appropriately prepared in their education programs to be competent practitioners when they graduate. A positive learning experience contributes to increased student confidence in their abilities, and equips them with basic theoretical knowledge and clinical skills (DeYoung, 2009). Simulation allows the students to familiarize themselves with the various pieces of equipment, procedures, and emotions related to the clinical situation in order to manage patient nursing care without compromising patient safety. Scenario-based simulation can allow students to experience situations that may be rarely encountered in clinical settings, or students may not have the chance to participate in these acute situations in clinical wards (Boulet & Swanson, 2004; Levett-Jones, McCoy et al., 2011). Simulation allows health care students and professionals to practice new procedures without fear of failure or compromising patient safety (Alinier, Hunt, Gordon, & Harwood, 2006; Alinier et al., 2004). Simulation enhances the acquisition of clinical skills (Cioffi, 2001) and bridges the gap between theory and practice (Nehring & Lashely, 2004).

Simulation allows students to repeatedly practice new procedures on a simulated patient, and learn through making mistakes and enhanced self-monitoring (Cioffi, 2001). Furthermore, simulation develops students' skill dexterity, which is central in the process of learning all clinical procedures (Kneebone, 2009). Ziv et al. (2000) indicate that simulation allows educators and students to see finer details of clinical competencies. Realistic patient simulators such as SimOne, have advanced features including heart sounds and displayed blood pressure. These features help students build up clinical competencies that only appear in complex real-world clinical settings, and allow educators to evaluate these competencies. Simulation gives students control over their experiences. During simulation, students actively search and select the information and its consequences, thus controlling the learning processes (Cioffi, 2001).

Satisfaction with Simulation Learning

Students' satisfaction with the learning experience has a significant impact on their academic performance. Satisfaction is the state of well-being as well as students’ feelings and opinions about their learning experience, self-confidence, faculty and the program as a whole (Prystowsky & Bordagy, 2001). Satisfaction is essential for knowledge and skill acquisition, and building student confidence (Pike, 1991) as well as meaningful learning (Williams & Dousek, 2012). Yuan, Williams, and YokMan (2014) identify the essential role of reflection on action during debriefing in the development of students’ clinical knowledge and skills. Improving debriefing methods can enhance student learning and satisfaction with the simulation experience (Levett-Jones, McCoy et al., 2011; McCausland, Curran & Cataldi, 2004; William & Dousek, 2012). Rudolph, Simon, Rivard, Dufresne and Raemer (2007) suggest that professional competencies are enhanced by reflecting on past experiences to self-correct and assimilate old and new experiences in the process of experiential learning.

Adequate preparation of simulation instructors with education theory, such as adult learning theory, and teaching strategies, such as debriefing principles, are necessary for instructors to be able to provide students with satisfying and engaging simulation experiences, which are also meaningful and purposeful (Harder, Ross, & Paul, 2013; Issenberg, Ringsted, Østergaard, & Dieckmann, 2011). Harder et al. (2013) indicate that instructors' comfort with teaching using simulation is essential for student learning and involvement in HFS. In addition, learning from simulation would likely transfer to clinical practice if taught as closer-to-reality nursing skills compared to traditional classroom learning (DeYoung, 2009).

The literature provides support for incorporating simulation-based education in nursing education curriculum. Nurse educators have sought to identify the relationship between student satisfaction with their simulation experiences and the level of mannequin fidelity (Levett-Jones, McCoyet al., 2011; Tosterud, Hedelin, & Hall-Lord, 2013). In addition, there are many aspects of simulation practice that still need to be rigorously investigated such as how, who, and what to simulate and associated educational supports needed, such as preparing and debriefing. There is little reported about evidence-based simulation instruction and practice, and what effect fidelity level of simulation has on participant outcomes and satisfaction.

Purpose of the Study

The purpose of this research study was to compare nursing students’ satisfaction with LFS and HFS in three main areas: debriefing and reflection; clinical reasoning; and clinical learning. In addition, a second purpose was to identify the most valuable aspects of students’ experience with LFS and HFS. These findings can assist educators when developing future simulation experiences.

Significance of the Study

Patient safety has been of great concern to the health care and medical education systems (Khan et al., 2011). Incorporating simulation in health care education curricula has much to offer in the area of error management, competency assessment, and patient safety issues training (Ziv et al., 2000).

Health care professionals, faculty, researchers and health care agencies are concerned about the cost-effectiveness of implementing simulation-based programs to address the needs of both nursing students and nursing programs, including constructing and sustaining simulation (Issenberg et al., 2011). The lack of consistent outcomes of simulated learning is another concern of health care educators and researchers. More research is needed on the designing and implementing of simulation experience and evaluating of students regarding their simulated learning experiences.

Chapter 2: Review of the Literature

In this chapter a review of studies on undergraduate nursing students’ satisfaction with different levels of simulation when learning clinical skills will be presented. The use of evaluation tools with simulation education and students' perceptions of simulation-based education in the health care education system will be discussed. Relevant literature sources were searched using CINAHL, SCOPUS, and PubMed databases. Within these databases relevant article and study reference sources, and additional sources from websites, online journals, theses, and dissertations were searched to expand the literature pool for this study.

Students' Satisfaction with Clinical Simulation

Traditionally, simulation laboratories have been used as the core of nursing educational settings. Both structured and unstructured simulation can be developed in clinical skills to meet individual and team learning objectives (Winslow et al., 2005).

Psychomotor Skills

Simulation has long been used in teaching clinical skills to students in health care education programs. The literature in health care education indicates that the evaluation of clinical simulation was primarily focused on teaching and assessing students’ psychomotor skills development and satisfaction with learning. Psychomotor clinical skills are generally considered to be a core component of nursing education, which includes technical skills such as intravenous injection and measuring blood pressure. Nursing students spend many hours in nursing labs practicing psychomotor skills, and in past years LFS has primarily been used to teach these skills.

Good (2003) claims that simulation in health care education programs can be utilized for teaching and evaluating basic clinical skills such as giving an intramuscular injection, and advanced skills such as patient intubation. Health care education literature supports the use of simulation to teach advanced psychomotor skills (Childs & Sepples, 2006). An advanced and sophisticated HFS mannequin was developed to incorporate mechanical and mathematical models that interact to provide realistic, automatic, and real-time pharmacodynamics and physiological parameters in response to patient conditions and interventions (Good, 2003). Bantz et al. (2007) discuss a variety of simulation methods from games to HFS mannequins in an eight-station clinical simulation day developed to help undergraduate nursing students transfer classroom knowledge of obstetrics and gynecology, and infant care into the clinical setting. The students agreed or strongly agreed that clinical simulation in addition to lecture is more beneficial to apply knowledge in clinical than lecture alone.

Cognitive Learning

Theoretical knowledge. Cognitive learning involves two components: acquisition of theoretical knowledge and development of cognitive skills such as critical thinking (CT) and clinical reasoning (CR). Many studies indicate effectiveness of simulation in increasing knowledge acquisition. Furthermore, simulation allows long term retention of theoretical knowledge by providing opportunity to apply knowledge in simulation and bridge the gap between theory and practice (Cleave-Hoggi & Morgan, 2002).

In a study by Cleave-Hoggi and Morgan (2002), students' satisfaction was reported based on a simulation learning environment that enhanced students' awareness of gaps in their knowledge and incorporated previous knowledge. They investigated medical students' opinions and comments regarding the nature of their HFS learning experiences. The students valued reflection of their experience in a learning environment. Most of the students reported that simulation provided opportunities to elaborate on knowledge through the simulated scenario in a safe and realistic environment. These authors concluded that students perceive the simulated experiences as satisfying when they have the opportunity to participate in active learning in a safe and realistic learning environment that integrates theoretical concepts into simulation and involves reflection on their actions taken during the simulation session (Cleave-Hoggi & Morgan, 2002).

Cognitive skills. The goal of nursing education programs is not only to teach psychomotor skills, but also to develop cognitive skills, specifically CT and CR. Current nursing curricula have shifted to adopt CT skills as an educational outcome (Billings & Halstead, 2012). Romeo (2010) indicates CT is an essential attribute in the process of problem solving and decision making (DM). Some studies report on the effectiveness of simulation to improve CT (Childs & Sepples, 2006; Ravert, 2008; Sullivan-Mann, Perron & Fellner, 2009). In their systematic review of simulation education, Cant and Cooper (2009) reported that six of twelve studies showed the outcome of increased student CT after simulated learning. However, other studies indicate simulation is not effective for developing students' CT skills (Shinnick & Woo, 2012).

Katz, Peifer, and Armstrong (2010) conducted a survey on current use of simulation in the National League for Nursing-accredited BSN schools. Seventy-eight schools responded to the online survey. Sixty schools reported using simulation in core clinical nursing courses such as health assessment and nursing fundamentals. Twenty-one schools reported using simulation for competence or performance evaluation, and 33 schools used simulation to assess student CT. Forty percent of respondents used patient simulation to replace clinical hours, and almost 90% of nursing schools reported that they used simulation to evaluate student CT. Four themes emerged from the open-ended question: development of problem-solving skills, development of CT skills, prioritization, and delegation roles; preparation for transition to clinical; required time for faculty to learn and develop competence in using patient simulation; and replacement of clinical, classroom, and skill laboratory time with patient simulation.

McCausland et al. (2004) used Laerdal SimMan to provide basic concepts and guidelines for successful simulation. In their study 72 nursing students completed a ten-item questionnaire and written evaluation. Among respondents, 83% reported pre-scenario reference materials were useful, 82% believed they had the required knowledge to make appropriate decisions, 97% believed the simulation prepared them for future situations, 96% thought the debriefing was helpful, and most students wanted more simulation earlier in the program. On written evaluation, some students reported experiencing stress during the debriefing and many students were not oriented to the simulator's features.

CR is the ability to think critically in a changing clinical environment (Billings & Hasteald, 2012). Many studies indicate the effectiveness of simulation in teaching CR and DM (Radhakrishnan, Roche, & Cunningham, 2007). However, Lapkin, Levett-Jones, Bellchambers, and Fernadez (2010) claim there is not clear evidence of simulation’s effect on CR acquisition. Cioffi (2001) concluded that it is unknown to what extent the development of judgment in clinical practice can be achieved through simulation.

Health care educators have recognized the importance of student satisfaction with their simulation learning experience. According to Kirkpatrick's levels of outcome evaluation, there are four stages of outcomes: reaction (satisfaction), learning, behaviour, and organization (Kirkpatrick & Kirkpatrick, 2009). There is little reported in the literature about the effect of different fidelity levels on student satisfaction, and the best method to design simulation and evaluate student outcomes. Simulation-based education ideally should be based on specific standards of best practice in order to have the potential benefit of the simulation experience.

Simulation Standards and Framework/Design Models

Students’ learning outcomes are influenced by many factors in the context of simulation education. Some of these factors relate to the simulation learning environment including instructional design and educational practice. When designing simulation learning outcomes, educators are advised to consider these factors.

William and Dousek (2012) examined the factor structure of the Satisfaction with Simulation Education Scale (SSE). They found three factors, Clinical Learning and Reflection (CL&R), Debriefing (Deb), and Clinical Reasoning (CR), that together accounted for 55.5% of the total variance in learning outcomes and student satisfaction.

In order to enhance the simulation practice and evaluation outcomes, the Standards of Best Practice: Simulation were developed in 2011 by the International Nursing Association of Clinical Simulation and Learning (INACSL). The association's mission is to disseminate standards of an evidence-based patient simulation methodology and promote research in the area of clinical simulation and learning environment (INACSL, 2011). The INACSL standards include terminology, professional integrity of participants, participant objectives, facilitation methods, simulation facilitation, debriefing, and assessment and evaluation of participants (INACSL, 2013).

Theoretical framework. The INACSL suggest that simulation should be based on a theoretical framework or conceptual model to guide the simulation practice. Hravnak et al. (2007) discussed the use of HFS Laerdal SimMan to teach cardiac nursing care to basic- and advanced-level nursing students. They indicated that the theoretical framework helps educators in organizing didactic teaching and developing simulation scenarios, and assisting students in systematic thinking.

For designing, implementing, and evaluating simulation in nursing education, the most common model was developed by Jeffries (2005) called the Jeffries National League for Nursing Framework for Designing, Implementing, and Evaluating Simulation. There are five components in this model. The first component is outcomes. The second and third components are teacher and student factors. Proper simulation design is the fourth component. The last component is the intervention of teaching-learning practice.

Learning domains. The best-simulation practice standards have emphasized the role of developing clear learning objectives and shared expected outcomes to provide satisfying learning experience for students. Expected learning outcomes should be at the student level of experience (INACSL, 2013; Jeffries, 2005).

In a simulation education context, there are three domains of learning: psychomotor (psychomotor skills), cognitive (knowledge acquisition and development of cognitive skills), and affective (attitudes, beliefs, and behaviour such as communication skills) (Kardong-Edgren, Adamson, & Fitzg, 2010). The psychomotor domain also involves cognitive and affective skills. Researchers and educators develop simulation objectives according to these learning domains. In order to develop satisfying simulation experiences, educators should design simulation programs according to these learning domains to guide the simulation design and evaluation of outcomes.

In 2009, the CPSI conducted a project to enhance patient safety across the health professions. The CPSI's goal is to build and integrate a framework of safety competencies for the health care professions (CPSI, 2009). Six patient safety learning domains were identified: a culture of patient safety; teamwork for patient safety; effective communication; management of safety risks; optimizing human and organizational factors; and recognizing, responding to, and disclosing adverse events. Simulation-based program developers and leaders need to integrate these domains into simulation education to enhance patient care and quality (CPSI, 2009).

Rudd et al. (2010) have indicated five skill areas that simulation-based education has the greatest potential to effectively deliver, namely: medication and intravenous product preparation and administration; clinical monitoring and management; clinical interventions;

communication and documentation; and teamwork. These five skill areas could guide the design of simulation programs in order to promote acquisition and development of clinical skills and knowledge.

In 2010, the Project Governance Group was a national project managed by Health Work Australia to evaluate current simulated learning environments (SLE) in order to enhance existing and new SLEs (Rudd et al., 2010). An online survey was conducted in Australia with accredited nursing and midwifery schools and undergraduate/professional nursing programs as part of the Simulated Learning Environments' National Project to enhance the use of clinical simulation in nursing education. The survey's key findings include the identification of clinical skill areas (e.g., teamwork, and medication administration and monitoring) that different fidelities of simulation have great potential to deliver. The authors contend that the survey findings are similar to those in other countries in terms of the variety of simulation-based education utilization. The recommendations suggest the need to precisely evaluate simulation processes and outcomes related to student learning.

Inconsistent Simulation Practice and Outcomes

Some studies on simulation evaluation have been based on conceptual models or theoretical frameworks to guide the simulation design and instruction, while other studies did not report a theoretical framework. Howard, Englert, Kameg, and Perozzim (2011) conducted a mixed-methods (survey and focus group) study to evaluate undergraduate nursing student's and faculty's perceptions of HFS instructional design. Kolb's Experiential Learning Theory and Jeffrie's Nursing Education Simulation Framework underpinned the study. The students' overall perceptions were positive, and they reported that simulation helped in understanding concepts, enhanced CT, perceived knowledge gains transferring to the clinical context, valued the simulation experience, and perceived simulation as realistic. Students also reported that they experienced nervousness during simulation.

