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Simulation Use in Pre-Licensure Nursing Programs: Assuring Excellence in New Nurse Competence and Confidence

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Abstract

Purpose: This program evaluation project aims were to review the current state of simulation experiences in pre-licensure undergraduate nursing programs in Washington State and determine policy recommendations related to the future use of simulation experiences in clinical nursing education. The evaluation compared student outcomes of NCLEX pass rates associated with clinical simulation versus traditional clinical nursing experiences. Programs were evaluated for compliance with INACSL Simulation Standards of Best Practice.

Conceptual Framework: The NLN/Jeffries Theory provided the framework for an analysis of program evaluation data regarding using the INASCL Simulation Standards of Best Practice.

Design/Method: The study design was a descriptive mixed method using a compilation of survey questions from the National Council State Boards of Nursing (NCSBN) Survey of Simulation Use in Pre-licensure Nursing Program Changes and Advancements and the Program Assessment Survey for Simulation (PASS). Ten completed surveys provided data for qualitative and quantitative analysis.

Results: Variation exists between nursing programs related to clinical hours per course. All programs offer a variety of simulation experiences as part of their pedagogy. Variation was also noted in program use of simulation activities substituted for traditional clinical hours, with 1:1 ratio being used when hours were substituted. All programs were aware of the INACSL Standards and were in varying stages of full implementation of those best practices. All programs met and most programs exceeded the minimum passing standard for NCLEX.

Conclusions: The simulation experience of the past year of Covid 19 supports the role of simulation in substitution for traditional clinical hours at both 1:1 and 2:1 ratio.

Keywords: undergraduate, simulation, traditional, clinical, replacement ratio, and nursing

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Providing a high-quality clinical learning experience in nursing programs continues to be a challenge. Factors driving this challenge include impacts from a shortened patient length of stay, increased patient acuity, multiple nursing education programs competing for the limited availability of clinical placements, and issues of student access to the electronic health record. According to the Washington State Nursing Care Quality Commission (NCQAC)Annual Report for Academic Year 2018-2019, twenty-five colleges and universities reported inadequate clinical sites for the students in the state of Washington (Nursing Programs-Education, 2021).

Disparities in actual student learning experiences in clinical placements have continued to evolve, often driven by patient safety initiatives that have decreased the number of students allowed in clinical sites at one time. Restriction of learning activities during the clinical placement to observation only impacts the quality of student learning as well (Nehring, 2008; Richardson & Claman, 2014).

Simulation-based experiences (SBE) can replicate patient situations, allowing students to develop and practice cognitive, motor, and critical thinking skills. As with all new approaches in learning and technology, assuring effective implementation and application remains a challenge (Alexander, et al., 2014; Arthur, Levett-Jones, & Kable, 2013; Cant & Cooper, 2017; Hayden, et al., 2014).

In 2012, the National Council of State Boards of Nursing (NCSBN) identified the need to explore, with rigor and a view to the ability to generalize, how simulation might substitute for traditional clinical experience. A large-scale two-part study looked at the following questions:

- "Is high fidelity simulation sufficient to help students adequately learn and meet competencies demanded in a challenging high acuity 21st-century practice environment?"
- "How do student outcomes after simulation compare with those of traditional clinical education?" (Hayden et al., 2014, p. S4).

After two years, part one concluded that there were no significant differences between simulation and traditional clinical education groups regarding end of nursing program knowledge, clinical competency, overall nursing practice readiness, or first-time National Council Licensure Examination (NCLEX) pass rates (Hayden et al., 2014).

Part two looked to determine the long-term impact of substituting simulation for traditional clinical experience by following the recently graduated nurses six months into their initial nursing positions. The new nurses and their hiring managers completed surveys at six weeks, three months, and six months for both intervention and control groups. In this study, managers gave all graduates, simulation, and traditional clinical education groups alike, similar ratings in critical thinking, clinical competency, and overall readiness to practice (Hayden et al., 2014).

Of note, a significant study conclusion was that 50% of simulation hours could effectively substitute for traditional clinical hours. The ratio of replacement of simulation hours to traditional clinical hours used was 1:1. An additional recommendation for further study regarding other hours ratios that might yield similar learning outcomes and NCLEX pass rates was suggested. They recommended that State Boards of Nursing use these results to inform policy decisions related to clinical hours required for graduation and progression to NCLEX examination (Hayden et al., 2014).

Five years after the NCSBN Simulation study's 2014 publication, slow changes were noted in operationalizing results. Examples of policy impacts are as follows. In a study of the 50 states and DC, 59% (30 of 51) have established simulation regulations, with 46% (23 of 51) providing a description or definition of what constitutes simulation (Bradley, et al., 2019). Approximately 50% (25 of 51) define the percentage of traditional clinical hours that nursing programs can replace with simulation hours. Except for Colorado, all are at a ratio of 1:1; Colorado allows for a 1:1 or 2:1 ratio. Additional findings of Bradley et al. (2019) include the challenge in locating simulation-related information on individual boards of nursing or nursing commission websites leading to concern for clarity of communication of changes in processes or regulations related to the role of simulation. Of note was the significant variability in the percentage of traditional clinical hours that individual jurisdictions allow replaced with simulation; "only 12 states set a minimum number of traditional clinical hours" (Bradley et al., 2019, p. 23). Clearly, while progress has occurred, much more is needed to assure consistent quality learning experiences for all pre-licensure nursing students.

In Washington State, because of the NCSBN study's publication, in September 2016, NCQAC instituted revised administrative rules related to simulation education in its pre-licensure nursing programs. These rules, referred to as Washington Administrative Code (WAC), are the details that elucidate the legal requirements of nursing practice. The rules stated that "programs may use simulation as a substitute for traditional clinical experience, after approval by the Commission, not to exceed 50% of clinical hours for a particular course." Recognized simulation, by the Washington State NCQAC, is a "technique to replace or amplify real experiences with guided experiences evoking or replicating substantial aspects of the real work in a fully interactive manner." ("WAC 246-840-534," 2019). For simulation to count as

clinical experience, nursing programs must support simulation-based learning with a simulation-based framework, model, or theory. The framework requires underpinning by fiscal, physical, material, technological, and human resources. Simulation programs are managed by both an academic and teaching experienced individual who provides oversight to the program. Clinical faculty must have simulation training and participate in ongoing professional development in its use. Programs must link simulation activities to programmatic outcomes. Policies and procedures are required to support integration planning, debriefing of the learning activity, a plan for faculty orientation, and evaluation of student experience. Debriefing is a post-simulation experience facilitated by an experienced faculty member that encourages reflective thinking and allows for student feedback regarding scenario performance ("WAC 246-840-534, 2019). These legally required elements align with the defined standards of best practice as identified in the 2014 NCSBN Simulation study (Hayden, et al., 2014). Not meeting the standards of best practice in simulation risks inadequate learner experience and poor learner outcomes.

The evolution of simulation standards of best practice began when, in the 1970s, simulation faculty working in nursing program simulation labs started to engage in collaboration around the use of simulation experiences. Thus was the inception of nursing-focused simulation meetings. These meetings ultimately were the catalyst for the birth of the International Nursing Association for Clinical Simulation and Learning (INACSL). 1995 saw the first national conference on nursing skills labs which was held biannually until 2009. In 2002 INACSL became the official professional organization for simulation (Sanko, 2017).

INACSL published the first best-practice standards for simulation in 2011, with updated standards in 2013 and 2016 (Standards Committee, 2016). As the science underpinning effective simulation evolved, so have the expected standards of best practice. These standards provide the

context and expectations for high-quality simulation experiences, along with the Healthcare Simulation Dictionary (Lopreiato et al., 2016). The importance of a standardized and shared understanding of expectations and terminology allows for continuity and commonality that support the ongoing development of simulation science. Thus, we see these standards and terminology embedded in the legal standards for nursing practice. These standards are congruent with the mission of NCQAC "to assure safe/quality nursing care for the people of Washington State" (Holm, 2021, p. 5).

Purpose/Aims of Project

Recommendations related to simulation substitution for traditional clinical hours have been available to guide clinical education planning since the publication of the 2014 NCSBN study (Hayden et al., 2014). The question arises, "how is simulation education used currently as clinical hour replacement in pre-licensure nursing programs in Washington State compared to traditional clinical education?" The aims of this project were two-fold. First, how is simulation education used as clinical hours replacement in pre-licensure nursing programs in Washington State? Secondly, does the simulation education provided meet the NCSBN-supported INACSL Simulation Standards for Best Practice? The hope is that this survey's findings will provide insight into the role of simulation-based clinical education hours compared to traditional clinical education hours in end-of-program NCLEX pass rates.

Currently, clinical nursing education substitutes simulation for traditional hours in a 1:1 ratio. Emerging evidence in the simulation literature suggests a 2:1 ratio, where each hour of simulation clinical substitutes for 2 hours of traditional clinical time. A 2019 study by Sullivan and colleagues found the simulation learning setting's intensity and efficiency allowed for more robust mastery on the student's part (Sullivan, et al. 2019). More time was spent in higher-order

learning activities (based on Miller's Pyramid) compared with student learning in the traditional clinical setting. Students completed a more significant percentage of learning activities in half the time, and with independence than traditional clinical hours learning activities (Sullivan et al., 2019).

This project seeks to illuminate an understanding of the "current state" of simulation education and hour substitution in Washington State and consider that a 2:1 ratio may lead to a more optimal student clinical learning experience and assure high-quality nursing care upon entry into practice.

Literature Review

The purpose of this literature review is to provide a historical, structural, and contextual understanding of the role of simulation in undergraduate nursing education. The program evaluation study is specifically interested in how simulation education replaces traditional clinical hours. Finally, it seeks to explore an understanding of Simulation Standards of Best Practice application in actual practice in Washington State pre-licensure nursing programs.

The search strategy targeted studies published in English between 2015 and 2020 and targeted undergraduate nursing education. Key search terms included *undergraduate, simulation, clinical, replacement ratio, and nursing*. Searches using Google Scholar, Pub Med, and CINAHL databases were conducted. Identified articles were reviewed for both content and for additional sources for review from the reference lists. A list of 278 articles was returned; the search was further refined to look specifically for articles related to simulation use in the United States. A total of 76 articles were reviewed for relevance. Articles from prior to 2015 were included as they presented themselves during the review process.

Simulation History

Clinical experience is seen as being an essential element that is required to learn nursing practice. Historically nursing education ascribed to an apprenticeship model of learning. In this model, clinical experience gained in the clinical site, with the student providing care to patients under the direction of a clinical instructor and the nurses working in that setting, was considered the gold standard for how students learn to be nurses.

Nursing students learned the care process in a divided manner, with probationary, junior, and senior nursing students having different skills and shared responsibility for each patient's care. In the early 1930s, the model of traditional clinical experiences shifted such that each student provided all needed care of patients assigned for that day. The previous model allowed for more time for students to master assessments and skills before taking them to the patient bedside. With the shift to total patient care, young students needed accelerated ability to master skills, so the learning lab's role took on new importance (Davis, 1932).

Simulation has played a role in clinical instruction for many years, its use dates to the earliest roots of nursing education. Examples of task trainers, such as pelvic models used in training midwives, can be found in the late 1700s. Lees and Acland's 1874 *Handbook for Hospital Sisters* describes the use of models for teaching bandaging. Florence Nightingale used simulation in demonstrating her newly defined infection control practices. The first full-size manikin, known as Mrs. Chase, was introduced into nurses training in 1910 at the Hartford Hospital Training School (Sanko, 2017).

Full-scale simulation and skills labs became a part of nursing education in the mid-1930s. These became the place for nursing students to learn skills such as IM injection. Students practiced skills on models and each other. By the 1990s, human patient simulators began to

evolve into more sophisticated teaching tools with assessable heart rates, blood pressures, and such. With the development of computers, these simulators became programmable, with the ability to demonstrate changes in physiological parameters throughout the learning scenario. The use of simulation-based learning outside of healthcare in high-risk industries such as aviation, inspired evolution in healthcare simulation. This simulation focused on crisis management and team communication. In the last 20 years, simulation in nursing education has become accepted and expected (Andrighetti & Knestrick, 2015; Sanko, 2017).