Wilson, Shepherd, Kelly and Pitzner (2005) evaluated nurses' perceptions of components and functions of Ann Complete Mannequin in terms of its reality, suitability for teaching, and its comparability with other teaching methods in delivering nursing health assessment knowledge and skills. These authors did not report the use of any theoretical model. The students reported that most of Ann simulator components and functions were realistic and, in fact, better than existing teaching methods, and suitable for teaching purposes in terms of appearance, movements, procedures and sounds subsections.

Alinier et al. (2006) conducted a pretest and posttest study design to investigate the effect of an intermediate-fidelity simulation (IFS) on clinical skills and competence of second-year nursing students. The authors did not report a specific theory or framework that underpinned their study. Data were collected pre- and post- simulation using an Observation Structured Clinical Examination (OSCE). The experimental group (EG) followed the traditional curriculum and was also exposed to simulation, while the control group (CG) followed the normal curriculum. The EG received two simulation sessions, each 3 hours long. The students in the EG were divided into two groups, one participated in the simulation while the other observed from different room. All the students in the EG received briefing before simulation and debriefed after simulation. The EG had a significant higher mean score on the OSCE than the control group, but there was no significant mean difference in student perception of stress and confidence.

Brown and Chronister (2009) investigated the effect of HFS on self-confidence and CT of nursing students in an electrocardiogram course. The EG received a 30-minute simulation weekly with debriefing, and the CG only received lectures on weekly basis. No theoretical framework for simulation underpinned the study. There was a significant difference on means of self-confidence between EG and CG, while no significant differences on means of CT scores.

The studies by Alinier et al. (2006), Brown and Chronister (2009), and Wilson et al. (2005) lack frameworks to underpin the simulation practice. The reviewed studies indicate that there are inconsistent practices in, and outcomes from, simulation education. Furthermore, few studies compared different fidelities or types of simulation mannequins.

Simulation Evaluation Tools

Rudd et al. (2010) recommended the need to precisely evaluate simulation processes and outcomes related to student learning. Kardong-Edgren et al. (2010) conducted a systematic review of recent simulation evaluation instruments. The purpose was to discuss learning domains by which evaluation instruments are categorized, as well as challenges in the development of evaluation instruments. Simulation evaluation instruments were classified into three categories: psychomotor, cognitive, and affective domains. Instruments that evaluate students' satisfaction were classified into the affective domain. Kardong-Edgren and his colleagues found that most of the 22 reviewed simulation evaluation tools were lacking validity and reliability measures. They recommended that adoption and progression of simulated learning should be based on empirical evidence of the effectiveness of this innovative educational approach. Effectiveness of simulated learning depends on valid evaluation results.

Currently, a number of psychometrically tested instruments have been developed to evaluate the outcomes of simulation education (Kardong-Edgren et al., 2010). Further research is required to utilize these instruments in the evaluation of simulation-based learning outcomes in different contexts. As a result, more accurate and consistent results will be obtained, and educators and program developers will be able to develop and provide improved simulation programs.

The Satisfaction with Simulation Experience Scale (SSE). The Satisfaction with Simulation Experience Scale (SSE) is a recently developed quantitative scale by Levett-

Jones, McCoy et al. (2011). The SSE consists of three sub-scales: Debriefing and Reflection (D&R), Clinical Reasoning (CR) and Clinical Learning (CL). The D&R subscale measures the students' perceptions of reflection on their feelings and actions taken during simulation and development of motor, affective, and cognitive skills. The CR subscale measures the students' perceptions of cognitive skills development, and the CL subscale measures their perceptions of development and transferability of learned skills including psychomotor, cognitive and affective to clinical settings. Since the development of the SSE, a few studies conducted in Australia have utilized it to examine nursing students' satisfaction with simulated learning.

One study using the SSE was conducted by the scale's developers, Levett-Jones, McCoy et al. (2011). The study's purpose was psychometric evaluation of the SSE and comparison of students' perceptions between MFS and HFS experiences. The study was conducted with 262 second-year and 76 third-year nursing students. The authors performed several psychometric tests for the SSE including content validity by a panel of experts, exploratory factor analysis with varimax rotation to determine the validity of the scale's constructs, and Cronbach's alpha to determine the scale's internal reliability. In this study, the internal consistency was satisfactory (Cronbach's alpha = 0.77). Three factors resulted from the exploratory factor analysis that formed the main subscales of the SSE: D&R, CR and CL, and each had high internal consistency (Cronbach's alpha = 0.94, 0.86 and 0.85, respectively).

The SSE scores revealed no significant differences between scores of the high-fidelity group of second year (M=4.515) and the mid-fidelity group of second year (M= 4.415) ($p > 0.05$). Also, there were no significant differences between scores of the high-fidelity group of third year (M=4.472) and the mid-fidelity group of third year (M= 4.415) ($p > 0.05$). In addition, the authors asked the students an open-ended question regarding additional comments they would like to make about their simulation experience. Although this open-ended question was not part of the SSE, the authors asked it to collect more data on the students’ perception of their simulation experiences.

In response to the open-ended question, students reported that simulation provided the opportunity to practice actively, practice CR, and make clinical decisions in a safe environment. The students reported that they valued debriefing because the instructor challenged them and provided support and feedback, which increased the students' confidence in their abilities. Levett-Jones, McCoy et al. (2011) concluded that the SSE is a valid and reliable tool to evaluate student satisfaction with simulation. As such, appropriate evaluation of simulation’s potential to provide a satisfying and engaging learning experience is required. Moreover, they recommended that further research with different fidelity levels and contexts will support the SSE validity and reliability.

A second study using the SSE (William & Dousek, 2012) was conducted with 167 second- and third-year paramedic students. The study’s purpose was to examine the factor structure of the SSE and its validity for paramedic students. Three factors together accounted for 56% of the total variance namely: Clinical Learning and Reflection (CL&R), Debriefing (Deb), and Clinical Reasoning (CR) and form three subscales of the SSE Scale. They adapted the three subscales: D&R (9 items), CR (5 items), and CL (4 items) from the original SSE in the study by Levett-Jones, McCoy et al. (2011). Williams and Dousek (2012) construct the SSE from three subscales: CL&R (7 items), Deb (6 items), and CR (4 items). They reported the total scale demonstrated a high Cronbach’s alpha of 0.88 with each subscale demonstrating high Cronbach’s alphas (0.88 for CL&R; 0.80 for Deb; 0.78 for CR). These authors concluded that the SSE has strong psychometric measurement properties such as construct validity and reliability yet suggested that the SSE requires further research within different contexts.

The Student Satisfaction and Self-confidence in Learning Scale (SSS). Another instrument commonly used in health care education literature to evaluate student satisfaction was developed by the National League for Nursing (NLN) and Laerdal (a large manufacturer of medical equipment): the Student Satisfaction and Self-Confidence in Learning Scale (SSS). The SSS is a 13-item tool consisting of two subscales: (a) 5-item satisfaction with learning scale, and (b) 8-item self-confidence scale. A few studies have examined the effect of different levels of fidelity simulators on student satisfaction using the SSS. There were five studies evaluating student satisfaction with simulation using the SSS.

First, Butler, Veltre and Brady (2009) conducted a study in the United States in which data were collected by distributing the SSS questionnaire to 32 pre-licensure students completing a pediatric nursing course in an associate degree program. Findings demonstrate that nursing students displayed higher satisfaction and self-confidence scores with HFS than LFS. There was a significant difference between the HFS and LFS scores (M= 61.86, M= 55.33, $p = 0.004$, respectively). These authors emphasized the essential role of active learning in undergraduate education at any simulation level. Active learning is a pedagogy in which students learn through engaging in the process of learning and being active learners. In the context of health care simulation education, students participate in a simulated scenario during which they provide care to a patient simulator and interact with their peers in role-playing. Butler et al. (2009) concluded that HFS improved students' problem-solving skills and increased their productive learning time, and students also perceived HFS as more realistic than LFS. They recommended further research on students with differing levels of simulation experiences and larger samples.

Second, a study in Norway by Tosterud et al. (2013) was conducted with 86 nursing students who were assigned to one of three groups: HFS, LFS static mannequin (SM), and paper and pencil case study (PP). The purpose of the study was to examine the students' perceptions of the different levels of simulation fidelity, and the effect of different educational levels on their perceptions. First-, second- and third-year nursing students were invited to participate in the study. The participants were randomly assigned to one of the groups: HFS, SM or PP. The data were collected using three tools developed by the NLN: the SSS, the Education Practice Scale for Simulation (EPSS), and the Simulation Design Scale (SDS). The results revealed a statistically significant difference between students' perceptions in the three groups: HFS, SM and PP. Only three out of five items of the SDS satisfaction sub-scale showed significant differences, and the PP showed higher scores than the HFS and LFS. Tosterud et al. (2013) concluded that all levels of simulation can be used at all levels in nursing education based on the outcomes desired. The findings indicate students had perceived the case study, a common method of teaching, more positively than HFS. They recommended further research on the effects of having students exposed to different levels of simulations.

Third, a study by Dobbs, Sweitzer and Jeffries (2006) was carried out at Indiana University with 60 nursing students enrolled in an introductory medical-surgical course. The purpose of the study was to test Jeffries's simulation design features to increase self-confidence and satisfaction with instructional design, problem-solving skills and students' knowledge. Five tools were developed by the NLN and used to collect the data: the SDS, the Satisfaction with Teaching Methodology Scale (STMS), the Self-Confidence in Learning Scale (SLS), the Self-Perceived Judgment Performance Scale (SJPS), and cognitive gains pre- and post-tests. Overall, the students were satisfied with the instructional design of the simulation. Cronbach's alpha was reported at 0.94 for the STMS. The students reported that feedback was the most important component of the simulation. Dobbs et al. (2006) concluded that this study added to the body of knowledge of simulation-based education by emphasizing the importance of simulation design features in Jeffries's simulation framework. They suggested further research was needed on simulation evaluation methods to measure simulation applications and outcomes in health care education.

The fourth study was conducted by Sharpnack and Madigan (2012) who evaluated 32 American nursing students' perceptions of LFS enhanced with computer-assisted instruction (CAI). The authors used the LFS as an evaluation method rather than as a teaching method. The students were given similar simulated scenarios to that of the test to prepare for the evaluation. Students were evaluated on performance in a simulated scenario of a 72-year-old patient with diverticulitis, a pressure ulcer, temporary colostomy and a percutaneous endoscopic gastrostomy (PEG) tube. The study was pilot tested, and the authors also ran a full-scale study. Data were collected using the SSS, EPSS, and the SDS. The results of the pilot study reflect that a supportive environment was perceived by the students on the EPSS, and on the SDS Likert scale the students’ rates were between 4 and 5 on the scale components, indicating they agreed or strongly agreed that the simulation was supportive and provided clear objectives. Decision-making, collaboration and mastering clinical skills were also reported by students. They found that the simulation allowed for active and diverse ways of learning. The EPSS Likert scale scores between 4 and 5 indicated that students agreed/strongly agreed that the simulation provided an opportunity for collaboration and teamwork, and simulation provided a diverse and active way of learning. The students’ reports were positive in terms of verbal feedback. Debriefing allowed students to identify and discuss areas for improvement. The faculty believed that the simulation enhanced students' syntheses of past knowledge and integrated this into practice. Sharpnack and Madigan concluded that the simulation was effective in evaluating student knowledge and acquisition of skills. The students' knowledge level was measured through the CAI program, and students scored between 93 and 100% on the case study questions. The students also successfully completed clinical judgment and nursing skills required on the low-fidelity static mannequin during role-playing. The results of the full-scale testing study also showed the students felt the simulation was realistic and supportive, providing a collaborative environment and allowing them to master clinical thinking skills and clinical competencies.

A fifth study, conducted in the United States by Alfes (2011), used the SSS to assess junior nursing students' perceptions of high- versus low-fidelity simulation. The participants included 63 baccalaureate nursing students. The results on *t*-tests indicate statistically significant differences in terms of self-confidence. The HFS group indicated more confidence (M= 32.48) than the traditional LFS group (M= 30.74). A *t*-test for satisfaction revealed no significant differences between groups on satisfaction with learning experience. A bivariate analysis revealed that self-confidence and satisfaction had a positive correlation (r= 0.70). Alfes concluded that both groups were satisfied with their simulation experiences. Regardless of the type of simulation, experiential learning provides student-centred learning and opportunities to practice new skills with feedback from both instructors and peers. Self-confidence allows students to acquire knowledge and develop new skills. Since satisfaction correlates with self-confidence, it is useful to measure levels of satisfaction with learning experiences. According to White, Brannan, Long, and Kruszka (2013), HFS helps students build confidence. In a study by Bradbury-Jones, Sambrook and Irvine (2007), confident nurses highly valued and used their nursing care skills, thus they are more motivated and empowered than non-confident nurses.

Overall, the five studies that used the SSS are similar in providing simulation and debriefing immediately after simulation, and all but Dobbs et al. (2006), and Sharpnack and Madigan (2012), compared the effects of different levels of fidelity simulators on student satisfaction. Butler et al. (2009) reported increased nursing students' satisfaction and self-confidence with HFS compared to LFS. However, Tosterrud et al. (2013) found nursing students more satisfied with LFS and case studies than HFS. Alfes's study showed no significant difference with nursing students’ satisfaction between HFS and LFS.

Other evaluation tools of simulation. Many other studies on simulation-based health care education evaluate the effectiveness of simulation sessions on undergraduate students' satisfaction with simulation education outcomes using others psychometrically tested evaluation tools. However, not all address students' satisfaction with simulation, but still include a section for students to evaluate their perception of the simulation experience.

Abdo and Ravert (2006) carried out a pilot study to explore nursing students’ perceptions of simulation experiences as realistic and effective at transferring learned skills, confidence in skills, preparedness for clinical practice, understanding the nursing role, and understanding the simulation situation. Abdo and Ravert (2006) used a satisfaction survey developed by Feingold et al. (2004) to collect data. Sixteen students reported working with HFS prepared them for the testing experience of their technical and decision-making skills. All students agreed on transferability of simulated learning to clinical practice. Ninety-six percent of students agreed on the simulation reflection of real setting, patient and situation, and 95% valued the simulation experience. Abdo and Ravert (2006) concluded that patient simulation experience is valued by students because it enhances technical and decision-making skills, and supports theoretical learning. Simulation also prepares students for clinical practice in a realistic environment; however, some students noted the lack of realistic progression of scenarios. Abdo and Ravert recommended that feedback is essential for effective simulation.

Shepherd, Kelly, Skene, and White (2007) compared novice graduate nurses' patient health assessment knowledge and skills using three learning interventions: self-directed learning package (SDLP); SDLP and two scenario-based PowerPoint workshops; and SDLP and two simulation sessions using the LFS mannequin. Seventy-four nurses participated in the study and they were scored by one nurse educator using the Clinical Response Verification Tool of relevant responses that graduate nurses are expected to perform. The results showed significant higher mean scores of the simulation group than the SDLP alone and the PowerPoint groups.

Ravert (2008) conducted a pretest and posttest study design to compare the effect of simulation on CT of nursing students in three groups: simulator, non-simulator, and control group. The second purpose of the study was to determine the effect of learning style on CT. Data were collected using the California Critical Thinking Disposition Inventory (CCTDI) and the California Critical Thinking Skills Test (CCTST), and Learning Style Inventory (LSI). No significant differences between groups were noted. All groups experienced moderate to large effect size on CT scores. The control group had a large effect size on the CCTDI, while both experimental groups had a large effect size on CCTST, and the control group had moderate effective size on CCTST. The results show that there was no significant difference in the students' CT skills before and after exposure to simulation experience.

In a study seeking to evaluate student perceptions of simulated clinical experiences, McCausland et al. (2004) investigated simulation as an effective teaching method in nursing education. They collected data from 72 nursing students. Laerdal's SimMan was used to conduct a 20-minute heart failure simulation. Students were oriented with the simulator for 5 to 10 minutes, and debriefed for 20 to 30 minutes. Afterwards, students were asked to complete a 10-item evaluation of their experiences. The majority of students (88%) felt simulation was realistic and 90% of the students rated simulation as a positive experience. They reported opportunities for critical thinking and hands-on application of skills. McCausland et al. (2004) suggest investigating other simulation outcomes with research-based approaches and psychometrically tested instruments.

Mole and McLafferty (2004) conducted a study in Scotland of 123 third-year nursing students with the purposes of (1) enabling teamwork in a realistic environment, (2) enabling students to practice clinical, organizational and management skills, and (3) identifying areas for improvement. Regarding the study's first purpose, the results indicated that 57% of the students strongly agreed that a simulated patient is valuable. About 83% of the students agreed that the simulation exercise helped them develop quick thinking skills and the ability to prioritize nursing care. Approximately one quarter of the students (26%) agreed there was a lack of direction at the beginning of the simulation, and 54% agreed that the time was not sufficient to complete the scenario activities. Additionally, about half (51%) of the students agreed that the simulation was unrealistic. For the second purpose, about half (52%) of the students agreed that the simulation allowed consolidation of clinical skills. In response to the third purpose of the study, the results showed that 86% of students valued the simulation experience. Moreover, about 84% of the students agreed the simulation provided an opportunity to practice their clinical skills, and 61% of students enjoyed their simulated experience. Mole and McLafferty (2004) contended that the findings indicated the use of simulator-based exercise provided the students with a valuable means for deliberate practice and critical appraisal of their performance.

Common themes that emerged from these studies were: positive perception of simulated experience and reflection; realistic experience and opportunity for practicing clinical skills including technical and cognitive skills; and transferability of simulated learning, integration of theory, and preparation for clinical practice (Abdo & Ravert, 2006; McCausland et al., 2004; Mole & McLafferty, 2004).

The studies reviewed indicate inconsistent practice, evaluation and outcomes of simulation education (Alfes, 2011; Butler et al., 2009; Tosterrud et al., 2013). In addition, the evaluation of students' perception of simulation learning tends to include the use of sub-scales as part of large instruments that are not psychometrically tested (Bantz et al., 2007; Cleave-Hoggi & Morgan, 2002; McCausland et al., 2004).

The Students' Perceptions/Preference of Simulation Learning

The SSE and SSS are commonly used as psychometrically tested evaluation instruments to measure student satisfaction with simulation learning. Many studies on the evaluation of simulation education tended to collect additional information on student perception of their simulation learning experience using different evaluation methods such as open-ended questions, interview, and ranking questions. These questions provide more information on the possible factors that might affect student satisfaction with simulation learning experience.

The NLN collaborated with the Laerdal Corporation to investigate the process of simulation development and implementation, and student satisfaction with learning at the College of Nursing and Health Professions at the University of Southern Maine (Childs & Sepples, 2006). Eight nursing schools served as collaborators in the study and 55 students participated in the simulation experience. Students were asked to rank simulation stations according to their personal preferences at the end of the simulation lab. The quantitative results of the two instruments showed that students felt simulation's most important features were feedback, objectives/information, complexity, and fidelity, respectively. The simulation educational practice that students rated most important were feedback, followed by team collaboration, opportunities for active learning, high expectations, and opportunities for diverse learning.

A national project (2003–2006) was conducted by the NLN for the purposes of exploring how to implement and evaluate simulation in nursing education (Rudd et al., 2010). The project had four phases. The results of phase 3 revealed that on the SDS, the HFS were more realistic than the other simulation types, provided similar feedback to the SM simulation, and provided similar opportunities for problem solving and decision making to the SM and more than the PP. The students' perceived feedback was most important for the HFS and SM than the PP simulation. On the EPSS, the results showed that the students in the HFS group perceived a diverse way of learning and valued education practice more than other groups. Student perceived active learning in HFS and SM and rated it more important in both than the PP simulation. In the PP group, the students agreed that collaboration was part of their experience and perceived higher expectations to perform well more than other groups. There were no significant differences between the pretest and posttest scores. Student satisfaction with HFS was significantly higher than other groups, and students in the HFS and SM had significantly higher self-confidence than in the PP group. There were no significant differences between groups on perceived judgment.

The results in phase 4 indicated that the students in the HFS group reported the presence and importance of active learning, rated diverse ways of learning high, and rated the importance of fidelity, feedback, support, and objectives high. The students in the PP group rated collaboration and high expectations high. The students in the HFS group rated themselves confident and satisfied with simulation instruction, and satisfied with the learning activity. The students in the PP group rated their performance high.

In a study by Kelly, Hager, and Gallagher (2014), students' opinions were sought regarding the most important components in the design and delivery of simulations in relation to CJ development. One hundred and fifty undergraduate nursing students participated in the study. Students were asked to rank 11 components of simulation that contribute to the development of CJ on a 5-point Likert-scale. The facilitated debriefing, post-simulation reflection, and academic guidance were the highest ranking components respectively, while case note, briefing, and orientation and participating in a role were the lowest-ranked components. All components received mean scores above 2.9 indicating that the student thought they contributed to the development of CJ.

Robertson (2006) evaluated undergraduate nursing students' perceptions of the simulation experience including the evaluation of simulation and the learning environment, and an indication of the most and least enjoyed of their experiences in qualitative responses. The students enjoyed simulation and rated all simulation aspects 4 or 5 on the Likert scale, indicated that they felt realistic, and increased knowledge, and they felt prepared for the clinical setting. Participants commented that they enjoyed realism, reinforced class reading, thinking on their own, and prioritizing and working through steps. The students least enjoyed not knowing what was expected and not having more simulation.

Current views of clinical simulation in health care education are positive. Nehring and Lashley (2009) indicated that both nursing educators and nursing students have found the experience of simulation-based training to be positive. Students value simulation as an effective method for teaching and learning (Murray et al., 2008). Students also acknowledge that simulation engages them in varied ways of learning (Hope, Garside, & Prescott, 2011). Students prefer simulation activities over traditional learning strategies such as classroom lectures because it allows them to engage in learning activity and participate actively (Nehring & Lashley, 2004; Neil, 2009). They also prefer simulation because they perceive that simulation integrates theory into practice (Hope, et al., 2011). In simulation, students learn through integrated experience and reflection. Debriefing encourages critical thought, allows constructive reflection and links theory to practice (Jeffries, 2005).

Hope et al. (2011) conducted a study over 2-year period to explore the relationship between simulation training, theory, and clinical practice. Data were collected by quantitative questionnaire and from qualitative data in focus group interviews. The results showed the students responded positively to simulation; appreciated opportunities to apply theory in a safe environment; felt prepared for clinical practice; improved their humanistic and problem solving skills, psychomotor and technical skills; and improved their self-confidence.

Challenges to Integration of Simulation

Many health care education programs have been incorporating simulation skills labs into their curricula for decades. The major challenges to the use of simulation in health care education include lack of human and financial resources (CPSI, 2005; Prion, 2008). A major issue identified in nursing education literature is that simulation use in health care education is facing many challenges in terms of constructing and maintaining simulation skills labs, which require large financial resources and dedicated faculty with the necessary expertise. A large amount of funds is required for establishing a centre to house high-fidelity human simulation mannequin(s). In addition to the support equipment, other expenses include maintenance and training, the costs for a dedicated necessary environment and recording equipment, and having mannequins of varied ages (Hravnak et al., 2007).

Levett-Jones, McCoy et al. (2011) and Sharpnack and Madigan (2012) note that other challenges facing implementation of clinical simulation include the availability of expert facilitators and adequate equipment to properly run simulation sessions. While student experience with simulation is directly impacted by their active involvement in simulation scenarios, the effect of faculty members' perceptions of simulation, and their training and comfort with it, should also be considered (Harder et al., 2013; Parker & Myrick, 2009).

Many health care education studies have focused on the evaluation of HFS, although only a few have compared its effectiveness with LFS. The literature reviewed indicates that the effect of different levels of fidelity of clinical simulation on learning outcomes and learner satisfaction is not clear (Harder, 2010; Levett-Jones, McCoy et al., 2011; Tosterud et al., 2013). The effectiveness of using HFS in health care education is well documented in the literature (Abdo & Ravert, 2006; Katz et al., 2010; McCausland et al., 2004); however, some studies also indicate effectiveness of LFS in health care education (Shepherd et al., 2007; Tosterud et al., 2013; Wilson et al., 2005). Harder (2010) reviewed quantitative studies on the effectiveness of HFS as a teaching method in health care education and found that three studies identified no differences in assessment and clinical skills of the recipients, and twenty studies showed improvement in learning after simulation. Several studies have been conducted to explore students' perceptions of their simulation experience in order to justify the use of simulation-based education. If student satisfaction is not related to the level of simulation fidelity, investment in low- and mid-fidelity could be a cost-effective alternative to HFS (Levett-Jones, McCoy et al., 2011). Furthermore, Bradley (2006) emphasizes robust research is needed to underpin simulation-based education.

Summary

This chapter provided a review of the literature on simulation in health care education, as well as an overview of current practices of educators and health care education institutions in the development of simulated learning experiences for undergraduate nursing education. International studies using the SSE and SSS were summarized and studies using evaluation tools to measure students' perceptions of simulated learning were presented. Nursing simulation practice and outcomes were not consistent across health care professions globally. In addition, educators used a variety of education evaluation methods to assess student performance and satisfaction with education programs for different purposes. The following chapter will introduce the theoretical framework that underpins this study.

Chapter 3: Theoretical Framework

The theory that guided this research is Kolb’s Experiential Learning Theory (KELT) (1984). This theory will be described and its concepts will be explained as they pertain to simulation-based learning in health care education, and the study variables will be defined.

Development of the Theoretical Framework

Kolb, Boyatzis and Mainemelis (1999) proposed that experiential learning theory provides a holistic learning process model. According to Kolb (1984) and Kolb et al. (1999), there are three models influencing the experiential learning process: Piaget's learning and cognitive development model; Lewin's action research and laboratory training of social psychology; and Dewey's learning model and philosophy.

Jean Piaget was a developmental psychologist interested in the process of cognitive development (Kolb, 1984). Piaget’s first studies focused on children's reasoning when answering IQ tests. Piaget claimed that individual cognitive development moves from the view of world as concrete phenomena to an abstract and constructionist view, and from egocentric to reflective modes of knowing. He emphasized the role of the environment on individual development. Piaget indicated that learning occurs through a mutual interaction between the process of accommodation of concepts into experience and the process of assimilation of experience into an individual's existing schema.

Kurt Lewin’s works on action research methodology and group development lead to the discovery of the training group (T-group) and the laboratory-training methods (Kolb, 1984). Lewin claims that the conflict between immediate experience and the detachment for analysis facilitates learning. As explained by Kolb (1984), learning is best facilitated through concrete experience followed by data collection and observation. Afterward, data are analyzed from different perspectives, and inputs and theories are formed from assimilation of these observations into existing schema of individuals. New implications or hypotheses are then deduced from these theories in order for actors to make choices and modifications of their future behaviours and experiences.

The other influence on Kolb’s theory stems from the pragmatist philosophy of educational theorist John Dewey. Kolb (1984) credits Dewey for the adoption of guiding principles for experiential learning in higher education programs. According to Dewey, the impulses and desires of experience transform into higher-order actions in the learning process (Kolb, 1984). Concept, experience, observation, and action are integrated in a dialectic process of learning and lead to development of a mature purpose. Dewey recommended presenting the information in a way that allows students to connect new concepts or information to their experiences in order for education to effectively take place and deepen student understanding.

The work by Dewey, Lewin, and Piaget guided the experiential learning practice and formed the basis for the development of experiential learning theory. Kolb (1984) indicates that these three traditions are based on a unity of the nature of the learning process. Lewin and Piaget traditions emphasize the ability to test abstract concepts during an experience and form bases for new actions through observing and reflecting on experience (Kolb, 1984). This is also true for Dewey's experiential learning tradition. Assimilation and accommodation processes transform new knowledge and make the experience meaningful for students by guiding them to link to previous experience and existing knowledge (Yardley, Teunissen, & Dornan, 2012).

Theory Introduction

Kolb’s Experiential Learning Theory (KELT) describes three components of learning: hands-on experience, interaction with the environment, and reflection on the experience. Kolb (1984) in his writing about experiential learning describes the four components or stages of effective learning: concrete experience (CE), abstract conceptualization (AC), reflective observation (RO), and active examination (AE) (Kolb, 1984; Kolb et al., 1999). Kolb's theory will be explained by describing characteristics of KELT and the adaptive modes and dialectical dimensions of experiential learning.

Characteristics of Experiential Learning Process

Kolb (1984) proposed the common characteristics that are shared between the three traditions of experiential learning of Dewey, Lewin, and Piaget. The six characteristics of experiential learning are as follows: (1) learning as a process, (2) continuous process learning that is grounded in experience, (3) conflict resolution between the different modes of learning adaptation, (4) learning as a holistic adaptation process, (5) person and environment transactions, and (6) learning as a process of knowledge creation (Kolb, 1984; McLeod, 2013).

For the first characteristic of experiential learning, Kolb (1984) and McLeod (2013) proposed that ideas or concepts are not fixed elements. Through experience, ideas are forming and reforming in the process of learning. Failure to learn from experience results when an individual's wrong ideas and concepts are not modified or corrected after experience (Kolb, 1984).

Kolb's (1984) second proposition about experiential learning is grounded in experience and that the learner's experience is a continuous process. The educator's role is not only to modify the student’s existing ideas but also to introduce new ideas. Learning occurs by substitution/ revision of the learner's earlier understanding (Kolb, 1984).

For the third experiential learning characteristic, Kolb (1984, 1981) explains that resolution of conflicts between different adaptive learning modes is required for learning to occur. The process of learning requires an ability to move with varying degrees from an active role in experience to a reflective observing role, and from specific involvement in experience to analytic objectivity in abstract conceptualization.