By the early 21st century, nursing continued to change the paradigm for how new nurses should be successfully educated. Organizations such as the NCSBN, National League for Nursing (NLN), and others began to call for increased use and complexity of simulation experiences to support skills acquisition in students with potentially fewer clinical site hours needed to acquire basic skills. It was further recognized that faculty development in the use of simulation teaching strategies needs to be provided. National mandates related to a focus on safety and quality to address ongoing medical errors and adverse patient outcomes further fueled the move to change nursing education. Clinical education using simulation as a modality is believed to provide a complementary learning opportunity to traditional clinical education. Simulation looks to have a role to play in assisting students in synthesizing knowledge as they apply psychomotor skills and develop critical thinking to drive patient care decision-making (Nehring, 2008). The previous oft-stated paradigm of "see one, do one, teach one" in healthcare is now replaced by "see one, practice many, do one" (Sanko, p. 81, 2017).

Simulation Pedagogy

Simulation is a sophisticated pedagogy and a powerful teaching strategy. "Simulation is a technique-not a technology-to replace or amplify real experiences with guided experiences that

evoke or replicate substantial aspects of the 'real world' in a fuller interactive manner" (Gabe, 2004, p. 2). The role of simulation in nursing education has evolved significantly over the past 20 years in part as a response to identified gaps in the transition from nursing student to graduate nurse.

Gaps in Preparation for and Transition to Practice

With the publication in 2000 of the Institute of Medicine (IOM) report on medical errors in US healthcare, the continued existence of the preparation-practice gap was affirmed (Kohn, et al., 2000). The IOM further expounded on this gap in its 2011 report on nursing's future, calling out the need for a multifaceted approach that included critically evaluating and revamping healthcare professionals' education and training (Ironside, McNelis, & Ebright, 2014). An integrative literature review by Hickerson and colleagues affirmed the preparation-practice gap in their review of 50 articles. This review called out the detrimental effect of this gap resulting in an increased turnover in new nurses, increased costs to the institution, and patient safety concerns. They called for increased collaboration between the educational institution and the healthcare employer to remediate gaps (Hickerson, et al., 2016).

In 2014 to better understand the nature of contemporary clinical education, Ironside et al. looked at this question. Findings suggest that the current focus on task mastery may not adequately meet the demands that new graduate nurses will have placed on them. Gaps were identified in critical thinking and implementing evidence-based practice and standards and individualized care to patient needs, values, desires, and current care delivery demands. Recommendations for continued focus on innovation in nursing education, targeting developing these more complex nursing processes, such as critical thinking, were suggested (Ironside et al., 2014).

The pedagogical approach in nursing education using the traditional clinical hours' experience approach has been questioned in the literature for more than 50 years, however, with no significant change in course. Looking at traditional clinical hours compared to clinical simulation hours begs whether we are comparing like entities with like student outcomes. In a recent attempt at a systematic review of this question, Leighton et al. sought to understand the correlation between traditional clinical and student outcomes. Simulation and skills laboratory were excluded in their search. Ultimately, they identified 118 articles to assess for eligibility. Shockingly, no articles were identified that met inclusion criteria, yielding an empty systematic review (Leighton, et al., 2021).

Another gap identified relates to how many hours are necessary for a student to attain nursing competency. Each state nursing commission or board of nursing regulates the number of clinical hours required for licensure. 60% of states have specific rules about clinical education related to what defines clinical, the number of hours, and inclusion or exclusion of simulation-based hours. All states have a specific number of hours required; however, the requirement ranges from 400-750 total hours. A significant lack exists in the literature related to clinical hours related to clinical competency accounting for the considerable variation. This lack of literature exists at the individual specialty level (OB, Peds, etc.) and total hours to competency for graduation (Bowling, et al., 2018).

The Role of Simulation Experiences

In the past seven to ten years, much has been learned about simulation and how it can add to or take the place of traditional clinical hours. The 2014 NCSBN study added significantly to the body of knowledge on this pedagogical approach. A 2016 study looked at perceived gaps in simulation research (Mariani & Doolen, 2016). A convenience sample of 50 members of

INACSL were surveyed. They found that outcomes associated with simulation, learner satisfaction, perception, and self-efficacy are well studied. Likewise, simulation as a teaching-learning strategy for psychomotor skills development is well studied. Another viewpoint was presented, supporting a lack of understanding of how much time is needed in simulation to achieve a similar effect as traditional clinical. The impact of simulation learning on behavior change and transfer of knowledge to practice were also identified as areas in need of further research.

Additionally, the lack of resources and support were identified as barriers in conducting needed simulation research (Mariani & Doolen, 2016). Few studies were found looking at the impact of simulation-based experiences on patient outcomes. This is an essential area for further investigation (Sanko, 2017). Clearly, more study is needed relating to traditional and simulation approaches to clinical learning, and outcomes attained by learners and how they impact patients.

In 2008, on behalf of the NCSBN, Nehring surveyed all states, the District of Columbia, and Puerto Rica to examine the status of regulation changes related to use of simulation in nursing education. Responses were received from 44 states, DC, and Puerto Rica that showed an evolving landscape related to simulation. Five states reported recent regulation changes, and one specified a percentage of 10 % of clinical hours replaced by simulation learning experiences. An additional 16 states reported clinical hours' replacement based on a case-by-case request basis. (Washington was among those) A recommendation was made that further discussion and research were needed (Nehring, 2008).

Educational Objectives & Outcomes

A 2013 Delphi study used international expert opinion to identify quality indicators for the use of simulation. Recommendations were made for pedagogical principles to guide

simulation design and use that included that simulation experiences be crafted in alignment with curriculum goals and course objectives. A suggestion was made that simulation experiences be mapped across the curriculum to assure alignment between program and course objectives. Simulation as a technique lends itself to scaffolding learning experiences that build on student knowledge and skills that move toward student mastery and increased independence. A further recommendation was made that simulation in some form be integrated into every clinical course and progress in complexity as student mastery increased. Finally, learning objectives be the driver for all aspects of simulation design and that those learning objectives be explicit to both faculty facilitator and learner (Arthur et al., 2013).

A still-growing edge within simulation pedagogy is how this technique, applied to learning, is best designed to facilitate quality educational outcomes. INACSL includes a standard related to outcomes and objectives as a best practice expectation. "All simulation-based experience begins with the development of measurable objectives designed to achieve expected outcomes" (Standards Committee, 2016, p.S13).

The work by O'Donnell, et al (2014) in a State of the Science Project looking at simulation learning objectives affirmed the importance of these outcomes in learner success (O'Donnell, et al., 2014). Using a literature review approach, they identified current-state and gaps in knowledge related to the role and use of simulation learning outcomes. Other findings included the inadequate use of a tested framework in guiding the development of research protocols or design decisions. Additionally, it was recommended that a means for more active measurement of simulation learning outcomes be developed. Instruments used need to be psychometrically sound to improve the quality and reliability of the evidence being used to support simulation methods. Recommended outcomes include critical thinking/clinical

judgment, self-confidence/self-efficacy, transition to practice (transferability), improved communication, clinical performance, professional behaviors, and clinical outcomes (O'Donnell et al., 2014).

Student outcomes associated with simulation experiences encompass cognitive, affective, and psychomotor domains of learning (Cantrell, et al., 2017). Simulations had the most significant effect on cognitive outcomes such as problem-solving, critical thinking, and clinical judgment. They seemed to have a lesser effect on improved knowledge outcomes (Cantrell, et al., 2017, p. 637).

Multiple studies have demonstrated positive student satisfaction with simulation experiences. Students have observed that simulation bridged the gap between what is presented in theory and the psychomotor skills initially learned in the skills lab; simulation allows for them to place knowledge and skills within the context of an actual clinical setting (Hyland et al., 2012).

In a 2013 review by Forona and colleagues of sixteen studies reported on student satisfaction with simulation. Students felt supported in their learning. Within the affective domain, satisfaction with learning experience was consistent across all levels of expertise and practice areas and learning styles, including solitary and social. This was also a finding in the Umbrella Review by Cantrell and colleagues (Cantrell, et al., 2017; Foronda, et al., 2013). Further, 25 of 26 studies in this review suggested a correlation between simulation experiences and student achievement of confidence. Significant evidence is also found with regard to the efficacy of simulation experiences with large effects in the psychomotor domain of learning. Repetitive practice builds retention in this domain. More study is needed to fully affirm the

transfer of clinical judgment and thinking skills from simulation to actual clinical practice (Cantrell, et al., 2017).

In a study by Bailey and Mixer (2018) of newly graduated registered nurses, nine of ten participants expressed that simulation experiences helped prepare them for professional practice. They stated that their learning was increased as a result of the more complex scenarios. These respondents expressed value in hands-on learning, the realism that simulation provided, and how successful scenario complexity increased their confidence. These results support Kolb's theory that experiencial learning changes the way one thinks.

To implement a quality simulation program, faculty and staff involved in the design and implementation of simulation experiences must have adequate training and a faculty development means to provide successful facilitation (Arthur, et al., 2013; Beroz, et al., 2019; Cantrell, et al., 2017). Ongoing faculty development in this area offers effective instigation and continuation of simulation within the curriculum. Knowledge of effective frameworks to be used in the design of scenarios is essential in setting the stage for learner success. Understanding the various levels of fidelity, having knowledge and comfort with the tools and technology to be used, and possession of relevant clinical understanding are also essential. Faculty need knowledge and skill in using an established framework to facilitate all aspects of the simulation session, including pre-brief/facilitation (orientation), the scenario itself, and the debriefing after the session. The skills and knowledge of the trained facilitator directly impact the quality of the learner experience (Arthur et al., 2013; Beroz et al., 2019). A "novice to expert" approach to faculty education was suggested by Beroz et al. (2019), beginning with foundations, theory, standards, and methods as the primary education for faculty engaged in simulation pedagogy and developing expert skills over time leadership, scholarship, and certification. Attention must be

paid to faculty receptiveness to a change in pedagogy with simulation. Miller and Bull (2013) found that support for and interest in the faculty to the addition of simulation experiences into their teaching tool kit requires substantial faculty commitment. It also requires external support as faculty learn this new way of teaching. Readiness to learn and willingness to be a novice learner again will directly impact the success of embracing simulation as a teaching strategy. Programs also need to plan for the financial support required to ensure essential faculty development is ongoing.

Students are required to master a significant repertoire of clinical skills during their education. Bloom's Taxonomy provides a framework in which nursing faculty provide the scaffolding to maximize the learner's experience (Clark, 2015). Theory courses address the cognitive domain and provide the foundation that supports higher student mastery levels of psychomotor and affective. Psychomotor skills are attained in several venues, the skills lab, the clinical site, and within the context of a simulation session. No single venue provides fully for student mastery. The combination of experiences and venues synergistically combine for skill and knowledge acquisition.

Traditional Clinical Experience

Traditional clinical experiences involve a faculty-supervised experience in a clinical setting working with a preceptor or resource nurse providing care for a patient or patients across a given shift. Faculty are present to provide assistance and encourage student learning and provide the opportunity for reflection on the day's learning in a post-conference. Some clinical sites provide dedicated education units where the preceptor nurse role is expanded to include the student more intensely in interactions with the expert clinical nurses. Barriers experienced include limitations of clinical sites or with numbers of students allowed on a given shift.

Decreased length of patient stays, increased patient acuity, and patient safety initiatives leading to more observation and less opportunity for hands-on care also impact the ability of the student to experience maximal opportunities for performance of psychomotor skills and higher order of nursing experience. The complexity of actual nursing practice further complicates the learning process for students.

In a 2014 study of clinical learning by McNelis and colleagues, in addition to positive findings of this venue as a setting for learning, four themes emerged indicating problems within the model (McNelis, et al., 2014). These themes include missed opportunities for learning in the clinical setting, getting the work done as a measure of learning, failing to enact situation-specific pedagogies to foster clinical learning, and failing to engage as part of the team (McNelis, et al., 2014, p. 32). These themes contribute to the experience of "down time" during the clinical day. Rethinking how faculty and students optimize their clinical time and expand the use of simulation to prepare students for competence in the clinical setting may allow for engagement with more complex aspects of care and increased mastery as a result.