The fourth characteristic or proposition of experiential learning described by Kolb (1984) and Kolb and Kolb (2005) is a holistic adaptation process that identifies differences between many learning ways. Learning involves the integration of whole functions of an individual including thoughts, beliefs, feelings, and perceptions. Kolb (1984) claims that learning is considered a broad concept that encompasses activities across one's life span and includes other adaptive concepts such as problem-solving and creativity.

The fifth proposition by Kolb (1984) is that learning occurs from a transaction between a person and a learning environment. Learners actively create learning situations that meet their learning objectives and are not only a response to a fixed environment. The last characteristic of experiential learning according to Kolb (1984) is knowledge creation through the learning process. An emerging definition is that learning is a process by which experience transformation creates knowledge (Kolb, 1984).

The Adaptive Modes and Dialectical Dimensions of Experiential Learning

Kolb et al. (1999) and Kolb (1984) describe experiential learning as a cycle that has four main adaptive modes: CE of current learning situation, AC of the observed experience to form new ideas, RO of the situation and reflection on the experience, and AE of the new ideas. These modes are further divided into two dialectical dimensions, prehension and transformation. The prehension dimension includes two opposed processes for grasping experience: apprehension and comprehension. The transformation dimension includes two transforming processes of the grasped experience through intention and extension (Kolb, 1984; Mainemelis, Boyatzis, & Kolb, 2002).

In order for learning to take place, a learner must complete Kolb's four-cycles of experiential learning. The two dimensions of experiential learning are independent and have equipotent contributions to the process of experiential learning (Kolb, 1984). Kolb (1984) explains that learning results when meaning and knowledge occur through extension of ideas in the external world and apprehend their CE. The learner then internally reflects on these ideas and experience attributes in the RO of the learning process (McLeod, 2013). Afterward, learners comprehend and consider the meanings and challenge their existing schema or previous knowledge through AC and develop testable hypotheses to examine in future through AE. Kolb et al. (1999) state that the "idealized learning cycle or spiral where the learner touches all the bases, experiencing, reflecting, thinking, and acting in a recursive process that is responsive to the learning situation and what is being learned"(p. 22).

The adaptive learning modes and dialectical dimensions form the structures of Kolb's experiential learning. Learning and knowing are created from grasping and transforming experience. The four modes of Kolb's experiential learning and the dialectical dimensions identified the impact of hands-on experience and reflection on this experience for learning to take place (Howard et al., 2011; Kolb, 1984; Reed, Andrews, & Ravert, 2013; White, et al., 2013).

In a study on student and faculty perceptions of HFS, Howard et al. (2011) used Kolb's theory as a framework to guide the simulation design. They claim that KELT emphasizes the essential role of practice for cognitive development. Howard and his colleagues also indicate that simulation as an active teaching method incorporates theoretical concepts that a student has learned in a classroom into the care of a simulated-patient in a safe and realistic learning environment. The active involvement of students in simulated learning allows practice of decision-making and solving problems in a simulated scenario. Furthermore, during debriefing students can constructively reflect on their experience and link to the concepts learned in the classroom which increase the acquisition of knowledge.

In their study on the effect of HFS on undergraduate nursing students’ learning and confidence, White et al. (2013) hypothesized that students achieve learning goals more through simulation than traditional classroom learning. White and colleagues explained that simulation engages students through active learning. In addition, debriefing after simulation enables students to reflect on their simulated experiences. These processes of experiential learning would increase students' cognitive skills such as CT and DM, and would increase confidence (White et al., 2013). They indicate that classroom time limits student interaction and reflection therefore limiting students' cognitive growth. The findings showed that both groups of HFS and traditional learning had significantly increased confidence levels on post-test scores, however no significant differences were found between the two groups' scores. In addition, the group that received simulation scored lower than the traditional classroom learning group on the cognitive test. They recommended a combination of two methods of learning is necessary to improve cognition and confidence in students.

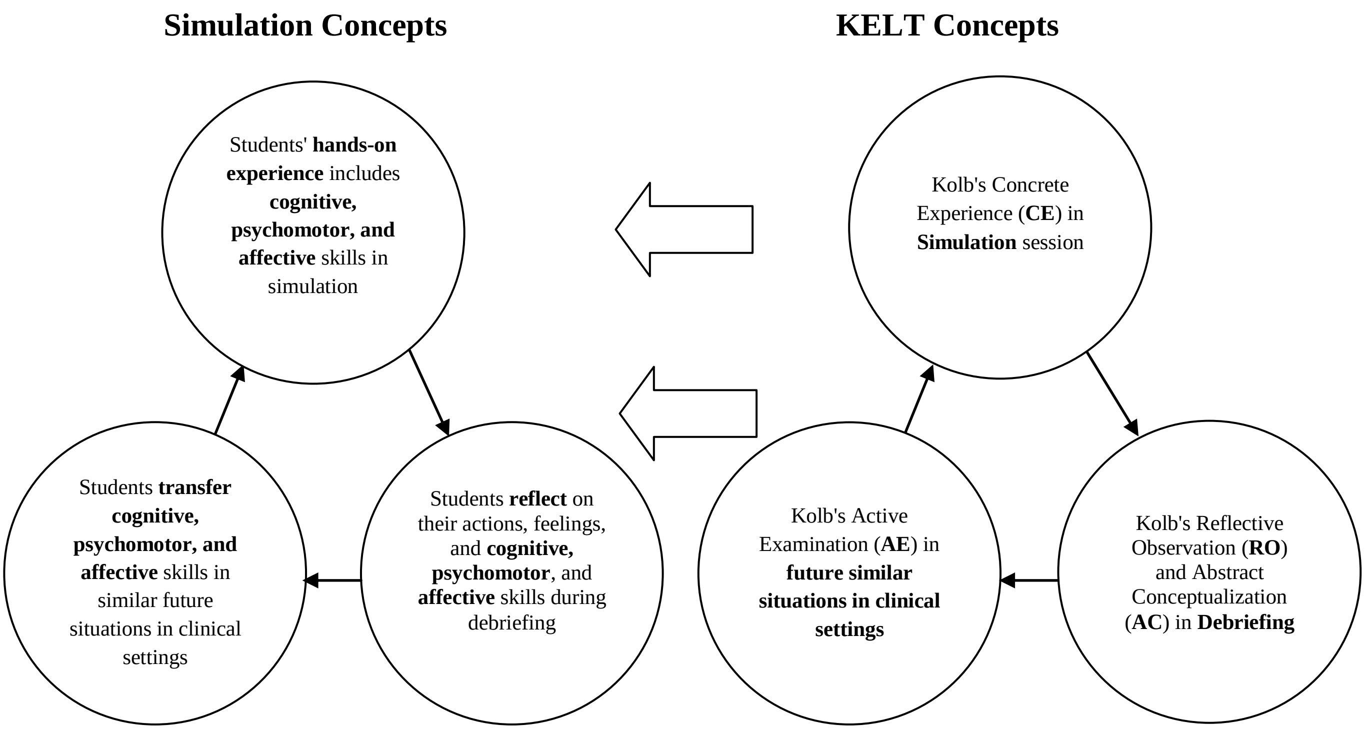
Reed et al. (2013) utilized KELT as a basis for their study in which two methods of debriefing were compared after four HFS sessions in undergraduate nursing education. The study results support KELT in that learning results from the concrete experience/feeling stage and reflection on this experience during debriefing. The literature supports the notion that simulation could meet the principles and characteristics of Kolb’s experiential learning theory.

Relational Statement

KELT was used to guide the current study on student satisfaction with low- and high-fidelity simulation. Relationships between the theory and study concepts were examined using the Satisfaction with Simulation Experience scale (SSE). The SSE was developed and utilized by Levett-Jones, McCoy et al. (2011) to evaluate student satisfaction with medium- and high-fidelity simulation experiences. The SSE is composed of three subscales including reflection and debriefing (D&R), clinical reasoning (CR), and clinical learning (CL). The SSE was developed specifically to evaluate student perception with experiential simulated learning.

Each concept of the simulation correlates with KELT's main concepts: simulation hand-on experience corresponds to CE, debriefing corresponds to RO/AC, and a second simulation experience or future similar clinical situation corresponds to AE (Figure 1).

Figure 1: Simulation and Experiential Learning Processes, Adapted from Kolb's Experiential Learning Theory



The statements of relationships will now be discussed. First, in experiential learning of simulation-based education, students acquire knowledge and develop guided actions and responses. LFS and HFS provide a structured environment for students to practice nursing care on a simulated-patient and to be actively involved in simulation during the concrete experience process of experiential learning. In debriefing after the simulation experience, students reflect on their experiences and feelings in the reflective observation. This constructive reflection allows the acquisition of new knowledge and integrates learned concepts into previous cognitive schema in the process of abstract conceptualization, and facilitates the formation of hypotheses of the learning procedure for future examination in similar clinical situations.

Second, in order for learning to occur, students must complete the four-cycle experiential learning process. Students should be able to successfully integrate theoretical concepts and constructively reflect on experience. They also should have the ability to improve performance in future learning by generating testable hypotheses from simulation to guide future actions.

Third, simulation can meet the principles or characteristics of KELT. Experiential learning emphasizes the role of experience and reflection on action, and the essential role of interactions with learning environment for learning to take place. Simulation allows development of cognitive, motor, and affective skills. Debriefing allows students to reflect on these skills, actions, and feelings during simulation. The students transfer their learned cognitive, psychomotor, and affective skills and new knowledge to clinical settings. Simulation learning environments involve instructional design and educational practice. The instructional design involves a degree of simulation fidelity; orientation and preparation of students; and providing clear learning objectives (time of simulation and debriefing, scenarios, case notes, and student roles). The educational practice involves the role of facilitator in facilitation of simulation, guiding the students, and facilitating complex simulation. In debriefing, facilitators support the students, provide feedback, promote safe environment to share experiences with others, and challenge the students.

The SSE measures students' perceptions of simulation learning in three areas: D&R, CR, and CL. The students' perceptions of cognitive skills learned during simulation CE is reported on the CR subscale; the students' perceptions of reflection on the learned skills actions, and feelings during RO and AC of debriefing are reported on the D&R subscale; their perceptions of transferring learned skills in future similar situations in AE is reported on the CL subscale. The students' perceptions of their simulated learning can be measured using the SSE. Figure 1 (adapted from Kolb, 1984) depicts the relationships of the concepts of simulation and the KELT.

In summary, according to KELT's four learning modes, CE, AC, RO, and AE are the basic components of the experiential learning process (Kolb, 1984). Learning occurs through grasping and transforming knowledge through these four stages of experiential learning. Learners' interactions with the learning environment and completion of the four-cycle process are essential for learning to take place.

The Process of Simulation Experience

Strategic planning of simulated education, including discussion, feedback and performance evaluation, maximizes student learning (Decker, Sportsman, Puetz, & Billings, 2008). Initial briefing or preconference, simulation session, and debriefing comprise the common structure of simulated-based teaching.

Simulation exercises allow students to respond to, and manipulate, authentic representations of real-world situations to enhance understanding of future encounters in clinical settings (DeYoung, 2009). Simulation is a representation of reality in a controlled and safe environment without compromising patient safety. As noted, the simulation experience has three parts: pre-briefing, scenario-based simulation, and debriefing.

Usually, students are given the simulation scenario prior to the simulation experience. During the simulation day, students have an orientation about simulators and simulation. The educator also discusses in the pre-briefing the simulation objectives, answers any questions associated with the simulated scenario and divides the students into groups. The simulation is then conducted in a simulation room, and a debriefing after simulation takes place in a conference room (Childs & Sepples, 2006; Ohtake, Lazarus, Schillo, & Rosen, 2013).

Simulation. Simulation differs from other forms of teaching; that is, during simulation, students actively participate in the learning process, while in lecture they passively learn theoretical concepts. During simulation sessions, students are encouraged to discuss clinical actions with other students using role-play to decide the proper nursing action to be taken during the simulation, which can improve students' negotiation and teamwork skills. In addition, the educator can provide guidance during the scenario and answer students' questions while facilitating the simulation scenario. The students in simulation are allowed to investigate freely with little information at the beginning and are provided with clinical information over time (Jeffries, 2005). This will encourage students to think critically and develop high level cognitive skills such as CR. There are simple to complex levels of simulation. Simple simulation has a low level of uncertainty, and information is obtained early with clear relationships and predictions of key decisions, while complex simulation has a high level of uncertainty (Jeffries, 2005). The complexity of simulation should be managed by a competent facilitator who has been trained in simulation education.

Debriefing. Debriefing after simulation is a process by which clinical issues and actions raised in simulation are discussed and learners come to terms with them and bridge the gaps in their knowledge (Fanning & Gaba, 2007; Rudolph et al., 2007). Dreifuerst (2010) explains that debriefing engages students and educators in the recollection of simulation events, and reflection and analysis of students' actions. Generally, students are encouraged to reflect on their simulation experience during debriefing. The debriefing is conducted immediately after simulation by the educator (facilitator or Clinical Education Facilitator -

CEF) in a conference room, and the time of debriefing varies generally from 20 minutes to 1 hour.

Through reflection, students consciously consider the meaning from their simulation experiences (INACSL Board of Directors, 2013). In debriefing after simulation, the students construct new knowledge and compare it with previous knowledge. In this way, they challenge their existing schema and ask questions in order to gain the knowledge acquired in the simulation experience. In addition, learners are capable of transforming their experiences (Kolb et al.1999). In debriefing, students can reflect on their actions, connect the theoretical component learned in class with the new knowledge and skills learned during the simulation experience, then reinforce them in clinical practice (Howard et al., 2011; Reed et al., 2013; White et al., 2013).

Research Questions

Based on the literature review and KELT theoretical model, this study consisted of an examination and comparison of undergraduate nursing students' satisfaction with their clinical simulation experiences. As few research studies compared LFS and HFS, the findings of this study will add to the knowledge in this area. The purpose of this research study was to examine fourth-year nursing students' satisfaction with simulated clinical learning and understand what students value about both LFS and HFS experiences.

The following research questions guided this study:

1. Are undergraduate nursing students more satisfied with LFS or HFS experiences regarding debriefing and reflection; clinical reasoning; and clinical learning?

2. What do undergraduate nursing students identify as the most valuable aspects of their LFS and HFS experiences?

Chapter 4: Methodology

This chapter describes the methodological approach used in the study. The study design, sample, setting, definitions, variables, measurements, ethical considerations, and data analysis techniques will be discussed.

Design

In this study a descriptive, cross-sectional, retrospective post-test survey design was used. The purpose of a descriptive study is to observe, describe and document a phenomenon (Loiselle, Profetto-McGrath, Polit, & Beck, 2007). The independent variables are experiences with LFS and HFS, and the dependent or outcome variable is nursing students' satisfaction with, and perceived value of, simulation. According to KELT (Kolb, 1984) hands-on experience, reflection and assimilation of knowledge to develop testable hypotheses in future similar experiences is essential for learning to occur, and will result in learning as students meet their learning objectives.

In a cross-sectional design, data are collected at one point in a time (Loiselle et al., 2007). In this study, data were collected in the Fall of 2014 from fourth-year nursing students regarding their recollections of HFS experiences during their second-year clinical skills course and LFS experiences in their third-year clinical skills course.

Setting and Sample

The study was conducted at the College of Nursing, University of Manitoba in Winnipeg, Manitoba, Canada. Simulated learning experiences were conducted in the learning and simulation laboratories at the College of Nursing. Inclusion criteria were that the nursing students were in the fourth-year of the program; had participated in HFS in the second-year clinical nursing practice courses (NURS 2180 Nursing Clinical Practice 1, and/or NURS 2190, Nursing Clinical Practice 2) and LFS in the third-year nursing skills laboratory course

(NURS 3280 Nursing Skills Laboratory); and had successfully passed their third year nursing. The fourth-year nursing students who were registered in the College of Nursing in Fall 2014, had completed the required courses, and were eligible to graduate in May 2015 were invited to participate in the study and complete the survey electronically using Fluidsurvey.

A statistical power calculation was conducted using the statistical software program G*Power, in consultation with a statistician. With power set at .80 and probability (alpha) set at .05, it was determined that a paired-*t* test statistic would detect a medium effect size between LFS and HFS mean scores for a minimum sample size of 27 participants. It was anticipated that there would be some difficulty obtaining participants considering that classes had ended for the term and students were writing exams at the time of data collection.

Simulation Experiences

According to Kolb (1984), learning occurs through experience and students must complete the four-cycles of experiential learning: CE, RO, AC, and AE. Both LFS and HFS sessions at the College of Nursing, University of Manitoba were composed of three main phases: pre-briefing, simulation and debriefing.

In pre-briefing, the students reviewed new procedures and had the opportunity to ask questions of the instructors. During the simulation sessions, students were engaged in active learning and practiced the new nursing procedure on mannequins. Afterwards, students debriefed with their peers and instructor. Debriefing consisted of constructively reflecting on their actions and feelings, identifying what went well, sharing feedback, and expanding their learning through considered meanings of their actions during simulation. Students form testable hypotheses about the learned procedure to test in future similar situations whether in clinical setting or in another simulation session (Reed et al., 2013).

The students were asked to indicate their past simulation experience at the university and/or at clinical settings. In the College of Nursing, University of Manitoba, Clinical Nursing Practice 1 is a 12-week course (2 days per week) focusing on the care of childbearing and childrearing families. This course was offered in the second year of the program and consisted of 6 weeks in hospital settings (labour and delivery, and on post-partum units), and 6 weeks in community settings such as elementary schools and home visits. Clinical Nursing Practice 2 focused on the care of older adults and consisted of 6 weeks in a personal care home, and 6 weeks in community clinics and a community-geriatric day program. The purpose of these clinical placements was to familiarize students with the clinical practice environment in hospitals and community settings.

The curriculum at the College of Nursing, University of Manitoba has been changed and HFS is no longer offered to the nursing students in the simulation centre at the college. Referring to the past simulation experiences, in 2012 the HFS was provided in the simulation centre at the College of Nursing. In each course, students also attended a one-day HFS experience in the College of Nursing simulation laboratory. The Medical Education Technology Inc. Emergency Care Simulator (METI ECS) was used in simulation lab to provide the students with HFS. It is a high-fidelity, computerized and full-body mannequin that has cardiovascular and respiratory modeling (Riley, 2008). The purpose of this HFS was to train students on clinical reasoning and to reinforce psychomotor skills that the students have learned previously. In the HFS experience, students were engaged in a scenario-based situation wherein they actively responded to the patient simulator and provided appropriate care. Reading materials and the related scenarios were provided to the students to review before the HFS experience. On the day of the HFS experience, a Clinical Education Facilitator (CEF), who instructs students in the clinical settings, briefed the students for about 10–15 minutes prior to the experience to discuss the simulated scenarios and answer any questions. Afterwards, a laboratory skills instructor oriented the students to the simulator and simulation room. The HFS experience was three hours long.

There were two different simulated scenarios; each was 30–45 minutes long. In the simulation room, students were divided into two groups of two to three students: observing and participating groups. The roles of the first scenario were assigned to the students in the participating group. These roles included two Registered Nurses and a nursing assistant or a physiotherapist. Afterwards, the observing group switched with the participating group and took part in the second simulation scenario and again the roles are assigned to the participating students. A debriefing after the simulation was usually held in a conference room for approximately an hour. All the students gathered with the CEF to discuss the simulation during the debriefing session. During the debriefing, students reflected on their feelings and actions during the simulation and discussed areas for improvement. An example of HFS in Clinical Nursing Practice 2 is a SIM Scenario of a patient with hip replacement who has an abnormal heart rate. The students were expected to assess the patient and provide appropriate care and referral.

Nursing Skills Laboratory is a third-year clinical skills course that provided nursing students with hands-on training in basic clinical nursing skills including psychomotor skills, such as administering intravenous medication, and critical-thinking skills, such as managing patients who experience fever during blood transfusions. This course was offered over two terms, lasting approximately 20 weeks. LFS was used to teach and evaluate psychomotor and critical thinking skills. The students learned new procedures or skills each week for about three hours and work in groups of 10–15 students. They were provided with the reading materials before each weekly laboratory session.

Laboratory Skills instructors would pre-brief with the students on any new equipment that would be used and the preparation for new procedures such as drug calculation and medication preparation. The students were then divided into two groups with each instructor. The instructors demonstrated the new procedure for the students. The Skills Laboratory is organized to allow students time and space to practice and master the new procedure, and to enhance their critical thinking through questioning. The students were expected to complete the new procedure, answer the questions related to brief scenarios, and take proper nursing actions. After completing all the questions, students moved to the next simulated patient. The instructors observed the students, answered their questions, and provided guidance while they practiced the new procedure. The instructors gathered all the students to debrief before the end of the skills lab. They discussed any difficulties or challenges they have faced during practice and answered any questions. An example of scenario-based LFS is caring for the patient with a nasogastric tube (NG). Some of the scenario-based critical thinking questions are: "What are the indications for a NG insertion other than providing nutrition?" and, "What class of medications might alter the gastric pH?"

Procedures

Recruitment of the students involved several steps. After the Education/Nursing Research Ethics Board (ENREB) approved the study, a letter was sent to the Dean of the College of Nursing at the University of Manitoba (Appendix A) to request permission to access the fourth-year nursing students, which was granted.

Recruitment

The fourth-year nursing students enrolled in the Fall term 2014 were invited to participate in the study. The students were instructed to read the information letter (cover letter) and keep a copy for reference. They were informed that by completing the survey they were providing informed consent to participate in the study. The invitation letter and the survey (see Appendix B) were emailed to the students through the Manitoba Centre for Nursing and Health Research (MCNHR) at the University of Manitoba in December, 2014.

The students were invited to complete the survey electronically using a link to Fluidsurvey that allowed them to open the survey and complete it online only once. An amendment request was sent to the ENREB December 8, 2014 to ask for fourth-year nursing instructors' assistance to put up a study poster in the skills lab and hallway bulletin board to increase student awareness of the study. A second letter was sent to the students one week after the invitation and survey (Appendix C) as a reminder notice. The students were asked to complete the online survey on, or before, December 15, 2014. Students were offered an incentive to complete the study by being entered into a draw for one of three bookstore gift cards valued at $30.00 each, set to occur on December 17, 2014. To ensure that the participants were anonymous to the researcher, the processes of data collection and the drawing were undertaken by the MCNHR.

The MCNHR removed student names and email addresses (identifiers) from the survey. The researcher received only the anonymized survey results that were emailed by the MCNHR and these were kept in a locked area so only the principle investigator has access to the data. Responses were entered into Microsoft Office Excel 2007 software and subsequently into SPSS 22.0 for analysis. The data will be deleted after manuscript publication of the study or after five years have elapsed following defense of the thesis, whichever comes first.

Instruments

The questionnaire/survey is composed of three components: sociodemographic questions, the SSE, and a ranking question. These components will now be discussed.

Sociodemographic characteristics. The sociodemographic data were used to describe the participants. The survey included three demographic questions: age, sex, and previous experience with clinical simulation. Age is a continuous variable and sex is a categorical variable of male or female. Students were asked about their experiences with simulation including HFS experiences in Clinical Nursing Practice 1 and/or 2 in the second year of the program, LFS experiences in Nursing Skills Laboratory in the third year of the program, and any other simulation experiences.

Satisfaction with Simulation Experience Scale (SSE). The scale was specifically designed to measure student satisfaction with simulation. The SSE is an 18-item survey developed by Levett-Jones et al. (2011). In the development and testing of the SSE, Levett-Jones and colleagues (2011) divided the scale into three subscales, D&R, CR, and CL. The D&R subscale measures students' perceptions of the debriefing and reflection of their simulation experiences including feelings, actions taken and simulated patient responses. The CR subscale measures students' satisfaction with simulation to develop their clinical reasoning skills, and the CL subscale evaluates students' perceptions of simulation in development of clinical learning skills. The full SSE and the three subscales were analyzed by the developers to determine internal consistency, reliability, exploratory factor analysis, and correlation factors.

A factor analysis of the scale items revealed that 18 items accounted for greater factor loading than other items in the pool items of the SSE (Levett-Jones et al., 2011). The internal reliability of the SSE has been established by its authors. The overall scale has a satisfactory internal consistency (alpha = 0.77). Each sub-scale has high internal consistency as determined by Cronbach's Alpha Coefficient; R&D (alpha = 0.94), CR (alpha = 0.86), and CL (alpha = 0.85) (Levett-Jones et al., 2011).

The three subscales are R&D (items 1 to 9), CR (items 10 to 14) and CL (items 15 to 18) and responses are measured on a 5-point Likert-scale to indicate students' level of agreement with each item. In this study, the items were scored the same as the original scale (1 = strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, 5 = strongly agree). The possible scores range from 18 to 90 for the Complete SSE; 9 to 45 for the R&D subscale; 5 to 25 for the CR subscale; and 4 to 20 for the CL subscale.

Most valuable components ranking question. Participants were asked to select from a listing of eight aspects of simulation to indicate which ones they viewed as valuable components of each type of simulation experience. These components were based on the literature reviewed on simulation (Bland et al., 2011; Butler et al., 2009; INACSL Board of Directors, 2011; INACSL Board of Directors, 2013; Kelly et al., 2014; Levett-Jones, McCoy et al., 2011; Nehring & Lashely, 2009; Reed et al., 2013; Rudd et al., 2010; White et al., 2013). In addition, participants were asked to rank the top three components that they thought were the most valuable parts of their LFS and HFS experiences. According to Kelly et al. (2014), the list of items in a ranking question helps researchers collect more specific data than from an open-ended question, especially if there are many factors that influence the variable being examined.

A number of items on the list of simulation learning features reflect the items in the three subscales of the SSE namely: instructor facilitation; reflection; opportunity to apply CR and DM; and opportunity to apply learned skills. The item on engaging and realistic environment reflects the level of fidelity of simulation. The other items, namely orientation and preparation materials; teamwork and collaboration; and reinforcing of theoretical knowledge were common themes emerging from the reviewed literature.

The survey was first pilot-tested by a fourth-year nursing student for readability and easy of completion. No changes were made to the survey or the process of conducting the survey based on the student’s experience.

Ethical Considerations

Before conducting this proposed study, the study was approved by the Education/Nursing Research Ethics Board (ENREB) at the University of Manitoba on

November 26, 2014. Subsequently, the Dean of the College of Nursing approved the study for distribution to the nursing students.

Anonymity and Privacy

Participants provided their consent by completing the online survey. The participants' identification information was removed by the MCNHR. Neither the researcher, nor any members of the thesis committee or nursing instructors had access to students' personal information. The survey data were received for analysis without any identifying information by the Principle Investigator (PI).

Risks and Benefits

Participation in the study did not involve any physical or psychological risks to participants. The study was retrospective in that it referred to the students' past experiences with clinical simulation which were not different from the usual nursing teaching and learning practices at the College of Nursing. At the completion of the study a summary of the results will be e-mailed to all fourth-year nursing students.

Data Analysis

Data were obtained from the MCNHR in the form of electronically completed questionnaires without students' personal information. The researcher entered the data using Microsoft Excel spreadsheets and data input and analyses were conducted using SPSS version 22.

The demographic information is reported as frequencies, means, and percentages. To answer the first research question related to the SSE, paired *t*-tests were performed to compare students' satisfaction scores on the SSE and its sub-scales between the LFS and HFS experiences. The paired *t*-test was used since students responses were measured twice on the same outcome variable to answer the question whether there are differences in the satisfaction scores within the sample. The *t*-test allows for testing for differences between groups by means of a normally distributed, continuous variable (Polit & Beck, 2008). Although Likert-type scale items conceptually are ordinal measures, they can also be considered as interval measures. By summing the scores of individual items together, the total score of the scale is determined (Polit & Beck, 2008).

Statistical significance (*p* value) was set as 0.05 for this study. The risk of conducting many *t*-tests on the same data increases the risk of type 1 error. Type 1 error or false positive is a wrong conclusion that a change in dependent variables resulted from the independent variable(s) when it did not (Polit & Beck, 2008). Therefore, Bonferroni adjustment was applied to adjust *p* values for multiple comparisons with the same set of data. In consultation with a statistician, it was determined that since there were four comparisons to be made between the scores of the SSE Scale and subscales, Bonferroni adjustment was calculated by dividing the *p* value ($p = 0.05$) by the number of tests conducted in the study. Thus the new p value was calculated as follows: 0.05/4= 0.0124. Scores on the SSE sub-scales were calculated to determine means and standard deviations. These scores were treated as continuous variables ranging from 1 indicating low satisfaction to 5 indicating high satisfaction with the simulation experience.

The ranking question consisted of a list of eight items from which the participants were asked identify their top three-rated components of simulation, in order of preference, with 1 being the highest. To analyze students' responses to the ranking question on what they found were the three most valuable components of their simulation experiences, frequencies and simple calculations were used.

Summary

Information on the study's design, measures, ethical considerations, sample, setting, procedures, and analyses have been discussed in this section. This study is retrospective and cross-sectional; and examined nursing students’ satisfaction with, and perspectives of, their

LFS and HFS experiences. The operational definitions and descriptions of the measurements and data analysis plan that were used in the study were also provided.

Chapter 5: Results

This chapter includes the results of the study, including a description of participant characteristics and students' perceptions of their LFS and HFS experiences. Descriptive statistics were used to report on the demographic data. The paired *t*-test was used to detect differences in students’ SSE and sub-scale scores between LFS and HFS experiences. The ranking question data were reported using simple ranking calculations and frequencies.

Characteristics of the Participants

The number of fourth-year nursing students at the College of Nursing at the University of Manitoba at the time of data collection was around 200. The Manitoba Centre for Nursing and Health Research (MCNHR) sent the questionnaire via Fluidsurvey to 101 students who were expected to graduate in May 2015. After the first email invitation to the students, 22 responses were received. After the second email and advertisement of the study by poster, another 22 responses were received which resulted in a total of 44 responses. The students who responded to the survey but did not meet the inclusion criteria (completion of the required courses) were excluded and the final number of eligible participants was 35 students.