Evaluation

As defined in INACSL Standards, "all simulation-based experiences require participant evaluation" (Standards Committee, 2016, p.s26). Evaluation can take the form of formative, summative, or high stakes. Formative assessments are a measure of the learning progress as learning is occurring. It intends to support student learning to encourage students to progress towards specified objectives and outcomes. Formative assessment is usually not graded. Summative assessment focuses on the measurement of learning status at a specific point in time. They evaluate what the student has learned and can demonstrate. High-stakes assessment has significant implications for the learner. They are usually tied to grades or progression. All types

of assessment, formative, summative, and high-stakes, can support the evaluation of cognitive, affective, and psychomotor domains of learning. Most simulation evaluation is formative. A goal of simulation design it to provide a safe, low threat, high yield, learning environment for the student. *"Mistakes are mysteries to be solved"* Suzan Kardong-Edgren (Jeffries & Kardong-Edgren, 2020). The safety of the environment encourages the student to learn from mistakes. In the low stakes, formative evaluation setting students are supported to deeply reflect on the learning experience and be open to hearing feedback from peers and faculty. The student then uses that feedback to identify and close gaps in knowledge and skills. While listed in the best practice standards, summative and high stakes evaluation are less often used as a measure of learner success in support of the goals of low threat, high yeild learning.

Assessment

A 2015 project of the NLN looked at the feasibility of using simulation for high-stakes assessment in pre-licensure nursing programs (Rizzolo, et al., 2015). A team of academic experts recommended suitable scenarios for end-of-program mastery evaluation. Student performance, using video recording, was scored. They found that simulation design takes a considerable amount of time to produce valid and reliable scenarios. Clarity of what is to be evaluated was critical. Facilitators require significant preparation to lead a high-stakes scenario. Finding the appropriate validated tool was also important. Differences of opinion continue within the simulation educational community as to the congruence of simulation learning philosophy, focusing on psychological safety and low risk, with high-stakes consequential evaluation. The authors of this project found that the NLN Fair Testing Guidelines were validated in their experience and that "no student should be judged via any one single test" (Rizzolo et al., 2015, p.302).

Simulation Environment and Types

Simulation experiences require an environment in which to facilitate the experience of the learner. The environment supports active learning on the part of the learner and sets the stage for the learner to move into the live clinical learning environment. These environments exist in what is usually referred to as a Simulation Learning Center or Lab. This concept of a specific learning environment for clinical skills has been a part of nursing education as far back as the mid-19th century. Full-scale simulation labs in nursing schools evolved in earnest in the 1930s (Sanko, 2017). Learning in these environments is phased, with pre-work or briefing where the learner gains a conceptual introduction to the topic or skill. The learner than has a kinesthetic experience where the learner uses cognitive, affective, and psychomotor domains to hardwire the learning, followed by a facilitated debriefing. Debriefing allows for guided exploration and reflection on the experience and is an essential contributor to the learning process (Sanko, 2017). Many find that debriefing is the place where the most significant learning from the simulation experience occurs.

Fidelity

Fidelity is defined as "the degree to which the simulation replicates the real event and or workplace and includes physical, psychological, and environmental elements" (Lopreiato, et al., 2016, p. 11). Working definitions of fidelity have evolved over the years as technology has evolved. An article by Davis, published in the American Journal of Nursing (AJN) in 1932, recounts the "Workable Nursing Laboratory" at Indiana University Training School for Nurses (Davis, 1932). The "Workable Nursing Laboratory" also engaged fidelity in its physical design with a quiet location, ample light, visibility for supervising faculty, and ability for students to observe each other planned into the layout (Davis, 1932). The environment was designed to

mimic the setting of the hospital to which students would be transitioning. Students were able to practice independently, in groups, and with the supervision and coaching of the faculty until they were ready to transition to the live clinical environment. Congruence with the clinical setting was considered essential for successful mastery. Parenthetically the "curriculum for the preliminary course taught in this setting included fifty-four hours of nursing theory and one hundred eight hours in laboratory practice" (Davis, p. 390, 1932).

The next evolution in the use of formalized simulation centers or labs in nursing coincided with the publication of the IOM report, *To Err is Human,* in 1999. Prominent in the work of the IOM was recognition of the role of faulty communication and teamwork in the ongoing issue of healthcare errors. Healthcare was challenged to look outside its own walls to other high-risk but highly reliable industries such as aviation for solutions. Aviation pioneered simulation to build highly reliable processes and teams, resulting in low rates of failure and bad outcomes. This work catalyzed interprofessional teams in simulation experiences to improve performance in these high-risk healthcare teams.

Other levels of fidelity include low and mid. Low fidelity is defined as "not needing to be controlled or programmed externally for the learner to participate" (Lopreiato, et al., 2016, p.20). Medium (or mid) fidelity manikins are full body with the ability to change heart, breath, and bowel sounds remotely (Seropian et al., 2004). They provide a more complex learning aid for developing basic assessment and intervention skills (Lapkin, et. al., 2010). The scenario and objectives allow modalities to adapt and create the desired level of fidelity.

Modalities

A variety of modalities are used in the simulation lab/center to facilitate meeting student learning outcomes. Modality is defined as, "a term used to refer to the type(s) of simulation

being used as part of the simulation activity, for example, task trainers, manikin-based, standardized/simulated patients, computer-based, virtual reality, and hybrid" (Lopreiato, et al., 2016, p.30).

Specific skills may be effectively experienced with a Part-task Trainer, also known as a Task Trainer or Partial Task Trainer (Lopreiato, et al., 2016, p.38). These provide just the key elements needed to learn a specific skill. Examples include airway, cardiac, genitourinary, injection, OB/GYN, and others (Stanford Medicine Center for Immersive and Simulation-based Learning, 2021). The trainer provides an opportunity for the learner to practice the technique in a risk-free setting before implementing the skill on a live patient. These are usually considered to be low-fidelity simulation technology. (Task trainers may be used to deliver a high-fidelity simulation experience as well if incorporated into a scenario with a high level of realism and interactivity)

Manikin-based simulation is likely the most well-known modality. While initial manikins, such as Mrs. Chase, were inert but allowed for the learner to have a physical interaction with the simulated patient, more recent manikins have significant technological innovation that allows for a more realistic and reciprocal experience between the "nurse and patient." The manikin patient has physical functions such as heart rate, breathing, and other tangible physiologic representations that the learner must assess, interpret, and respond to. Manikins may be used in either low or high-fidelity simulation, as high-fidelity is defined as "simulation experiences that are extremely realistic and provide a high level of interactivity and realism for the learner". The fidelity is determined by the scenario rather than the equipment used (Lopreiato, et al., 2016, p.11). Other modalities in use in simulation include use of a

standardized patient and computer based, also referred to as virtual or virtual reality simulation, and round out the available tools to craft the simulation experience for the learner.

Fidelity and Modality United

Understanding of the role of high-fidelity simulation in the development of clinical reasoning skills continues to evolve. In one early systematic review of this question, limitations of the available studies to review on this inquiry failed to answer conclusively. That said, they did find three outcomes integral to the development of clinical reasoning: knowledge acquisition, critical thinking, and ability to identify deterioration in the patient increased in learners exposed to this type of learning experience. Learners identified very high levels of satisfaction in the studies reviewed; learner satisfaction is vital in engaging the learner and facilitating learning (Lapkin, et al., 2010). Another paper reported high-fidelity simulation experiences to be valuable for team-based learning, critical thinking development, and facilitative of reflective practice. The safety of the learning environment improved learner competence through repeated practice and the ability to interact as a professional (Garrett, et al., 2011).

Designated high-fidelity manikins are full-sized with increased realism in their physical structures and functions. Programmed by computer, they can mimic diverse parameters of physiology. Changes in physiology can be manifested in all body systems. The technician can alter the readings and physiological responses based on the interventions of the learner. They typically have a speaker embedded that allows for verbal interaction between the learner and a patient voice actor, adding to the realism of the simulation experience (Lapkin, et al., 2010; Lopreiato, 2016, p.11).

Use of a standardized patient also referred to as a simulated patient, is another modality to introduce a high degree of fidelity into a simulation learning experience. These are

individuals who are coached to simulate the actual patient. They "become the patient" and engage with the learner as if they were the actual patient with a history. They display the physical, emotional, mannerisms, and personality characteristics of the expected patient. They present in a realistic, standardized, and repeatable way. Frequently they are used for teaching history-taking, physical assessment, and other clinical skills in a simulated clinical environment. Often these are high-stakes assessments for the learner. They may also be used to add fidelity to a scenario by playing the role of a family member (Lopreiato, 2016, p.48).

Definitions continue to evolve rapidly in the current environment. "Virtual" or "Virtual reality" refers to a simulation where the experience occurs solely within a computer-based synthetic environment (Stanford Medicine Center for Immersive and Simulation-based Learning, 2021). These modalities are now combined into a new definition, "computer-based." (Lioce et al., 2020, p.14). A continuum is possible within the environment, from a fully immersive one to a more limited world. Input into the experience is generated by the learner using a keyboard or other device that allows for interaction within the environment. This approach is often used to train complex medical procedures. Another variation of this is less complex and can use a desktop and a mouse or other device to provide for interaction within the "world" by pointing or touching the items to be used in patient assessment of care. The simulated patient responds to whatever course the disease process takes or responds to the interventions (or lack thereof) from the learner. This type of "virtual simulation" is the newest modality of simulation experiences; it has been used extensively over the past year of the Covid-19 pandemic to replace live clinical experiences during remote learning.

Computer-based modalities look to enhance nursing education using technology. Like in-person simulation experiences, the learner has an opportunity to practice assessments and

responses in a safe environment. The technology supports repeated attempts to change their assessment or interventions based on computer-based and scoring feedback. Over the past 15 years, these technologies have evolved significantly.

An example of computer-based simulation, widely in use in US nursing programs, is vSim for Nursing (Foronda, et al., 2016). NLN had called for the development of effective technologies that would support the teaching of nursing decision-making skills. vSim for Nursing resulted from a collaboration between Wolters Kluwer Health, Laerdal Medical, and the NLN. Students interact with the web-based platform in which they play the role of the nurse. They choose the assessments, interventions, and communication with the team necessary to provide appropriate care. The scenario lasts approximately 30-45 minutes. Feedback is received, and they may repeat the scenario as often as desired to improve outcomes. Both faculty and students report satisfaction with the learning experience. Post simulation evaluation of the experience found that the product was easy to use, and that content was relevant to their role as the nurse. Other feedback included frustration with an inability to multitask in the virtual environment, that real-time features such as hand hygiene took too long, and that there was a preference for providing nursing actions in real life rather than troubleshooting within the virtual setting (Foronda, et al., 2016, p.130). Students in this study worked together in teams of two which may have influenced study outcomes on satisfaction.

Another example that combines virtual simulation with standardized patient actors is the E-Simulation program First^{2}Actweb (Cant, et al., 2015). In a study of 367 pre-licensure nursing students in Australia, participants completed the three-scenario experience. Each scenario presents the learner with 32 assessment and treatment options. The scenarios involve acute myocardial infarction, hypovolemic shock, and chronic obstructive pulmonary disease and

feature an actor standardized patient. The learner experiences visual, text, voice, optional choices, and feedback. Students are required to make real-time decisions about the management of the patient over an eight-minute role play. The student is engaged with the computer simulation for approximately 60 minutes. The computer collects the data from the learner interactions and provides a summary score. On a course satisfaction survey of 330 participants 93% gave a positive rating on seven queries. Only one and a half percent were in disagreement (Cant, et al., 2015). The high fidelity and realism were found to increase the understanding of patient deterioration and cue appropriate response of the learners.

As the newcomer modality in simulation experiences, computer-based simulation will benefit from additional study. The nomenclature to describe these modalities needs to be refined and mutually agreed upon to facilitate comparison across studies (Cant, et al., 2019). Levels of fidelity, immersion, and the embodiment of the simulated patient as actor or avatar will be important information to have available to fully understand these modalities. Face-to-face simulation has a significant body of literature to underpin it; hopefully, a similar body of literature will evolve regarding these computer-based modalities. As we are assured of similar effectiveness in learning from these modalities, then the attractiveness of a less human resource and physical resource-driven approach to simulation experiences may allow expanded support for student learning.