Data on three demographic characteristics were collected: age, sex, and simulation experience. The participants included 27 (77.14%) female and 8 (22.86%) male students. The mean age of the students was 25.94 with a standard deviation of 5.65, and ranged from 21 to 46 years. According the University of Manitoba Office of Institutional Analysis (2015) the sample is comparable to the College of Nursing student population based on sex. There were 711 undergraduate nursing students in the Fall term 2014, 601 (84.52%) females and 110 (15.47%) males. The University of Manitoba does not publish statistics on the age range of students, thus it is unknown if the sample represents the population based on age range.

The majority of students (n= 34) (97.14%) in this study reported they completed the LFS and both HFS experiences, and no other simulation experiences. Only one student (2.86%) reported having one LFS and only one HFS experience and no other simulation experiences. The data of this student were included in the analysis as this participant still met the inclusion criteria of the study (See Table 1).

Table 1. Demographic Characteristics of Participants N= 35

Variables	M	SD	n	%
Gender				
Male			8	22.86
Female			27	77.14
Age in years	25.94	5.65		
Previous Simulation Experiences				
Nursing Clinical Practice 1			35	100
Nursing Clinical Practice 2			34	97
Nursing Skills Laboratory			35	100
Other simulation experiences			0	0

SSE Scale Findings

The primary outcome variable, students’ satisfaction with simulation experiences, was analyzed with the paired *t*-test to compare the SSE and subscale scores between participants' LFS and HFS experiences. Descriptive statistics were used to summarize the results from the

SSE scale. The frequency distributions of the SSE items for LFS and HFS are presented in Appendix D.

Research Question 1. The first research question considered was: Are undergraduate nursing students more satisfied with LFS or HFS experiences regarding debriefing and reflection, clinical reasoning, and clinical learning?

A 95% confidence interval (CI) was computed for the paired samples t-test. The upper and lower confidence intervals indicate the range in which there is 95% confidence that the mean difference lies within the range of the estimated values. The overall mean scores for the SSE were 68.57 (SD = 8.92) for LFS and 67.00 (SD = 11.16) for HFS. The mean score for SSE items (calculated by dividing the overall score by total number of items) was 3.81 for LFS and 3.72 for HFS. There were no significant differences between LFS and HFS on the SSE Scale ($p = 0.407$), the D&R subscale ($p = 0.860$), or the CR subscale ($p = 0.322$).

For the CL subscale, the overall mean score for satisfaction with LFS is 16.37 (SD = 2.14) and for satisfaction with HFS is 15.11 (SD = .24), $t = 2.80$ ($p = 0.008$). The CL subscale demonstrated a significant difference in mean scores between LFS and HFS (see Table 2).

Table 2. Comparison of HFS and LFS Scores on SSE Scale and Subscales N=35

Variable	LFS M (SD)	HFS M (SD)	Mean difference	*t*	*p*	95% CI Lower	95% CI Upper
SSE Scale	68.57 (8.92)	67.00 (11.16)	-1.57	0.84	0.407	-5.37	2.23
D&R Subscale	33.14 (5.93)	33.37 (7.25)	0.03	0.18	0.860	-2.38	2.84
CR Subscale	19.10 (2.50)	18.51 (3.49)	0.11	1.01	0.322	-1.64	0.55
CL Subscale	16.37 (2.14)	15.11 (0.24)	0.31	2.80	0.008*	-2.17	-0.34

*$p < .0124$ (Bonferroni adjustment)

The effect size was calculated for the mean difference between the scores of LFS and HFS on the CL subscale. For a paired *t*-test statistic of -2.80 the eta square value is 0.19, which indicates a large effect size, according to Cohen (1988). When examining the mean differences between groups, Cohen's *d* is most commonly used to determine the effect size (Polit and Beck, 2008).

Research Question 2. What do undergraduate nursing students identify as the most valuable aspects of their LFS and HFS experiences?

Participants were asked to rank the top three aspects of their simulation experiences. Simple calculations were conducted to summarize the results of the ranking question. In order to identify the top three items, the frequencies of the items ranked either first, second, or third were summed. The frequency distributions of the ranked question items for LFS and HFS are in Appendix E. Eight items were included in the ranking question: (1) Preparation materials and orientation, (2) Instructor facilitation, (3) Reflection following the simulation experience,

(4) Opportunity to apply clinical reasoning (CR) and decision-making (DM) skills, (5) Opportunity to practice the learned nursing skills, (6) Teamwork and collaboration, (7) Engaging and realistic environment, and (8) Reinforcement of theoretical knowledge learned in classroom. Space was provided for two additional items as needed and left open for the students to specify.

Three students did not rank item 1, two students did not rank item 2, and two students did not rank item 3 for the LFS. There were two students who did not rank item 1 and one student did not rank item 2 for the HFS (See Appendix E).

One additional item added by one respondent for the LFS was "Opportunity to learn from peers." Two additional items added for HFS was "Challenging case scenarios" and "Opportunity to collaborate and highlight peers' strengths." These three items emphasize the role of debriefing to enhance learning from peer's feedback, and the role of challenging case scenarios, collaboration between students, and learning from peers during simulation to develop clinical reasoning skills and clinical learning.

The three items most frequently ranked as valuable parts of LFS were: Opportunity to practice new skills (n=25); Preparation materials and orientation (n=17); and Opportunity to apply clinical reasoning and decision-making (n=16). The three items most frequently ranked as valuable parts of HFS were: Opportunity to apply clinical reasoning and decision-making (n=21); Opportunity to practice new skills (n=20); and Engagement and realism (n=17) (See Tables 3 and 4).

Table 3. Ranking Question of High-Range Frequencies of the Most Valuable Items of Simulation Experiences for LFS, N = 35

Variables	LFS (n)
1 Preparation Materials & Orientation	17*
2 Instructor Facilitation	7
3 Reflection	5
4 Opportunity to Apply CR and DM	16*
5 Opportunity to Practice New Skills	25*
6 Teamwork	11
7 Engagement & Realism	10
8 Reinforced Theoretical Knowledge	11
Other factor (Opportunity to learn from peers)	1
Other factor (Not identified)	0

*Top three ranked items.

Table 4. Ranking Question of High-Range Frequencies of the Most Valuable Items of Simulation Experiences for HFS, N = 35

Variables	HFS (n)
1 Preparation Materials & Orientation	11
2 Instructor Facilitation	5
3 Reflection	4
4 Opportunity to Apply CR and DM	21*
5 Opportunity to Practice New Skills	20*
6 Teamwork	11
7 Engagement & Realism	17*
8 Reinforced Theoretical Knowledge	16
Other factor (Challenging case scenarios and diagnoses)	1
Other factor (Collaboration and highlight peer's strengths)	1

*Top three ranked items.

Summary

The majority of participants were female and the mean age was 26 years. The paired *t*-test showed a significant difference between LFS and HFS on the CL subscale of the SSE. No other significant differences were noted between other subscales or the SSE. The data from the ranking question revealed the top three items that reflect the most valuable aspects of the students' simulation experiences. The following chapter will discuss implications of these findings in nursing and health care research, education and practice.

Chapter 6: Discussion

SSE Scale Findings

The findings indicate that the participants had positive perceptions of satisfaction with both LFS and HFS. This suggests that both types of simulation provided the students with hands-on experience and the opportunity for reflection on the experience in an interactive learning environment. Simulation is supported by KELT (1984), which emphasizes the role of experience and reflection, and interaction with the learning environment in development of learning.

The mean item scores found in the current study (3.81 for LFS and 3.72 for HFS) were somewhat lower than findings from previous research. Levett-Jones et al. (2011) reported satisfaction scores of 4.52 for HFS and 4.42 for MFS for second-year nursing students, and 4.47 for HFS and 4.42 for MFS for third-year nursing students. Williams and Dousek (2012) also compared a range of levels of simulation such as low- to high fidelity simulation and reported a mean score of 4.27 in their study.

Neither of the studies by Levett-Jones et al. (2011) or Williams and Dousek (2012) compared the mean differences of each subscale of the SSE. In the current study, there was a significant difference in the CL subscale mean score between LFS and HFS, with participants indicating a higher mean score for LFS than HFS.

Debriefing and Reflection Sub-scale (D&R)

There was no significant difference in mean scores between LFS and HFS for the D&R subscale, indicating these students' perception of debriefing and reflection for both type of simulation was similar and could be satisfying and effective for student learning in both formats. According to Edith Cowan University (2011), reflective practice increases patient safety by promoting critical inquiry and improving clinical skills and knowledge. The current study findings may be useful for researchers and educators when structuring future simulation learning activities.

The D&R subscale relates to the role of the facilitator in debriefing. The findings of the D&R subscale in the current study showed satisfaction with the role of facilitator in both types of simulation. Dobbs et al. (2006) and Harder et al. (2013) reported that students perceived the important role of the facilitator during simulation in promoting constructive debriefing, challenging the students, asking questions, and providing constructive feedback and opportunities for students to discuss and reflect on their actions that enhance their learning.

In the current study, the instructors in LFS made rounds during student practice, answered their questions and provided guidance. Before the end of the skills lab, the instructors debriefed with all the students in the lab and answered any further questions. Some of the facilitators in the LFS debriefed with the students for a shorter period of time than other facilitators depending on the time left for debriefing, and some students finished earlier than their peers and did not attend the debriefing. In the HFS, one CEF 'became' the patient's voice and the other CEF also provided probes during simulation. During debriefing, the CEFs debriefed with all the students in the conference room to discuss the students' feelings and actions, and reflect on their experiences. The students in both the LFS and HFS experiences had the chance to ask questions and discuss any challenging points. Some of the facilitators debriefed in a different room than the simulation room, and some of them debriefed for longer times than the other facilitators. These variations in debriefing practice are consistent with the literature reviewed in terms of what, when, where, who, and how to debrief.

Clinical Reasoning Subscale (CR)

The finding of no significant difference in means on the CR subscale between both types of simulation indicates that the students' level of satisfaction was relatively similar. This suggests both LFS and HFS could enhance the clinical reasoning and cognitive skills of the students.

Tanner (2006) described CR as a process of making decisions from generating and evaluating alternative choices to selecting the better set of actions. The students in the current study practiced the new procedures through LFS and simulated scenarios. They answered the questions related to the scenarios and developed their CT. The simulated scenarios in LFS did not involve time progression or verbal communication between the mannequin and students. LFS is well documented to enhance psychomotor skill acquisition and has been used for many years in developing basic clinical nursing skills such as intravenous injection and critical thinking using static mannequins and simple case scenarios (Sharpnack & Madigan, 2012; Tosterud et al., 2013).

In the HFS in the current study, the students developed CR through participation in simulated scenarios and responded to patient simulators. Some of the facilitators provided direction and probes during the simulation. Yuan et al. (2014) examined the effect of HFS on baccalaureate nursing students and reported that HFS improved students' clinical reasoning skills.

Clinical Learning Sub-scale (CL)

The mean item scores for the CL subscale were 4.09 for LFS and 3.78 for HFS, and the significant difference between means indicates that participants rated LFS more highly than HFS for CL. Clinical learning activities in nursing involve psychomotor skills, integration of knowledge, and basic cognitive skills such as medication calculation and critical thinking to advanced cognitive skills such a clinical reasoning. Clinical learning is enhanced and transferred to clinical practice through practice in engaging and realistic environments, and by reflection on practice during debriefing (Howard et al., 2011; Reed et al., 2013).

In the current study, students experienced weekly simulation sessions in the skills lab year-round, while they only had one-day HFS sessions in each course. One reason speculated for students' higher rating of LFS over HFS to develop their clinical learning might be that the HFS experience was relatively new to the students and they may have felt stressed or anxious because they were less familiar with the high-fidelity mannequin. Levett-Jones, Gersbach et al. (2011) identified some factors that influence the development of CR skills. They evaluated third-year nursing students' competencies using a developed Structures Observation and Assessment Practice (SOAP). They found four factors that affected CR: participants' perceptions of learning outcomes, consistency of simulation with the clinical practice, assessors' experiences, and impact of anxiety and stress. However, other studies indicate that students may evaluate their simulation experiences high if it is their first exposure to simulation and because they are excited to practice on the advanced-technology simulator (Levett-Jones et al., 2011).

Sullivan-Mann et al. (2009) studied the effect of multiple simulation scenario exposure on nursing students' CT using the Health Science Reasoning Test (HSRT). A control group received two simulations while the experimental group received five simulations. The experimental group had significantly higher scores on the HSRT than the control group. Providing more simulation sessions to students might be helpful to familiarize them with HFS (Abdo & Ravert, 2006; Robertson, 2006).

Another reason for the higher rating of LFS over HFS might be the complexity of HFS in relation to clinical learning. The students in the current study practiced management of complicated patient scenarios using HFS where they provided care and responded to the simulated patients. The HFS has a computer screen attached to show vital sign changes in response to nursing care. The students were able to measure blood pressure, hear lung and heart sounds, and observe eye movements.

Ackermann et al. (2007) found that the role HFS in clinical learning could be affected by the complex nature of the HFS mannequins. They conducted a simulation program using SimMan HFSr to help new graduate nurses transition to acute care practice. Participants reported that simulation was realistic and dynamic, provided hands-on learning, helped retain knowledge and facilitate learning, and developed critical thinking in emergency cases. Participants reported that they initially had problems with the complexity of the simulator as it was not flexible and difficult to measure blood pressure, but most commented that simulation knowledge was applied in a safe environment. Similar findings were reported by Davoudi, Wahidi, Rohani, and Colt (2010) who investigated health care professionals' perceptions, preferences and opinions, of the effectiveness of LFS versus HFS on learning conventional transbronchial needle aspiration (TBNA). The results showed that the students equally enjoyed and were enthusiastic about the three models, yet preferred LFS in terms of realism, ease of learning and an ideal model, and preceptors perceived LFS as more useful than HFS for learning and teaching TBNA.

Instructors in the current study might have been more anxious because they were not fully familiar with HFS. McCausland et al. (2004) and Harder et al. (2013) reported on the role of instructors who facilitate simulation in student learning. It is important to orient and provide adequate training to instructors to equip them with skills required to effectively conduct HFS and debriefing after simulation.

LFS could lead to learner satisfaction with simulation to achieve the desired learning objective such as psychomotor and CT development. Sharpnack and Madigan (2012) examined the effectiveness of enhanced LFS on sophomore students' satisfaction with their simulation learning experiences. The students found the enhanced simulation approach realistic and supportive, and they reported that the program assisted them in mastering clinical skills and competencies such as clinical judgment. HFS could lead to learner satisfaction with simulation to develop enhanced cognitive skills such as CR and reinforce knowledge and psychomotor skills learned in the skills lab (Yuan et al. 2014).

Although some students prefer LFS over HFS to develop clinical learning, LFS may not be sufficient to promote the development of higher cognitive skills such as CR and DM that require the active and engaging learning provided by the HFS. According to Shepherd et al. (2007), LFS could be effective in teaching "just in case" and "just in time" skills. Including scenario-driven LFS in undergraduate curricula could promote independence in students' development of clinical skills. In addition, LFS provides opportunities to reinforce educational principles and clinical practice at a basic level and sets the stage for further and more complex learning and reflection in HFS (Childs & Sepples, 2006; Shepherd et al., 2007). HFS engages the students in a realistic environment and provides active learning that is necessary to develop CR and clinical learning.