The findings of a recent study looking at computer-based simulation to develop clinical judgment in pre-licensure nursing students reported findings that suggest virtual simulation is beneficial to student learning and the development of clinical judgment skills (Fogg, et al., 2020). Students completed five scenarios across the quarter. Each simulation involved a pretest, simulation, post-test, and documentation activities. (It is noteworthy that debriefing is not

described as part of the simulation experience in this study) A minimum score of 90% on the scenario was required for passing, and students could repeat the scenario as many times as needed to achieve that level of mastery. In addition to exposure to key pediatric diagnoses and higher acuity patients, there was also documentation in an electronic health record that added to the fidelity of the experience. Clinical hours credit was calculated on a 1:1 ratio for the time spent in completing each scenario. When completing the first and final scenarios, students scored themselves on the Lasater Clinical Judgment Rubric (LCJR). That metric, along with data on the number of attempts on each scenario, provided the evaluative study data. Students demonstrated significant improvement on the LCJR between the first and final scenarios. The average number of student attempts decreased significantly from the first case with a mean of 3.38 and the last case with a mean of 2.11. Limitations affecting results include that familiarity with the platform rather than an increase in knowledge may account for the decrease in attempts to goal score over time. It may also indicate that once familiarity was established, it allowed for a focus on thinking through the priorities of the case rather than navigating the computer-based program.

Simulation Structure

In a Delphi study by Arthur et al. (2013), structural quality indicators were identified as essential, including student preparation and orientation during a pre-brief and a structured debriefing. The experience needs to be facilitated by an experienced and trained faculty member immediately following the simulation experience (Arthur et al.,2013).

Pre-briefing (Facilitation)

Pre-briefing sets the stage for a successful simulation experience and is the first phase of the simulation. The INACSL standard states, “facilitation methods, (also referred to as briefing

in the standard), vary and use of a specific method is dependent on the learning needs of the participants and the expected outcomes. A facilitator assumes responsibility and oversight for managing the entire simulation-based experience (Standards Committee, 2016, p.s16). To meet this standard, a facilitator with skills and knowledge in simulation pedagogy engages the learner (s) at the level of their learning experience and competency.

Lopreiato et al. define pre-briefing as "an information or orientation session held before the start of a simulation activity in which instructions or preparatory information is given to participants. The purpose of the pre-briefing is to set the stage for a scenario and assist participants in achieving scenario objectives" (Lopreiato, et al., 2016, p. 27).

Participation in a pre-briefing alleviates learner anxiety and improves learning. While some anxiety facilitates student learning, excessive anxiety blocks successful engagement. Time is allowed to introduce the scenario, review the objectives, and provide orientation for familiarity with the environment. Pre-briefing is a component of the facilitation that a successful simulation experience requires. It should be structured for learning and encouraging the student to think like a nurse. Thus, pre-briefing begins the process that supports the learner's performance during the scenario and for deeper reflection during debriefing. The activities of the pre-brief provide the content and background to prepare the learner for full participation in the simulation experience.

One of the primary purposes of the pre-brief element is to assure a setting of psychological safety for the participants (Rudolph, et al., 2014). Psychological safety is the perception on the part of the learner that risks can be taken without consequences (Cheng, et al., 2020). This perception supports the learner in participating openly in discussions with other learners and faculty. Within the affective domain of learning, the pre-briefing provides an

environment where feelings of insecurity and threat are acknowledged and managed while nurturing well-being and possibility. Within that envelope of psychological safety, the learner is encouraged to take risks in the interest of stretching learning. It ultimately assists in avoiding defensiveness and fosters openness to feedback. All of this increases the learning across the entire simulation experience. In the event of an error, the setting of psychological safety allows for learning rather than guilt and self-deprecation. While there may still be some negative emotions associated with an error during the experience, those negative feelings may also motivate additional learning.

Additional activities associated with the pre-briefing activity include learners building a meaningful learning environment and identifying the rationale for the care that will be provided. Students can engage as a group to discuss their understanding of the scenario, the condition that the patient is presenting with, and ways they may attend to the patient's needs during the simulation experience. The facilitator role encompasses providing a supportive presence to leading discussion and answering questions. Orientation of the student to the physical space, in much the same way that the nurse is oriented to a new clinical space, prior to assuming patient care, is another important modeling as well as providing comfort on the part of the learner for being safely within the space during the scenario (Page-Cutrara, 2015).

Page-Cutrara followed up her concept analysis on pre-briefing with a study in 2017 looking at the impact of a Structured Pre-briefing Model on student learning, focusing again on the crucial role of pre-briefing (Page-Cutrara & Turk, 2017). Pre-briefing, identified as one of the major phases of simulation learning, is where the learner is prepared for success during the subsequent phases of scenario and debriefing. Not only is the student preparing for the structure, function, and operational aspects of the scenario at hand it is a time for students to practice

thinking like a nurse, what Jeffries has referred to as "practicing the intentionality of noticing during patient care" (Jeffries P. , 2014, p.222). Leveraging the concepts of intentionality and its companion reflection, the model was informed by the critical role of reflection throughout the simulation experience. The Cycle of Reflection framework referenced by Page-Cutrara and Turk, incorporates the work of Greenwood, Schlon, and Dreifuerst, making explicit the role of reflection in the learning process throughout all phases of the simulation experience (Page-Cutrara & Turk, 2017, p. 79). See Figure #1. Greenwood's "reflection-before-action" incorporated into the other elements of pre-briefing (Schon, and Dreifurest) intentionally sets a future focus and allows the student to anticipate what is to come and options for response. Set in the context of specific learning objectives and facilitated by an experienced faculty may build these important skills in the learner.

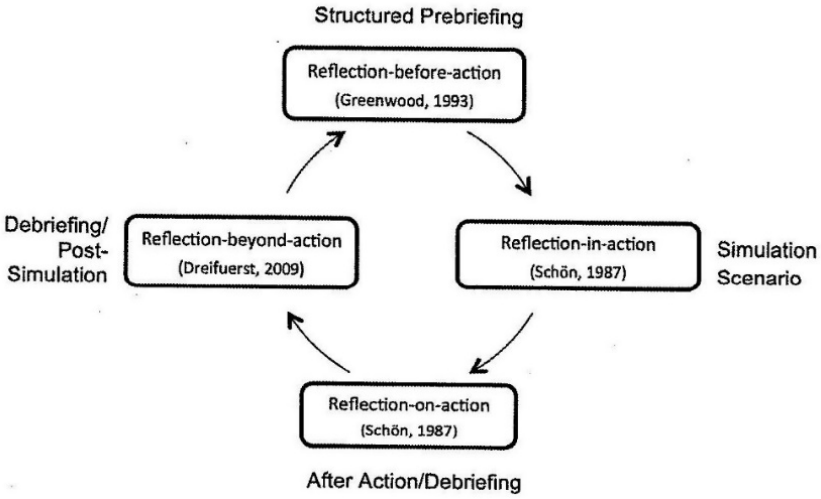

Figure 1 Cycle of Reflection throughout the Nursing Simulation Process

The control group in the Page-Cutrara and Turk study received traditional fifteen-minute pre-briefing activities that included orientation to space and equipment, the manikin, the roles, objectives, and patient situation. The intervention group received the traditional pre-briefing

along with additional facilitated reflection-focused prompts. The intervention group experienced no more than 30 minutes of the combined pre-briefing approach. The Creighton Competency Evaluation Instrument (CCEI) and Clinical Judgment subscale were used for data collection. As measured on the CCEI, competency performance scores were significantly different from the control with a *p*-value of <0.0001. Clinical judgment scores were substantially greater for the intervention group than the control with a *p*-value of < 0.0001. Finally, the perception of the pre-briefing experience was shown to be greater for the intervention group compared to the control group. A reflection-focused structured pre-briefing that incorporates traditional pre-briefing may contribute more robustly to the learning to "notice" that is part of learning to think like a nurse (Page-Cutrara & Turk, 2017).

Debrief

Following phase two of the simulation experience (the scenario itself), phase three is debriefing. Per INACSL standards, "all simulation-based experiences include a planned debriefing session aimed at improving future performance" (Standards Committee, 2016, p.s21). Lopreiato defines debriefing as "a formal, collaborative, and reflective process within the simulation learning activity, an activity that follows a simulation experience and led by a facilitator, to encourage participants' reflective thinking and provide feedback about their performance while various aspects of the completed simulation are discussed, to explore with participants their emotions and to question, reflect, and provide feedback to one another" (Lopreiato, et al., 2016, p.8).

Arthur et al. (2013) identified critical elements of this quality indicator as an activity that is provided immediately after the scenario. It should be structured to explore the essential elements of the scenario objectives and support students in understanding their experience. It is

intended to be a reflective practice that once again fits well with the Cycle of Reflection model in Figure 1. In addition to self-reflection, it allows for the learner to receive constructive feedback from peers and faculty. Building on feedback, the learner can identify areas of strength and areas to focus on for improvement. Learners can explore both the technical and non-technical aspects that were experienced in the scenario (Arthur, et al., 2013). Reflection differs from self-assessment in that reflection seeks to understand the situation at hand, while self-assessment compares the learner's behavior against a standard (Lavoie et al., 2019). Additionally, debriefing allows the learner to identify gaps in knowledge. The learner is then encouraged to look at how to transfer their new knowledge into practice.

Evidence supports that rich learning occurs during the debriefing phase of the simulation experience. One study determined that knowledge increased only when debriefing occurs (Shinnick et al., 2011). It was suggested that the time spent by students in the company of their peers and guided by skilled faculty provided the learner a less stressful environment in which to reflect on and explore the events of the experience, including the hands-on care provided. Problem-solving can occur without the stress of the "patient" in need of real-time care and response. This also addresses any performance anxiety overlay as the student can reflect deeply on their experience. The experimental group had significantly higher scores than the control group at a *p*-value of 0.009. Results of this study affirmed that learning does not occur "primarily or exclusively in the hand-on portion of the simulation experience and the debriefing is the most valuable in producing gains in knowledge" (Shinnick, et al., 2011, p.e109).

A systematic review by Levett-Jones and Lapkin in 2014 looked at various methods of debriefing in ten randomized controlled trials (Levett-Jones & Lapkin, 2014). In all studies, there was a significant improvement in the pre-test to post-test scores in the performance of skills

such as vital signs, assessment, CPR, task management, and team working regardless of the type of debriefing. In two studies, the impact of the debriefing was evident months after the initial simulation experience (Levett-Jones & Lapkin, 2014, p e58). Debriefing fosters group learning, and learning in teams facilitates individual thinking flexibility and improved appreciation for the perspective of others (Jeffries, 2020).

Debriefing Frameworks

It remains to be fully understood how different approaches to debriefing might affect mastery of the learning outcomes. By standard, debriefing must be supported by a framework that considers the expected outcomes, the complexity of the scenario, needs of the learners, includes the phases of reaction, analysis, and summary, and matches the skills of the facilitator (Standards Committee, 2016, p.s23). Seven different frameworks are cited as meeting this standard. There is no specific guidance about a preferred framework. All encourage open-ended Socratic questions to support some level of reflection. Socratic questioning is a techniqe whereby the facilitator uses probing questions to encourage the participants to think, discuss, analyze and evaluate their experience fro themselves. Thus, they discover their own learning (Intel Teach Program, 2020).

The emphasis in all frameworks is to recall the events and explore the thinking and decision-making that occurred. Most encourage acknowledgment of emotions before exploring the specifics of the experience. This is especially important if there was any perceived or real error in care experienced. Maintaining a setting of psychological safety remains a critical element of the debriefing experience. It is also essential to focus the learner not only on the action but the thinking behind why that action was chosen.

When selecting a framework, the facilitator needs to have a level of experience and confidence regarding its implementation. Some lend themselves to a specific scenario better than others. For example, a skills-based scenario such as resuscitation may benefit from Plus Delta or GAS Model that allows for the focus to be discreetly on the beginning, middle, and end of the scenario and skills and learner performance, what went well, what needed to be changes, etc. Other frameworks to choose from include Promoting Excellence and Reflective Learning in Simulation (PEARLS), Debriefing with Good Judgment, OPT Model of Clinical Reasoning, The 3D Model of Debriefing, and Debriefing for Meaningful Learning. It is expected that additional frameworks will continue to be developed as an understanding of simulation science grows. It is beyond the scope of this literature review to review each of the current frameworks in detail. However, it is worthy to acknowledge the importance of the use of a recognized framework to facilitate the experience for the learner. Structured debriefing is critical in simulation experience success.

During the past year, the use of computer-based simulation has risen exponentially. In settings where in-person simulation and debriefing was not possible due to public health concerns, moving debriefing to the virtual world and, in some cases, adding a component of self-debriefing has taken the place of in-person (Cheng, et al., 2020; Verkuyl, et al., 2018). An integrative review of self-debriefing by McKenna et al. reviewed ten studies (MacKenna, et al., 2021). They found that Verkuyl et al. also found self-debriefing to be valuable in student learning but most effective when paired with a facilitated follow-up group debrief (Verkuyl, et al., 2018). These modalities show promise that will benefit further study.