It should be noted that mean scores of the SSE reported in Levett-Jones et al. (2011) and Williams and Dousek (2012) were higher compared to mean scores of the current study. Some reasons for this finding could be that the current study is retrospective that collected data on students' past experiences. The students might not have remembered the details of their simulation experiences, which may have affected their responses.

Another reason for the difference in mean scores might be the different contexts between studies. The original studies by Levett-Jones et al., (2011) and Williams and Dousek (2012) were conducted with second- and third-year nursing students in Australia, while the current study was conducted with fourth-year nursing students in Canada.

Most Valuable Components of LFS and HFS

Learners' interactions with the learning environment by actively engaging in hands-on experiences and reflecting are essential to acquire new knowledge and skills (Kolb, 1984). The results of the ranking question demonstrate students perceived most valuable components of simulation in relation to their LFS and HFS experiences. These findings provide some insights into specific simulation aspects and their values for the students exposed to LFS and HFS.

Top Three Ranked Items

Application of learned skills. The ranking question findings indicate that the participants highly ranked the "Opportunity to apply new skills" for both types of simulation. This indicates that the students appreciate learning new skills in both types of simulation and transferring the learned knowledge to clinical practice. One explanation for this finding might be that the simulation experiences provided the students with opportunities to practice in safe and controlled environments. In the current study the students had weekly skills lab during which they learned new nursing procedures. They were able to reinforce their knowledge and the learned skills in the skills lab, practice and master learned psychomotor skills and CT in a safe and controlled learning environment without fear of harming the patient. On the other hand, in the HFS experience they integrated the learned theoretical knowledge and psychomotor skills into a simulation experience. HFS provided the students with an authentic representation and varied ways of learning, engaged the students in learning, and assisted them in learning advanced cognitive skills such as DM.

Mole and McLafferty (2004) found that simulation was helpful for third-year nursing students to identify and rectify their deficits in their skills. In Abdo and Ravert's study (2006) on students' satisfaction with simulation, students indicated that simulation was realistic and increased their self-confidence, tested their decision-making and clinical skills, and prepared them for clinical practice. The findings are also supported by Kolb's experiential learning theory (1984) that emphasizes the role of hands-on experience and practice during simulation to develop experiential learning.

Application of cognitive skills. In the ranking question, the item "Opportunity to apply CR and DM," was ranked high for both types of simulation. This finding suggests that the students were able to think through the case scenarios in both types of simulation and provide appropriate care to the simulated patient.

This finding indicates that the students were able to apply cognitive skills including CR and DM in both types of simulation and transfer the learned knowledge and skills to clinical practice. A reason for this could be that the students were engaged in active learning and the challenging environment. In the current study in LFS, the students were asked to complete the new procedures and answer CT questions related to case scenarios. In the current study in the HFS, the students practiced DM and advanced cognitive skills such as CR. They were expected to manage a simulated patient scenario and provide nursing care and make appropriate health care decisions.

Sharpnack and Madigan (2012) evaluated nursing students' perceptions of LFS enhanced with computer-assisted instruction. They found that students felt the simulation was realistic and supportive, provided a collaborative environment and allowed them to master clinical thinking skills. HFS provided a structured and realistic environment to assist the students in developing advance cognitive skills such as CR and DM, which are essential components of clinical learning (Alfes, 2011; Butler et al., 2009).

LFS complements HFS in nursing education curricula. The students practiced and mastered psychomotor skills and basic cognitive skills such as CT in LFS, and then learned advanced cognitive skills such as CR in HFS. When the simulation is conducted in a learning environment that promotes development of new skills such as psychomotor skills and CR and

DM, and promotes clinical learning and acquisition of new knowledge in order to grow and be competent, this can enhance student satisfaction with simulation and achievement of learning objectives.

Orientation and preparation materials. The finding from the ranking question indicates the students highly valued "Orientation and preparation materials" for LFS. Students' satisfaction with simulation learning is influenced by environmental factors including simulation design instruction and educational practice (Dobbs et al., 2006; Sharpnack & Madigan, 2012). In the current study, the students in LFS were prepared with reading materials and orientation before the weekly skills lab and pre-briefing on the lab day. The students in HFS were also prepared before the simulation by orientation and preparation materials, and pre-briefing. The students only had one HFS experience in each course, and they might not have received adequate orientation and preparations for HFS. Further study in this area might reveal more data on type of preparation and orientation required for students before simulated learning. HFS practice could be improved by providing appropriate orientation and preparation materials (Abdo & Ravert, 2006; Harder et al., 2013; Kelly et al., 2014; Robertson, 2006).

This finding from the ranking question is supported by Kolb's theory (1984) that emphasizes the role of interaction with the learning environment in order to acquire knowledge and achieve learning objectives. In order to provide a satisfying simulation experience for students, educators orient and provide preparation materials for students. Instructors develop expected learning objectives that are shared with the students before simulation as a benchmark to be achieved by the end of simulation. When students meet the expected learning objectives, they likely will be satisfied with their learning experience.

The literature indicates that a structured simulation and orientation with required preparation materials is essential to achieve the expected learning outcomes. Prentice and

O'Rourke (2013) reported the results of a collaborative quality improvement project conducted in Canada to help undergraduate nursing students respond when reactions from blood transfusions occur. Data were collected prior to and after simulation elicited students' preparations for simulation including completion of reading materials, understanding differences of blood transfusion reaction before and after simulation, and anxiety and satisfaction with simulation. The results showed that students over time continuously rated their simulation experience highly, and that the simulation experience increased knowledge and enhanced preparation for similar situations in the future. Orientation and preparation materials, clear objectives, safe, controlled and collaborative environment all influenced the students' satisfaction with their simulated learning environment and learning experiences (Hope et al., 2011; Robertson, 2006).

Engagement and realistic environment. The students highly valued "engagement and realism" for HFS. This finding suggests that HFS provided the students with a realistic environment and engaged in simulated learning.

The HFS experience provides an authentic learning environment that allows engagement in realistic simulation scenarios. The clinical simulation scenarios allow learners to actively participate and master clinical skills in complex situations that they may not be able to participate in during clinical placement. This will prepare them for clinical practice to be competent nurses. Brady et al. (2006) noted that active learning helps the development of CT, CJ, and DM.

The findings from the ranking question are supported by KELT. In order for learning to occur learners should actively interact with the learning environment (Kolb, 1984). According to Kolb (1984), learners participate and interact with learning environments to transform new knowledge, develop testable hypotheses, and transfer the learned skills and new knowledge to future similar situations. Adequate orientation and preparation of learners to participate in simulation learning is essential, such as providing orientation to simulation environment, briefing, simulation learning objectives, and reading material. Simulation provides students with active learning and engages in a realistic and safe environment. The students would be satisfied with a simulation experience that provides active and engaging learning experience. According to the British Colombia College and Institute (2003), curriculum and teaching factors influence student satisfaction.

Learners participate in simulation, accommodate knowledge from reading material into simulation, and take actions based on their theoretical knowledge and the provided patient information. They collaborate with peers and practice psychomotor and cognitive skills in order to master them to be competent nurses in clinical settings. In addition, in debriefing the students discuss with peers and instructors and reflect on feelings and actions taken during simulation experience. They also reflect on their past knowledge from the reading materials to assimilate new knowledge and form hypotheses to test it in future similar situations in clinical settings. Expert facilitators assist students in learning during simulation and debriefing.

Recommendations

Simulation learning environments involve facilitation, educational practice, and simulation design. The study results support the role of simulation and debriefing in knowledge and skills acquisition and transfer to a clinical setting. Participants reported satisfaction with both LFS and HFS in the areas of debriefing and reflection, clinical reasoning, and clinical learning.

Support for Instructors

Providing increased support and training to the instructors who facilitate clinical simulation is recommended. The instructors might have different levels of preparation and readiness and/or lack experience in conducting simulation and debriefing, which could lead to inconsistent simulation and debriefing practice. Participants reported satisfaction with their simulation experiences to enhance their reflection, clinical reasoning, and clinical learning. Instructors could enhance their skills and abilities to facilitate simulation sessions and debrief more effectively. Constructive and timely feedback supports the student and challenges them to think critically and reflect on their actions. Instructor orientation workshops and support from the simulation laboratory technicians could be helpful in this regard (Harder et al., 2013). A supportive, safe, engaging and challenging learning environment promotes a satisfying learning experience. Expert facilitators promote active and safe learning environments that enhance student learning by providing support during simulation and constructive feedback in debriefing.

Additional Simulation Sessions

There was a significant difference in participants' satisfaction scores on the clinical learning subscale, with higher levels of satisfaction for LFS experiences. The findings from the ranking question indicate students valued orientation and preparation material provided with LFS. One reason for the difference in the satisfaction rating could be that the students had more LFS than HFS experiences. The students might not have been as familiar with the HFS mannequin and environment. At the College of Nursing, University of Manitoba, the students were provided with weekly skills lab in LFS while they only had one day of HFS in each course.

One recommendation is to provide additional HFS sessions and a more thorough orientation to HFS for the students to increase their familiarity with the HFS technology and learning environment. The students' stress and anxiety associated with the simulation experience might be decreased by participating in more than one HFS session. Furthermore, providing appropriate orientation and preparation materials could assist the students during the HFS experience by providing basic information about the simulated-case scenarios and preparation to be able to participate effectively in simulation and reflective debriefing.

The additional HFS sessions may provide the students with the opportunity to practice and master new skills and could enhance their learning and help them meet learning objectives. Offering two or three HFS sessions, rather than just one, could enhance student performance and reinforce theoretical knowledge and development of clinical learning and advanced clinical skills such as clinical reasoning and decision making. Additional HFS simulation sessions might familiarize the students with the simulation program and decrease their anxiety, which could enhance skills development and satisfaction with the learning experience (Abdo & Ravert, 2006; Harder et al., 2013; Kelly et al., 2014; Robertson, 2006).

Combine LFS and HFS

The effectiveness of both LFS and HFS is supported by the results from the SSE as the students reported satisfaction with both types of simulation. The ranking question results show that the students valued opportunities to practice learned skills and application of CR and DM in both types of simulation. Students valued the engagement and realism of HFS. LFS is straight-forward, easy to manage, and suitable to teach psychomotor skills; however, it lacks the realism of HFS. It is recommended for educational institutions that the role of HFS be valued and complement the role of LFS in their curriculum. Combining different levels of simulation is recommended (White et al., 2013). This could enhance student learning basic nursing skills in LFS skills labs and reinforce theoretical knowledge and practice with advanced skills such as CR and DM in HFS labs. The role of health care institutions and researchers is to provide stakeholders with rigorous and objective evidence of the effectiveness of combining LFS and HFS.

Limitations

This study has several limitations. First, the LFS and HFS experiences at the College of Nursing were organized and offered differently. In LFS, the students had weekly lab sessions during the term and this may have enhanced student performance and familiarity with the simulators. On the other hand, they only experienced one day of HFS in each course which could mean that they were less familiar with the HFS environment and simulators.

The small sample size (N = 35) means that it is not possible to generalize the findings from the study as the sample may not be representative of the population of all fourth-year nursing students at the College of Nursing or of students at other institutions. Another limitation is the self-report nature of the SSE. The risk for bias and responses to social norms is possible with a self-report survey (Polit & Beck, 2008).

The ranking question was focused on items related to aspects of simulation identified as most valuable by participants. Student satisfaction could have been affected by other factors that were not included in this question. Using a focus group interview could have provided more information about satisfaction with their learning experiences. Incentives and posters were used to encourage participation in the study and the survey was available online for convenience. However, the timing of the study was close to exam writing time and this might have affected student participation rate. In addition, as this study utilized a retrospective design, participants may not recall all detail of their past experiences and that could affect their responses on the satisfaction questionnaire. Finally, the use of a post-test design did not allow for measurement of the change in the students' satisfaction over time with different types of simulation.

Future Research

Some recommendations from this study for future research include first, conducting a similar study to compare more similar levels of exposure to LFS and HFS such as a comparable number of LFS and HFS sessions and consistent debriefing practice including place of debriefing, length of time, and instructors’ experience. Having a similar number of simulation experiences and similar instructions for preceptors in conduction simulation and debriefing could enhance the comparability between the simulation experiences. This would control for confounding differences in simulation and debriefing practice.

Another recommendation is conducting the study with a different cohort and with a larger sample. The results from this study are related to one cohort of nursing students at the College of Nursing in the University of Manitoba. Further research could yield more information on the satisfaction of students with different demographics and also could shed more light on the effectiveness of different fidelity simulations on students’ satisfaction with their learning experience.

Evaluating students' satisfactions using a pre-/post-test design immediately before and after the simulation experience is another recommendation to consider in future research. The students might remember more details of their experience with the simulation experience and that could affect their responses in the survey and could be compared with satisfaction after one to three months.

Another suggestion is to use focus group interviews to collect more data on students' perceptions of their simulation experiences. Such findings could help educators in the development of more satisfying simulation experiences for students. This study's findings suggest the need for more work on how to conduct simulation with different levels of students using different levels of fidelity simulation. This would further contribute to the body of knowledge on clinical simulation learning.

Conclusion

Clinical simulation is becoming increasingly prevalent in the education of health professionals. It is clear that there is a need to teach health profession students utilizing advanced educational methods that engage them in active learning and have the potential to transfer learning skills into practice. This study provides evidence that students valued both LFS and HFS experiences, and that in one area, clinical learning, LFS was found to be preferable for participants. However, considering the limitation of the small sample size the results cannot be generalized to the population of nursing students. In addition, one cannot assume the students were overall more satisfied with LFS than HFS as the significant difference was only in the CL subscale. The results from the ranking question reveal that the opportunity to practice learned skills and apply CR and DM were ranked the most valuable aspects for both types of simulation. In addition, orientation and preparation materials of LFS experience were highly valued by participants, and engagement and realism of HFS was also reported by participants as a valuable component. Further research is required to examine whether these results are applicable to different cohorts of students in different contexts and which factors contribute to and interfere with successful student satisfaction.

Student satisfaction should be considered an important component when designing education programs. The findings from this study can contribute to the knowledge base of simulation learning and add another dimension to considerations of whether costly technology-advanced HFS is preferable in nursing curricula to LFS activities, or whether it is advisable to incorporate components of both.

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UNIVERSITY OF MANITOBA

Appendix A

Faculty of Health Sciences **College of Nursing**

Dr. Beverly O'Connell
Dean, College of Nursing
University of Manitoba

Dear Dean O'Connell,

My name is Sumayah Fatane, and I am a Master of Nursing student in the education stream in the Faculty of Nursing, University of Manitoba. Dr. Christine Ateah is my academic advisor. I am writing to request your permission to access fourth-year nursing students who are enrolled in the fall term 2014 at the College of Nursing. My thesis research project is titled, "Undergraduate nursing students' satisfaction with simulated learning experience."

The study purpose is to investigate nursing students' perceptions of their simulated learning in clinical skills and simulation labs. I am requesting permission to distribute a questionnaire to the fourth-year nursing class in October or November 2014. I intend to use the online survey Fluidsurvey through the MCNHR to make the questionnaire available to students.