Simulation in nursing education continues to evolve. The setting of the simulation center has expanded from the previous approach of focus on skills practice and basic skills to an

expanded focus on building critical thinking and clinical judgment (Berragan, 2011). Simulation experiences allow the student to explore their developing nursing identity. The emphasis on realistic patient scenarios allows for communication as well as clinical skills practice. With the presence of skilled faculty facilitation, the protected environment of the simulation center enables the student to learn from positive practice and actual and near-miss mistakes. Debriefing provides the opportunity to reflect deeply on the scenario and learn from errors without real-world consequences. The literature suggests that, most importantly, nursing education recognize the role that simulation can play in the learning experience, not as the sole method of learning but as a companion to clinical experiences in which the student engages with actual patients. In the active learning environment of simulation, book-ended with pre-brief and debrief, the learner is supported in constructing knowledge and meaning, informed by their previous experience building on what they brought with them.

Simulation as Substitution for Traditional Clinical Experience Hours

The use of simulation experiences in substitution for traditional in-person clinical experience has increased exponentially over the past fifteen years. As technology has expanded and additional research completed, the application of simulation experience in place of traditional clinical hours has been explored and debated within pre-licensure nursing education. In 2010, one of the first studies to look at simulation in BSN pre-licensure was published. Katz and colleagues invited 241 schools from across the U.S. with 78 programs responding (Katz, et al., 2010). Sixty (78.9%) reported using simulation in some form; 70% reported plans to purchase additional manikins. Core clinical courses of health assessment, nursing fundamentals, medical/surgical nursing, pediatrics, and obstetrics used simulation in the greatest frequency. In recent years simulation has been used to provide mental health experiences as well. Simulation

was widely used to provide students with realistic practice opportunities before attending traditional clinical experiences. Questions were asked regarding using simulation as a replacement for traditional clinical hours; 40% of respondents noted using simulation to replace clinical hours spent previously with live patients (Katz et al., 2010, p.48). Open-ended questions regarding simulation for clinical replacement indicated an interest in replacing classroom and skills with high-fidelity simulation. Supplement experience rather than replacement experience remained a prominent theme.

An increased focus on safety inserted additional barriers to accessing traditional clinical hours and hands-on experiences; additional studies evaluated the impact of simulation experience on student clinical learning. A 2011 study by Meyer, et al. looked at the impact of a 25% substitution of simulation experience in a junior pediatric clinical course (Meyer, et al., 2011). Each student had 72 hours of clinical and 24 hours of simulation experience. The timing of the simulation experiences varied across the student experience, but the amount of simulation experience was constant. Student performance was evaluated using a standardized tool (Massey & Warblow, 2005). On average, after two weeks of clinical, students who attended simulation performed 1.124 points higher than those who had yet to attend. While not statistically significant at the two-week score (*p*-value 0.19), the second clinical evaluation students with simulation experience scored significantly higher (*p*-value 0.03). The experience of simulation learning improved overall clinical performance, which suggests that simulation is valuable in addition to, and perhaps in place of a portion of clinical hours. Clinical judgment ratings were disappointing in that the simulation experience did not positively impact them. It was recommended that additional studies are warranted (Meyers, et al., 2011).

NCSBN Simulation Study

In 2011 the National Council of State Boards of Nursing (NCSBN) began a multisite study on simulation as a substitute for traditional clinical hours. By 2014 when the study was published, the continued shortage of traditional clinical placements led to increased pressure to allow simulation to replace some portion of clinical hours. Regulatory agencies required guidance in making decisions regarding simulation. A descriptive study was completed in 2014 that looked at the 66 NCSBN members (U.S, D.C., and U.S. territories) and other jurisdictions that regulate registered nurse practice. The purpose of the survey was to determine the "present-state" of regulations and practices related to simulation experiences, what percentage of hours were being replaced, and plans to revise or create regulations regarding the use of simulation (Hayden, Smiley, & Gross, 2014).

Findings indicated eight states and six international jurisdictions who did not allow simulation to replace clinical hours. Four states specifically stated in written regulations the maximum amount of simulation hours that can replace clinical hours, generally up to 25%. The remaining 38 states did not specify an amount of simulation used to replace clinical hours. Others reported approval on a case-by-case basis. The number of jurisdictions regulating simulation use was increasing. This became the starting place for the rollout of the study results, soon to be referred to as the "NCSBN National Simulation Study"(Hayden, et al., 2014)

Considered a seminal work on the question of substitution of simulation experiences for traditional clinical experiences, in 2014 Hayden, et al. published the results of a several-year multisite study looking at in impact of high-fidelity standards-based simulation on student outcomes (Hayden, et al., 2014). The NCSBN study was conducted in two parts. Part One was a randomized controlled study of outcomes in nursing students exposed to high-quality

simulation experiences during their academic program. Participants were 600 nursing students from ten pre-licensure nursing programs from across the U.S. They were divided into three groups. A control group received traditional clinical education and no more than 10% of simulation experiences. One experimental group experienced 25% of their clinical hours replaced with simulation and the second experimental group had fifty percent of their clinical hours replaced with simulation. The replacement was at a 1:1 ratio, each hour of simulation counting as one hour of traditional clinical experience. The research questions for Part One were as follows:

- "Does substituting clinical hours with 25% and 50% simulation experiences impact educational outcomes (knowledge clinical competency, critical thinking, and readiness for practice) assessed at the end of the undergraduate nursing program?"
- "Are there course by course differences in nursing knowledge clinical competency and perception of learning needs being met among undergraduate students when traditional clinical hours are substituted with 25% and 50% simulation?"
- "Are there differences in first-time NCLEX pass rates between students that were randomized into a control group, 25% and 50% of traditional clinical substituted with simulation?" (Hayden, et al., 2014, p.S6).

The purpose of Part Two of the study was to look at the long-term impact of hours substitution. The study participants were followed for six months after beginning their first registered nurse position. Performance in practice was evaluated for clinical competency, critical thinking, and readiness for practice. The research questions for Part Two were as follows:

- "Are there differences in clinical competency, critical thinking, and readiness for practice amount new graduate nurses from the three study groups?"

- "Are there differences among new graduates from the three study groups in acclimation to the role of the R.N.?" (Hayden, et al., 2014, p.S28)

The findings were not statistically significant for the differences in student outcomes between the three groups related to NCLEX pass rates and successful transition to clinical practice as assessed by the new nurses and their nurse managers during the six months, the Part Two arm of the study. Another significant finding was the demonstrated transfer of learning from simulation to clinical practice.

The conclusion of this study provided evidence to support up to 50% simulation experiences in substitution for traditional clinical hours at a 1:1 ratio. Also recommended was further study of ratios other than 1:1 to look for similar outcomes. It was also recommended that state boards and commissions of nursing use these results for policy decisions related to clinical hours required for graduation. This study provides the blueprint for the replacement of clinical hours with simulation in pre-licensure nursing education. After the release of these recommendations, concern arose about how to assure appropriate foundations be in place before programs move forward with hours substitution (Alexander, et al., 2015). Further reinforcement of expected program guidelines, faculty preparation, and administrative support was published.

Shortly after the publication of the NCSBN Simulation study, a national baseline survey of 1400 pre-licensure nursing programs was undertaken to provide the baseline for measurement of practice change related to the NCSBN study recommendations (Breymier, et al., 2015). Four hundred thirty-two (32%) of programs responded. Ninety-nine percent indicated that simulation was used as a teaching methodology, and 76% indicated substituting simulation for traditional clinical experience. While most of the respondents stated using a 1:1 ratio, a variation of 3:1,

2:1, 1:2, and 1:3 ratio was also used. Additionally, 55% of programs used a different ratio between courses within their program (Breymier, et al., 2015).

NCSBN Study Implementation

Over the succeeding four years, professional discussion continued about expected program implementation based on INACSL Standards, and periodic survey of implementation based on these recommendations occurred (Beroz, 2017; Rutherford-Hemming, et al., 2019). Dialogue also continued regarding the use of simulation in replacement for traditional clinical hours. A 2015 study by Curl and colleagues found that combining simulation with traditional clinical experiences resulted in significantly higher pre-graduation exit exam scores than students who experienced traditional clinical experiences alone (Curl, et al., 2016).

Additional study is needed to refine how simulation experience can play a role in skill transfer and higher-order thinking. Persico and Lalor's 2019 review of simulation-based education to substitute traditional clinical builds on the earlier findings of Mariani and Doolen (2016) that additional studies with rigor, common language, and shared mental models for simulation experiences are needed. There is more to be known about how simulation translates to actual patient care settings and translates to improved health outcomes in patients (Persico & Lalor, 2019). Similar recognitions and questions were found in Roberts and colleagues' global review (Roberts et al., 2019).

Harder posed a question that suggested "rather than ask if this should occur, rather why would simulation benefit student learning" (Harder, 2015, p.435). A discussion is also ongoing regarding traditional clinical experience, how students spend their time, how learning is supported, and students' perception of this. Leighton's "empty systemic review" further drives

home the need for a deeper understanding of the traditional clinical experience to better understand how to compare it with simulation (Leighton, et al., 2021).

In 2019 Bradley and colleagues surveyed simulation use in the U.S. and changes in regulation over the five years since the publication of the NCSBN study (Bradley, et al., 2019). Key findings were that simulation use had increased significantly. Variability between states at the state board or commission level persists. Thirty boards/commissions now have some regulations related to use of simulation; twenty-one have no simulation regulations. Simulation is described and defined in 23 of those with regulations; seven do not describe what qualifies as simulation. Twenty-five document a specified percentage of clinical hours that can be replaced with simulation, allowing up to 50% in some states; four do not specify an exact allowable replacement percentage.

Regarding the ratio of simulation to traditional hours replacement, less definition was found. Three jurisdictions specified that one hour in simulation be counted as equal to one hour in traditional clinical. One allowed one hour of simulation to be counted as either one or two hours of traditional clinical. The remaining did not define an equivalent ratio. Finally, twenty jurisdictions describe the requirement for faculty involved in simulation experiences; ten did not specify anything in this regard (Bradley, et al., 2019, p.20-23). These authors concluded that a "re-visioning of what constitutes clinical learning is needed to overcome the tension of comparing simulation and traditional experiences; thus, nursing can embrace the value of clinical learning in all settings and focus on outcomes and quality of experiences instead of hours"(Bradley, et al., 2019, p.24).

Emerging evidence suggests that a 2:1 ratio of simulation replacing traditional clinical hours provides similar outcomes as the previously studied 1:1 ratio. A 2015 study looking at a

comparison of pediatric simulation and traditional clinical experience used a ratio of one hour of simulation being equal to two hours in traditional clinical (Parker, et al., 2015). Students participated in a three-day simulation of three to four hours per day (equivalent to 18-25 hours of clinical). The student experienced 88 hours of traditional clinical for a total of 112 hours to meet course requirements. Results indicated a statistically significant difference in student perception of greater opportunities for collaboration with peers in the simulated setting. Students also reported significant differences in perception of clarity of learning objectives. Regarding student reports related to the design of simulation versus traditional, there were no significant differences and no difference in student confidence and satisfaction with the learning experience. These authors concluded that additional research is needed related to learning in the traditional clinical setting to better understand each modality's role in the total nursing education experience.

To better understand the role of ratio in the learning experience associated with simulation, a multicenter observational study in 2019 by Sullivan et al. compared traditional clinical to simulation on the type, number, and level of educational activities experienced by the student as determined by Miller's Pyramid (Sullivan, et al., 2019). Key findings were noteworthy for differences in the student experience in simulation. Students completed more patient care activities at a high level of functioning, based on Miller's Pyramid, than were experienced in the traditional clinical setting. These activities in simulation were also completed in a shorter period than experienced in traditional clinical. Students function independently in the role of the nurse when in the simulation experience. The student determined the physical assessments, skill activities, and teaching that the simulated patient required. Downtime was significantly higher in the traditional clinical setting. Decreased downtime accounted for the student's increased intensity during simulation. Finally, the students spent a greater percentage

of time in higher-order processes on Miller's Pyramid. In traditional clinical, students spent 42% of their time in the "knows" level of Miller, compared to students in simulation where 51% of time was spent in "knows how"(compared to only 12% of "knows how" in the traditional clinical setting). "Knows how" indicates a greater focus on critical thinking/clinical reasoning. The results of this study suggest that “one hour of simulation being equal to two hours of traditional clinical ratio" is supported by students completing more patient care activities at a higher level of function in 1/5th of the time than in the traditional clinical setting (Sullivan et al., 2019, p. 41). This study affirms the intensity and efficiency of the simulation experience in support of optimum student learning.

In a 2019 study, 878 nursing students participated in a comparative descriptive cross-sectional study looking at 1:1 versus 2:1 traditional clinical to simulation replacement ratios on NCLEX pass outcomes and ATI testing scores (Zyniewicz, 2019). Findings identified the substantial prevalence amongst the programs for the 1:1 ratio in current practice. Students in the 1:1 ratio group had statistically higher scores on the ATI Adult Medical-Surgical Proctored Assessment. The 1:1 and 2:1 groups had mean scores that fell within the proficiency level and exceeded minimum expectations. Additionally, there was no correlation found between the 1:1 or 2:1 group regarding NCLEX pass scores, affirming that either 1:1 or 2:1 will provide student success on this critical outcome measure (Zyniewicz, 2019).

These studies, many over the past seven years, affirm the value of simulation experiences in successful learning for nursing students. Simulation experiences support in-person traditional clinical experience outcomes. Results have demonstrated that simulation can also provide experience in substitution for live clinical, particularly in high-risk patient scenarios or in the absence of access to traditional clinical hours settings. Further, the intensity of learning activities

and ability to function in high order levels of activities make simulation experiences valuable to overall student learning and achievement of learning outcomes. These increased proficiencies in higher order activities lend to improved transition into registered nurse clinical practice.

Conceptual Framework

Using a framework helps us understand and provides insight into how implementing proposed evidence-based practice changes into actual practice change success is maximized. A framework allows for structure, perimeters, and a system for understanding the connections between concepts, constructs, and the relationships that interconnect them, adding to the understanding of the practice being studied. A framework can also provide insight into evaluating a process's implementation (Nilsen, 2015).

Adult Learning Theories

In evaluating the aims of this program evaluation, it is essential to understand how adult learning theories intersect and interact with the phenomenon of simulation learning. Knowles theory of adult learning, proposed in 1968, described three key characteristics. Adult learners are self-directed, learn from the pool of their past life experience, and are internally motivated to learn. Adult learners want to understand the "why" of what is being learned. Also, learners want to know how to improve the practice rather than focus on evaluation (Clapper, 2010). Learning occurs across cognitive, affective, and behavioral domains and within visual, auditory, and kinesthetic learning styles. While adult learners tend to have a dominant learning style, they can learn across all styles. When learning involves seeing, hearing, and doing, retention rises to 90% ("Principles of adult learning," 2012). "Experiential learning theory" has provided a foundation for simulation-associated mastery for many years (Kolb, et al., 2000; Sanko, 2017, p. 78). Kolb defined learning as, "the process whereby knowledge is created through the transformation of

experience, (therefore) knowledge results from the combination of grasping and transforming the experience" (Bailey & Mixer, 2018). Simulation learning is an active modality that is well served by Kolb's framework. Simulation-based learning integrates all learning domains and styles of adult learning and thus lends a knowledge base to understand the phenomenon of simulation learning (Richardson & Claman, 2014).

Miller's Pyramid of Assessment of Clinical Confidence provides a slightly different lens that aids in understanding simulation education outcomes (Pe, et al., 2014). Competence develops beginning at the base of the pyramid with knowledge ("knows") followed by competence ("knows how"), action ("shows how"), and finally action ("does"). (See Figure 2) The model clearly describes the progress of the learner along a continuum of mastery of knowledge and skills. First described by George Miller, MD, in 1990, it is frequently used to understand how accomplishment and progress by the learner toward expectations of performance are progressing (Miller, 1990).

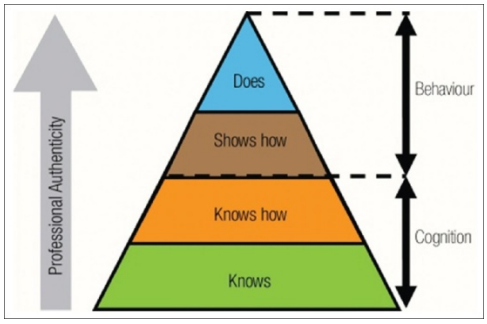

Figure 2 Nigerian Journal of Basic and Clinical Sciences *https://www.njbcs.net/viewimage.asp?img=NigerJBasicClinSci_2012_9_2_53_108463_f1.jpg*

The model has been used considerably in healthcare venues for assessing and validating clinical skills. Many of the articles reviewed for this project used this model in the evaluation of student outcomes. The learner is assessed regarding all four levels with "knows," "knows how," and "shows how" most often applied to simulation experiences (Bray, et al., 2011).

The NLN Jeffries Simulation Theory

Simulation learning is structured across three phases. In pre-brief, the learner receives an introduction to the topic and the environment. The stage is set for the learner to tether learning through hands-on psychomotor, cognitive, and affective domains (experiential learning) in a low-risk setting. Finally, the learner has the opportunity through debriefing to further explore this learning in deep reflection to further cement the experiences of the actual simulation scenario (Sanko, 2017). Debriefing after the simulation session is key to maximizing participant learning (Jeffries, 2016).

Jeffries simulation theory was first described as a framework in 2005. The framework has been the main framework, now theory, to guide simulation research and practice since 2007 (Cantrell, et al., 2007). Nurses' theoretical thinking and testing using simulation learning in nursing education evolved and validated the Jeffries framework as a descriptive mid-range theory. According to Jeffries, "clinical simulation is a phenomenon,…nursing theory is used to identify and explain relationships among phenomena to predict consequences, or to provide action from these activities" (Jeffries, 2016, p.xi). The goal of this theory is to provide a consistent framework in which best practices, outcomes and systems changes in simulation can develop, exist, and be evaluated from.

In 2012 Lafond and Van Hulle-Vincent published a critique of the NLN/Jeffries framework. Sixteen studies from the US and UK, published between 2005 and 2011, were identified using the framework to guide research. In all studies, positive outcomes of student satisfaction, confidence, and improved skill performance were identified, affirming the NLN/Jeffries theory as a successful structure to construct and implement simulations that produce positive student learning (LaFond & Van Hulle-Vincent, 2012). In 2015 Adamson

reviewed 153 studies published between 2000 and 2014, finding support for the NLN/Jeffries Simulation Framework's significant components and affirmed it as a theory to support simulation education (Adamson, 2015). Recurring themes were that simulation works in providing positive learning outcomes for participants. The importance of outcome variables in the NLN/Jeffries Theory was confirmed. A case was made to expand the scope further to include longer-term educational outcomes (Adamson, 2015). There is mixed evidence regarding the superiority of high, medium, or low fidelity. Learners perceived more significant impacts with higher fidelity on their problem-solving abilities than lower fidelity. The variety of findings related to fidelity suggests that the learning objectives of the simulation drive the appropriate fidelity of the simulation. The following definitions of fidelity were used in the present survey

Table 1

Use of Simulation in Clinical Education

Use the following definitions in answering the following questions:

- **High Fidelity Simulation:** in healthcare simulation, high-fidelity refers to simulation experiences that are extremely realistic and provide a high level of interactively and realism for the learner. Can apply to any mode or method of simulation for example, human, manikin, task trainer, or virtual reality.
- **Low Fidelity Simulation:** Not needing to be controlled or programmed externally, for the learner to participate. Examples include case studies, role playing, or task trainers used to support students or professionals in learning a clinical situation or practice.
- **Task trainer:** A device designed to train in just the key elements of the procedure or skill being learned, such as LP, chest tube insertion, central line insertion, or part of a total system for example ECG simulator. A model that represents a part or region of the human body, such as an arm or an abdomen. Generally used to support procedural skills training, however they can be used in conjunction with other learning technologies.

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O'Donnell, Howard, and Miller reviewed the "state of the science" related to simulation learning outcomes (O'Donnell et al., 2014). A conceptual framework, described by Norman and

Eva (2010) as a critical review approach, was used to review current literature focusing on simulation learning outcomes (O'Donnell, et al., 2014, p. 374). They defined learning outcomes as "the measurable effects of a simulation-based activity between participant, educator, simulator, and environment which takes into consideration educational objectives, participate level, pre-experience preparation, environmental realism, and simulator realism" (O'Donnell et al., 2014, p. 374). The NLN/Jeffries framework (now theory) was affirmed as valuable and is used in scenario development, implementation, and evaluation. Recommendations for further work in using the theory in the development of research protocols or for use in design decisions concerning educational methodology were suggested (O'Donnell, et al., 2014, p. 379).

One of this program evaluation aims is to explore the standards and means employed in simulation learning in participating nursing programs. The NLN/Jeffries theory will guide analysis to that aim (Jeffries, 2016, p. 40).

The NLN Jeffries Simulation Theory exists within a context that includes elements such as setting, circumstances, place, and purpose. Within the context exists the background which includes scenario specific goals and expectations. This includes how the simulation experience fits into the larger curriculum intentions. The background elements inform and influence the design of the simulation experience. In this arena, resources such as time and equipment need to be included. Scenario design exists outside of and precedes the actual simulation experience. Other components required include the preparation needed, activities that will be completed, and elements that set up the fidelity of the experience.

Once background and design have been accounted for the scenario proceeds within the context of the planned simulation experience. The contained environment of the simulation is supported as experiential, interactive, establishes an environment of trust, and is learner centered.

Psychological safety is a key component of a successful simulation experience and exists within this portion of the theory. Within the experience there is a dynamic interaction between the facilitator and the participant/learner and is shaped by embedded educational strategies.

Finally, outcomes of the simulation experience can be divided into 3 categories, the participant/learner, the patient, and the system in which they exist. Much is known about the outcomes associated with the participant/learner. These include reaction, changes in knowledge, skills, attitudes, and behaviors. Most outcomes are targeted to the participant/learner. It is believed that positive outcomes in learning for the participant/learner may have direct impact on improved health outcomes for the patients to be cared for and the healthcare system in which the patient care takes place. The outcomes associated between stimulation experiences and the level of the patient and system continue to develop with additional research (Jeffries, 2016).

Gaps in Translation of Science to Practice

This review of the literature exposed many gaps related to both traditional and simulation clinical experiences. Perhaps the most startling was Leighton's empty systematic review regarding traditional clinical hours (Leighton et al., 2021). The lack of literature to back up the tradition of in-person clinical experience as the expected means to develop critical thinking and competence in new graduate nurses should give all nursing educators pause. There has been significant evolution in both knowledge regarding and implementation of simulation experiences to augment or replace traditional clinical hours.

Significant variation is present in boards and commissions of nursing across the US (Bradley et al., 2019). The lack of consistency of hours' expectations for graduation and simulation in meeting those hours also calls for additional study.

It is hoped that this program evaluation will affirm the "current state" of simulation

use in nursing education in Washington State. Hopefully, identification of areas for improvement will lead to the graduation of more prepared new nurses will be identified. Hours substituted in clinical experience are only part of the puzzle. It has been identified that improved preparation for practice outcomes for new nurses relies not only on the number of hours of experience but also on high quality, standards-based simulation experiences. Not only number of hours but also the quality of simulation, based on accepted simulation standards is needed to assure that students have the quality learning experiences needed for initial practice success. Identification of improvement areas potentially includes cost-effectiveness, appropriate resource utilization, faculty education, and improved student experience.

Methodology

This program evaluation project evaluated the use of simulation hours as a replacement for clinical hours in a purposive sample of pre-licensure nursing programs in Washington State. The study was reviewed by the Institutional Review Board (IRB) of Seattle University and found to be exempt. (Appendix C) The sample's nursing programs lead to an associate or baccalaureate degree designation at graduation with subsequent NCLEX completion for licensure to practice. Exclusion criteria included RN to BSN and graduate-level nursing entry programs. The NCQAC website provided a list of pre-licensure nursing programs. The program evaluation results intend to inform policy change recommendations to the NCQOC regarding clinical hours replacement with simulation in pre-licensure nursing education.