I plan to send three e-mails to the fourth-year nursing students: 1) to invite the students to participate and provide information on the study, 2) a reminder e-mail to complete the survey which will be sent a week after the first e-mail and 3) after the successful defense of the thesis a summary of the findings will be sent to all fourth-year students. The letters to the students and the questionnaire are attached.

The Education Nursing Research Ethics Board has approved this study. I would be pleased to provide any other information and I would appreciate hearing from you as soon as possible. If you have any concerns or questions about the study, please contact me ( ) or my advisor, Dr. Christine Ateah ().

Sincerely,

Sumayah Fatane

UNIVERSITY OF MANITOBA

Appendix B

Faculty of Health Sciences **College Of Nursing**

Dear 4th Year College of Nursing Student,

This invitation and consent form, a copy of which it is recommended you print for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information

You are invited to participate in a research study titled, “Undergraduate Nursing Student Satisfaction with Low- and High-Fidelity Simulation”. My name is Sumayah K. Fatane, a student in the Master of Nursing program, College of Nursing, University of Manitoba. My thesis advisor is Dr. Christine Ateah, Professor, College of Nursing. I am conducting this research study as part of the requirements of my master's degree.

The purpose of my master's thesis study is to investigate nursing students' perceptions of the simulation experience in the skills and simulation labs. You are eligible to participate in the study as you are enrolled as a fourth-year student who has successfully completed third year of the Bachelor of Nursing program at the University of Manitoba. You are being asked to complete a questionnaire by clicking on the link below. The questionnaire contains three parts. The first part has 3 sociodemographic questions. The second part has 18 questions about your perceptions regarding your experiences with simulation in NURS 2180, 2190 and NURS 3280, and a question that asks you to choose the most valuable things you perceive regarding your low fidelity simulation (LFS) and high fidelity simulation (HFS) experiences. It should take approximately 15 minutes to complete the questionnaire. The Manitoba Centre for Nursing and Health Research (MCNHR) in the Faculty of Nursing will collect the questionnaire and your responses will be confidential. Neither myself, my advisor nor any other faculty members will be made aware of your participation or non-participation in this study. After completing the questionnaire, you will have a chance to be entered in a draw for a $30 bookstore card. The MCNHR will handle the drawing process to ensure confidentiality.

Once the analysis of the data is complete, all fourth-year nursing students will receive a summary of findings through e-mail. Participating in this research study has no risks. Future nursing students in the undergraduate program may benefit from this study.

You are free to participate or refuse to answer any of the questions in the survey. By completing the questionnaire, you are providing your voluntary informed consent to participate. Please be assured that your responses will be totally confidential. The completed questionnaire will be directly forwarded to the Manitoba Centre for Nursing and Health Research (MCNHR) in the College of Nursing. My advisor and I will receive only completed questionnaires without any identifying information. All data related to the study will be destroyed by the MCNHR and the researcher after five years from the successful defending of the thesis.

If you have any questions about the study, you may contact myself at ( ) or my advisor Dr. Christine Ateah at ( ). I would very much appreciate your response by (December, 15). If there are any technical difficulties with completing the survey please contact the Manitoba Centre for Nursing and Health Research (MCNHR) at .

Your completion and submission of this questionnaire indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time prior to submitting your survey, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way. This research has been approved by the University of Manitoba Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at. Please keep a copy of this consent form for your records and reference.

Sumayah K. Fatane
Master of Nursing Student

Dr. Christine Ateah
Professor, Faculty of Nursing

Please click on the link provided below, or copy and paste the URL into your browser:

LINK HERE

Appendix C

THE QUESTIONNAIRE

Demographic Data

Age: ________

Sex: Male ( ) Female ( )

Please indicate the Skills Lab simulation experiences you have completed:

- (NURS 2180) Nursing Clinical Practice 1 Yes ( ) No ( )
- (NURS 2190) Nursing Clinical Practice 2 Yes ( ) No ( )
- (NURS 3280) Nursing Skills Laboratories Yes( ) No ( )
- Other additional simulation experiences Yes ( ) No ( )

  If you have completed other additional simulation experiences, please describe:

  ____ ________________________

  ____

  ____

  ______

Thank you. Please turn to see next page

Satisfaction with Simulation Experience Scale (SSE Scale)

The purpose of this questionnaire is to learn about your experiences with simulation in second- and third-year Simulation and Skills Labs.
Please select the appropriate answer according to the instructions below:

SD if you STRONGLY DISAGREE	
D if you DISAGREE	
US if you are UNSURE	
A if you AGREE	
SA if you STRONGLY AGREE	

(A) In NURS 2180 Clinical Nursing Practice 1, a high-fidelity simulation (HFS) computerized full-body mannequin was used to simulate a patient delivery of an infant. The simulation was facilitated by a Clinical Education Facilitator (CEF). Debriefing after the simulation lab occurred for students to discuss the appropriate actions to be taken during the patient delivery and answer student questions.
In NURS 2190 Clinical Nursing Practice 2, a full-body patient simulator was used during a simulation scenario of an older patient at a community clinic and the experience was facilitated by a CEF. Debriefing after simulation was held in a conference room where students reflected on their feelings and actions taken during simulation and discussed these with other students and the CEF.
Please consider your overall experience with these high fidelity simulation experiences and complete the following questions:

Satisfaction with Simulation Experience Scale	Strongly Disagree SD	Disagree D	Unsure US	Agree A	Strongly Agree SA
Debrief and reflection					
1. The facilitator provided constructive criticism during the debriefing	SD	D	US	A	SA
2. The facilitator summarized important issues during the debriefing	SD	D	US	A	SA
3. I had the opportunity to reflect on and discuss my performance during the debriefing	SD	D	US	A	SA
4. The debriefing provided an opportunity to ask questions	SD	D	US	A	SA
5. The facilitator provided feedback that helped me to develop my clinical reasoning skills	SD	D	US	A	SA
6. Reflecting on and discussing the simulation enhanced my learning	SD	D	US	A	SA
7. The facilitator's questions helped me to learn	SD	D	US	A	SA
8. I received feedback during the debriefing that helped me to learn	SD	D	US	A	SA
9. The facilitator made me feel comfortable and at ease during the debriefing	SD	D	US	A	SA
Clinical reasoning					
10. The simulation developed my clinical	SD	D	US	A	SA

reasoning skills 11. The simulation developed my clinical decision-making ability	SD D US A SA
12. The simulation enabled me to demonstrate my clinical reasoning skills	SD D US A SA
13. The simulation helped me to recognize patient deterioration early	SD D US A SA
14. This was a valuable learning experience	SD D US A SA
Clinical learning 15. The simulation caused me to reflect on my clinical ability	SD D US A SA
16. The simulation tested my clinical ability	SD D US A SA
17. The simulation helped me to apply what I learned from the case study	SD D US A SA
18. The simulation helped me to recognize my clinical strengths and weaknesses	SD D US A SA

Thinking back on your high fidelity simulation (HFS) experiences in NURS 2180 Clinical Nursing Practice 1 and NURS 2190 Clinical Nursing Practice 2, please select from the list below all options that closely reflect what you found to be the most valuable aspects of your HFS experiences.

- Preparation materials and orientation to the simulation area ( )
- Instructor facilitation ( )
- Reflection following the simulation experience ( )
- Opportunity to apply clinical reasoning and decision-making skills ( )
- Opportunity to practice the learned nursing skills ( )
- Teamwork and collaboration ( )
- Engaging and realistic environment ( )
- Reinforcement of theoretical knowledge learned in classroom ( )
- Other, please describe ___________________________________
- Other, please describe___________________________________

Also please rank the top three options from above which reflect what you found to be the most valuable part of your HFS experiences.

____

____

____

(B) In NURS 3280 Nursing Skills Laboratory, low-fidelity simulation (LFS) involved a non-mechanized mannequin which was used to simulate teach and practice different nursing skills. Debriefing was provided to the students during and after each skills lab to discuss main points during practice of the new procedures and give feedback on student performance and answer student questions.

Please consider your overall experience with these low fidelity simulation experiences and complete the following questions:

Satisfaction with Simulation Experience Scale	Strongly Disagree SD	Disagree D	Unsure US	Agree A	Strongly Agree SA
Debrief and reflection					
1. The facilitator provided constructive criticism during the debriefing	SD	D	US	A	SA
2. The facilitator summarized important issues during the debriefing	SD	D	US	A	SA
3. I had the opportunity to reflect on and discuss my performance during the debriefing	SD	D	US	A	SA
4. The debriefing provided an opportunity to ask questions	SD	D	US	A	SA
5. The facilitator provided feedback that helped me to develop my clinical reasoning skills	SD	D	US	A	SA
6. Reflecting on and discussing the simulation enhanced my learning	SD	D	US	A	SA
7. The facilitator's questions helped me to learn	SD	D	US	A	SA
8. I received feedback during the debriefing that helped me to learn	SD	D	US	A	SA
9. The facilitator made me feel comfortable and at ease during the debriefing	SD	D	US	A	SA
Clinical reasoning					
10. The simulation developed my clinical reasoning skills	SD	D	US	A	SA
11. The simulation developed my clinical decision-making ability	SD	D	US	A	SA
12. The simulation enabled me to demonstrate my clinical reasoning skills	SD	D	US	A	SA
13. The simulation helped me to recognize patient deterioration early	SD	D	US	A	SA
14. This was a valuable learning experience	SD	D	US	A	SA
Clinical learning					
15. The simulation caused me to reflect on my clinical ability	SD	D	US	A	SA
16. The simulation tested my clinical ability	SD	D	US	A	SA

17. The simulation helped me to apply what I learned from the case study	SD D US A SA
18. The simulation helped me to recognize my clinical strengths and weaknesses	SD D US A SA

Thinking back on your low fidelity simulation (LFS) experiences in NURS 3280 Nursing Skills Laboratory, please select from the list below all options that closely reflect what you found to be the most valuable aspects of your LFS experiences.

- Preparation materials and orientation to the simulation area ( )
- Instructor's facilitation ( )
- Reflection on the simulation experience ( )
- Opportunity to apply clinical reasoning and decision-making skills ( )
- Opportunity to practice the learned nursing skills ( )
- Teamwork and collaboration ( )
- Engaging and realistic environment ( )
- Reinforces theoretical knowledge learned in classroom ( )
- Other, please describe ___________________________________
- Other, please describe___________________________________

Also, please rank the top three options from above which reflect what you found to be the most valuable part of your LFS experiences.

____

____

____

Thank you very much for your participation in this study. It is greatly appreciated.

You are invited to participate in a drawing for a $30 UM Bookstore gift certificate card (three chances to win). If you wish to enter in the drawing, please provide your name and email address on this page. Your name will not be connected with your responses. Your responses will remain anonymous.

Name: ___________________________________

Email address: _____________________________

Appendix D

SSE Scale Frequencies of LFS, N=35

SSE Scale Items	SD	D	US	A	SA	total
Debriefing & Reflection Subscale						
1	1	3	6	21	4	35
2		3	6	21	5	35
3		8	9	16	2	35
4		3	6	20	6	35
5		3	6	21	5	35
6		4	5	18	8	35
7		6	6	19	4	35
8		4	7	20	4	35
9	1	6	6	17	5	35
Clinical Reasoning Subscale						
10		1	4	25	5	35
11		4	4	23	4	35
12		1	4	25	5	35
13		9	9	12	5	35
14		3	3	21	8	35
Clinical Learning Subscale						
15		2	1	25	7	35
16		2	3	22	8	35
17			6	22	7	35
18			1	24	10	35

SSE Scale Frequencies of HFS, N=35

SSE Scale Items	SD	D	US	A	SA	total
Debriefing & Reflection Subscale						
1	1	4	5	22	3	35
2	1	3	2	19	10	35
3	1	3	6	20	5	35
4	2	2	4	20	7	35
5	1	4	7	19	4	35
6	1	3	6	18	7	35
7	1	4	8	15	7	35
8	1	4	7	17	6	35
9	3	4	6	14	8	35
Clinical Reasoning Subscale						
10	1	3	4	25	2	35
11		5	2	21	7	35
12		3	6	22	4	35
13		10	8	13	4	35
14		4	4	19	8	35
Clinical Learning Subscale						
15		1	6	23	5	35
16		4	6	22	3	35
17		3	6	22	4	35
18		3	8	19	5	35

Appendix E

Ranking Questions Frequencies of LFS, N = 35

	Choices										
Top three frequencies											Total
Items	1	2	3	4	5	6	7	8	9	10	
1 Preparation	3	10	4	2	5	3	3	2	0	0	32
2 Instructor	2	2	3	2	8	6	2	7	1	0	33
3 Reflection	1	2	2	3	4	5	7	9	0	0	33
4 Apply CR	5	6	5	12	4	2	1	0	0	0	35
5 Apply skills	16	6	3	3	3	1	3	0	0	0	35
6 Teamwork	5	1	5	1	4	6	8	5	0	0	35
7 Engagement	1	2	7	4	3	6	7	5	0	0	35
8 Reinforce theory	2	5	4	8	4	5	3	4	0	0	35
9 Other	0	0	1	0	0	0	0	0	0	0	1

Ranking Question Frequencies of the Most Valuable Items of LFS Simulation Experiences, N = 35

Variables	Top three frequencies	3 mid-range	4 low-range
1 Preparation Materials & Orientation	17*	10	5
2 Instructor Facilitation	7	16	8
3 Reflection	5	12	16
4 Opportunity to Apply CR and DM	16*	18	1
5 Opportunity to Practice New Skills	25*	7	3
6 Teamwork	11	11	13
7 Engagement & Realism	10	13	12
8 Reinforced Theoretical Knowledge	11	17	7
9 Other factor	1	0	0

*Top three ranked items

Ranking Questions Frequencies of HFS, N = 35

	Choices										
	Top three frequencies										Total
Items	1	2	3	4	5	6	7	8	9	10	
1 Preparation	5	3	3	2	4	3	7	6	0	0	33
2 Instructor	1	3	1	3	5	7	8	6	0	0	34
3 Reflection	0	2	2	2	3	10	9	7	0	0	35
4 Apply CR	7	6	8	6	2	4	1	1	0	0	35
5 Apply skills	11	6	3	5	4	2	2	2	0	0	35
6 Teamwork	5	4	2	7	7	1	4	5	0	0	35
7 Engagement	5	5	7	3	4	5	2	4	0	0	35
8 Reinforce theory	1	6	9	7	6	3	1	2	0	0	35
9 Other	0	0	0	0	0	0	0	0	1	0	1

Ranking Question Frequencies of the Most Valuable Items of HFS Simulation Experiences, N = 35

Variables	Top three frequencies	3 mid-range	4 low-range
1 Preparation Materials & Orientation	11	9	13
2 Instructor Facilitation	5	15	14
3 Reflection	4	15	16
4 Opportunity to Apply CR and DM	21*	12	2
5 Opportunity to Practice New Skills	20*	11	4
6 Teamwork	11	15	12
7 Engagement & Realism	17*	12	6
8 Reinforced Theoretical Knowledge	16	16	3
9 Other factor	0	0	0

*Top three ranked items