Design

The study design was a descriptive mixed method using a compilation of survey questions from 2 previously reported studies. The survey used melded the questions from the NCSBN Survey of Simulation Use in Pre-licensure Nursing Program Changes and

Advancements (Smiley, 2019) and the Program Assessment Survey for Simulation (PASS) developed by Sabrina Beroz (Beroz, 2017). (See Appendix A)

The NCSBN tool has been used effectively to explore current simulation learning practices repeatedly and will provide a standardized data set to compare Washington state results against. The PASS tool was designed in 2017 by Beroz to meet an identified need for a valid and reliable tool to identify faculty and program development needs in simulation as well as program development and performance to standards. It is based on NCSBN checklists and the INACSL Standards of Best Practice which are part of current Washington NCQAC regulations for approval of simulation use for clinical experience.

Participant Recruitment and Data Collection

Data collection was via an online questionnaire distributed via Qualtrics. Initial design included an allowance for in-person site visits and interviews. This was not possible due to the impacts of Covid-19 on access to nursing programs during the data collection phase of the evaluation. Email letters were sent to an available list of nursing program deans, directors, and simulation coordinators soliciting participation in the program evaluation. Twenty-two surveys were sent with a return of 12. One response was incomplete, and another did not contribute data as they were developing a new simulation program. The final sample consisted of 10 completed surveys. Survey return rate was impacted by Covid-19 restrictions and the increased workload overall within nursing programs because of the shift to remote and on-line learning.

Data Analysis

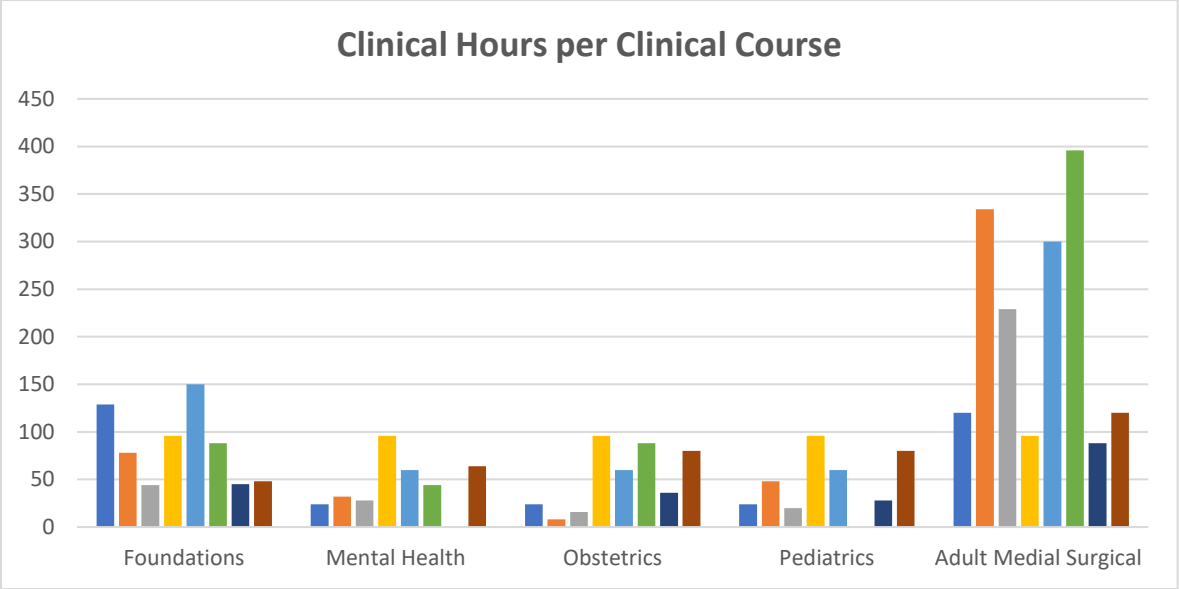
Descriptive statistics compared the demographics of the type of program, type of institution, and the number of pre-licensure graduates in the previous year. Responses to content questions were analyzed for totals, mean, range, frequency, or percentage as appropriate to the

element of simulation use and substitution in question. NCLEX pass rates were analyzed related to success on the first attempt at NCLEX and program passing score average as a metric of student success. (The available data did not lend itself to drawing correlations between nursing program-specific numbers of clinical hours or clinical hours ratio to simulation hours and NCLEX pass rates) For simulation-based questions in this study, simulation was defined by fidelity level using definitions, as described above; adapted from Lopreiato et al. (Agency for Healthcare Research and Quality [AHRQ], 2016). See Table 1.

Results

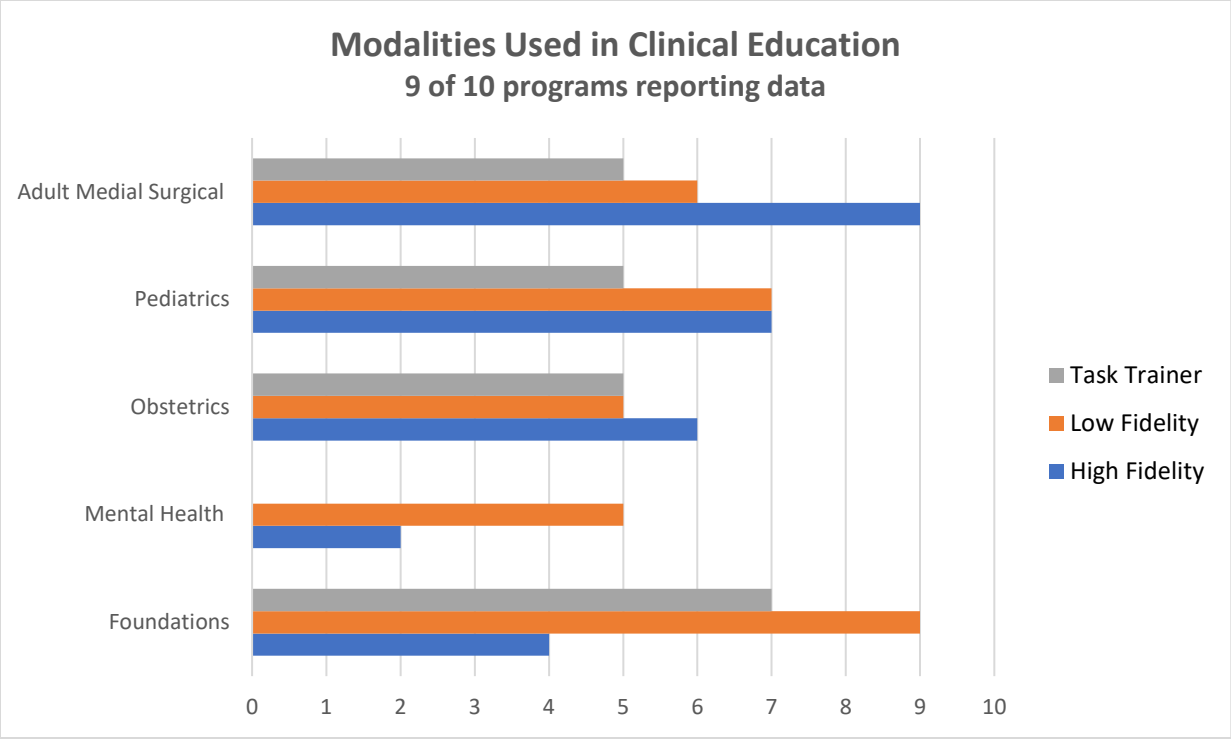
Demographic data yielded the following information about the nursing programs responding to the survey. Respondents identified program and institution type. A total of ten programs provided data for this study. Four programs responded as university-based, conferring a Bachelor of Science degree in nursing. Six programs responded as Community or Technical College based, conferring an Associate degree in nursing. Most respondents were in Western Washington State, with five responding in King County. Three ADN programs were in Whatcom, Snohomish, and Pierce counties. One university program and one community college program were in Eastern Washington (Grant and Yakima Counties). Program size was diverse; the number of graduates in 2019 ranging from 12 to 192.

Programs provided the number of clinical hours, defined as having patient contact and providing hands-on patient care for the following courses: Foundations, Mental Health, Obstetrics, Pediatrics, and Adult Medical-Surgical care. Eight respondents provided data for this set of questions. The graph below illustrates the wide variation between reporting programs on this question.



(See Appendix D for data tables). Programs with higher number of adult medical surgical hours reported lower mental health and pediatric clinical hours, reflective of difficulty obtaining those clinical placements.

Respondents were asked about their use of high and low fidelity simulation and task trainers in the same courses. It was noteworthy that 100% of programs reported the use of high-fidelity simulation in adult medical-surgical courses. Pediatrics and Obstetrics were other courses with increased high-fidelity simulation, reporting 78% and 67%, respectively. Mental Health reported only 22% use of high-fidelity but 56% use of low-fidelity simulation. Other types of simulation modalities reported were standardized patient, virtual reality, and dramatic arts-aesthetics.



All respondents reported offering a variety of practice opportunities in the simulation center/lab. Practicing routine assessments and remediation of skills was provided by eight of the nine responding programs. Practicing procedures, patient scenarios, and high-risk scenarios were offered by seven of the nine responding programs.

Respondents were asked about the attributes of their simulations. All reported requiring a scenario. Most respondents develop their own scenarios; half of those state that these scenarios are validated before use. Most also reported use of standardized, evidence-based, peer-reviewed scenarios as well. The typical scenarios' duration was split between 15-30 minutes (56%) and 31-60 minutes (44%). All reported that debriefing was a required element within their program, and all reported that the debriefing was longer than the scenario. Only one respondent noted no increase in simulation in clinical courses over the past three years.

A key question of interest in this program evaluation relates to the use of simulation hours counting in place of traditional clinical hours. Traditional hours are defined as those

experienced in a live clinical setting with actual patients/families. Nationally, simulation hours in substitution for traditional clinical hours have increased between 2010 and 2017 to 61% from the previous 48% (Smiley, 2019). In the current program evaluation study, five of nine respondents (56%) reported that simulation hours are "on occasion" or "yes, substituted" for traditional clinical hours.

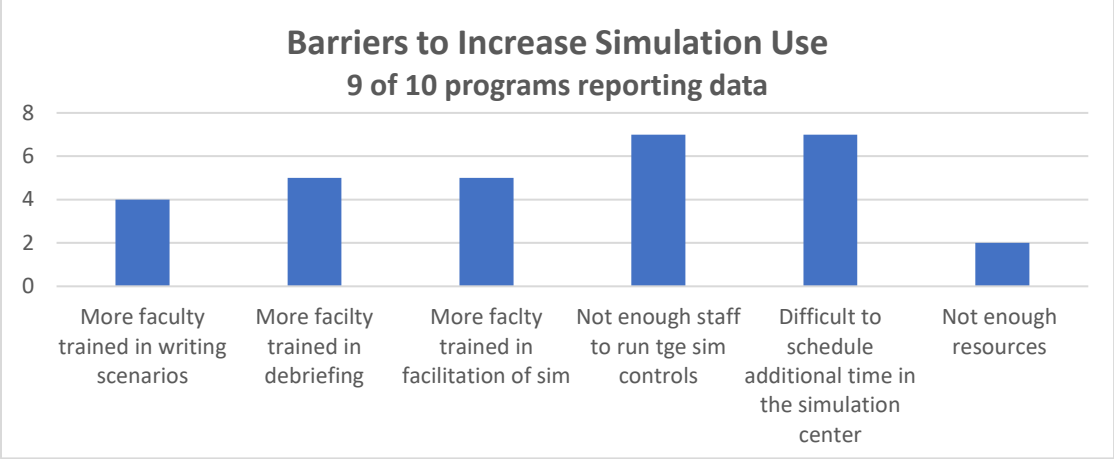
Regarding the weight of simulation hours substitution, nationally in Smiley's study, a ratio of one simulation hour counting as one hour of traditional clinical was 83% (Smiley, 2019). Only five of nine respondents in this section of the survey reported on the ratio of hours substitution. Of these respondents, four of five (80%) likewise responded that a one-to-one ratio was used. The remaining respondent indicated a less than one to one ratio, with simulation not counting as a full hour. Respondents did not provide consistent responses to the question series asking about the percentage of any given total clinical hours substituted by simulation hours.

On the question of "reasons for substitution of simulation for traditional clinical hours," all respondents stated, "as a complement to clinical experience" and "because of lack of traditional hours in available clinical placements." Other predominant reasons included positive learning outcomes for students, goal/objective driven education, and the ability to practice safety.

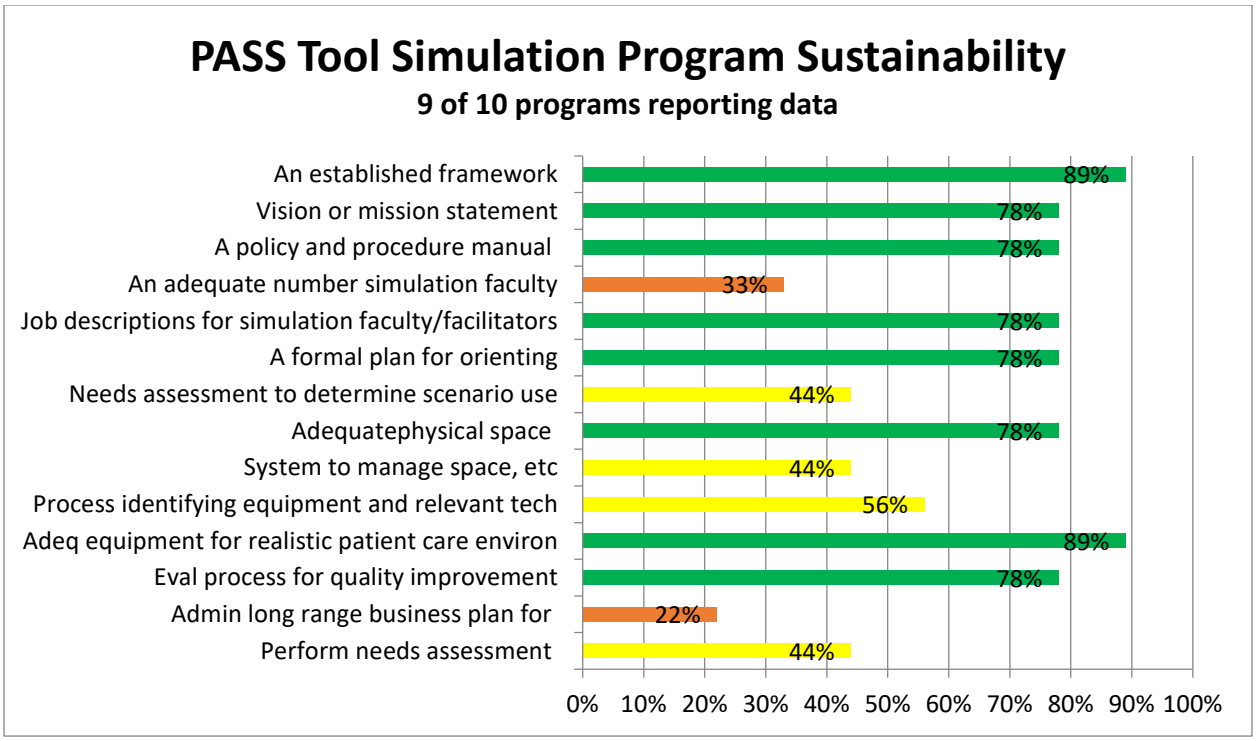
A similar question was asked as part of the PASS tool regarding the primary purpose of using simulation. Respondents were able to select more than one option. All nine respondents indicated increased patient safety as the primary purpose. Four respondents also included increased NCLEX scores as a goal. Several indicated increased enrollment and increased retention as the reason. The importance of patient safety was consistent in both ways of asking for reason and purpose.

None of the respondents indicated a current percentage of traditional clinical hours allowed as substitution by simulation hours. Six of nine respondents would like to substitute 25% of clinical hours, and one of those indicated that an application was in process for this with NCQAC. One additional respondent each indicated a desire for 10%, 30%, and 50%. NCQAC currently allows for up to 50% of clinical hours for a particular course, after approval, being substituted by simulation; this is currently at a one-to-one ratio (Washington State Department of Health, n.d.).

All surveyed programs responded regarding barriers to increased simulation use. Lack of staff and resources including ability to schedule simulation experiences were the predominant barriers, followed by training.



Basic frequencies were used for quantitative analysis of the PASS Tool items. Respondents were asked if their program had each of the following elements. The Program Sustainability subscale variables indicated positive reporting on 8 of the 14 elements. (>75% of programs reporting the presence of the individual element) Results reiterated the previously described barriers experienced in the lack of adequate and trained faculty and staff to support simulation.



All respondents were familiar with the NCSBN 2014 Simulation Study and were familiar with the INACSL Simulation Standards of Best Practice. Regarding the use of INACSL Standards of Best Practice in Simulation, respondents described varying levels of implementation. Ranking on this PASS tool subscale is rated, "always," "sometimes," or "never" by the respondent. Simulation was considered as achieving the criterion if the answer on these questions was "always" (Beroz, 2017). Predominant reporting of "always" was noted on the standards of Outcomes and Objectives, Facilitation, and Debriefing. While the Evaluation Standard criterion were rated with higher negative response, the specific criterion within that standard were summative and high-risk evaluation which are not widely used in current simulation practice in Washington. Higher scores were obtained when asked about use of formative evaluation with 78% reporting "always". Evaluation criterion could benefit from additional consistent implementation. The standards of Interprofessional simulation practices indicate the least level of implementation and thus significant room for growth.

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Use of INACSL Standards of Best Practice Simulation

Outcomes and Objectives	% Always	% Sometimes	% Never
Outcomes and objectives meet program outcomes	89%	11%	0%
Outcomes and objectives specific	78%	22%	0%
Outcomes and objectives measurable	78%	22%	0%
Outcomes and objectives achievable	78%	22%	0%
Outcomes and objectives realistic	78%	22%	0%
Outcomes and objectives time-phased	78%	22%	0%
Outcomes and objectives communicated prior to activity	67%	33%	0%

Facilitation	% Always	% Sometimes	% Never
Facilitation skills and knowledge simulation pedagogy	67%	33%	0%
Facilitation objectives leveled to learner	89%	11%	0%
Facilitation provides prep activities before SBE	89%	11%	0%
Facilitation delivers predetermined or unplanned cues	67%	33%	0%
Facilitation follows SBE with debriefing	100%	0%	0%

Debriefing	% Always	% Sometimes	% Never
Debriefing competent in process	100%	0%	0%
Debriefing environment conducive to reflective learning	100%	0%	0%
Debriefing able to devote concentrated attention to debrief	78%	22%	0%
Debriefing based on theoretical framework for debriefing	100%	0%	0%
Debriefing congruent with scenario objectives and outcomes	100%	0%	0%
Debriefing evaluated using a valid and reliable tool	67%	11%	22%

Participant Evaluation	% Always	% Sometimes	% Never
Participant evaluation method determined prior to SBE	67%	22%	11%
Participant evaluation use of formative evaluation	78%	11%	11%
Participant evaluation ratio of 1 facilitator to 3-5 participants	56%	33%	11%
Participant evaluation use of summative evaluation	11%	0%	89%
Participant evaluation use of high stakes	11%	0%	89%

Interprofessional Simulation	% Always	% Sometimes	% Never
Interprofessional simulation-based on theoretical framework	0%	83%	17%
Interprofessional simulation-based on Sim-IPE competencies	33%	50%	17%
Interprofessional simulation recognizes barriers	33%	50%	17%
Interprofessional simulation evaluation plan for Sim-IPE	50%	33%	17%

Simulation Design	% Always	% Sometimes	% Never
Simulation design structures format based on purpose	78%	22%	0%
Simulation design scenario provides context for SBE	67%	33%	0%
Simulation design uses various fidelity to create realism	67%	33%	0%
Simulation design pilot test all SBE before full implementation	44%	44%	11%

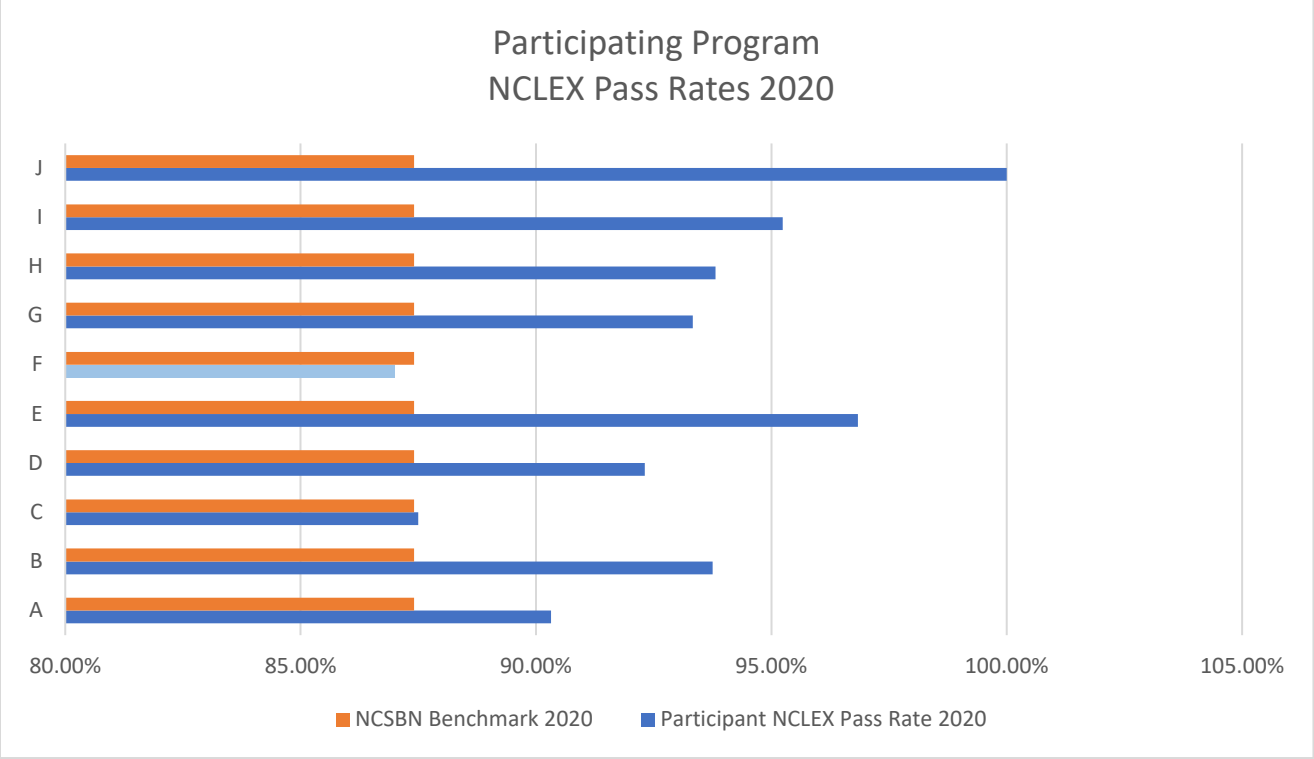
When asked regarding use of an educational theory to underpin their program, seven of the ten programs responded in the affirmative. Only one program replied no; two programs did not respond to this item. The same pattern of response was seen when asked about program

collection and retention of evaluation data. Most programs tracked learner contact hours, equipment usage, and investment of faculty time and faculty effectiveness in the facilitator role in simulation sessions to measure the simulation experience's effectiveness. Predominate drivers of decision as to what simulation scenarios are used were faculty choice and clinical experience desired. Curriculum mapping use was described by five of the responding programs. The same programs also described using a Simulation Committee to assist in planning, development, and evaluation and the presence of a dedicated simulation coordinator and simulation technician. Five programs described CHSE or CHSE-A certified faculty/staff, one per program, along with two programs with CHSOS certified faculty/staff, one per program. Finally, none of the respondents are currently SSH-certified simulation centers or labs.

This project's final aim was to explore the potential impact of clinical simulation usage on NCLEX pass rates. As reported by the 2014 NCSBN study, there were no negative impacts on first-time NCLEX exam pass rates for students who experience simulation as part of their clinical nursing education (Hayden et al., 2014). NCQAC requires nursing programs to maintain an 80 % first-time pass rate for program accreditation (Washington State Department of Health, n.d.). All programs in the study group exceeded this standard. Parenthetically the national NCLEX first-time pass rate in 2020 was reported at 87.41 % ("2020 NCSBN NCLEX pass rates," 2020). All but one of the sample nursing programs exceeded this national benchmark as well.

Comparisons were made with sample ADN mean to sample BSN mean, sample ADN mean to all state ADN mean, sample BSN mean to all state BSN mean, and all state ADN mean to all state BSN mean pass rates. In comparison of BSN to ADN program NCLEX pass rate means, there were no significant differences found ($p \leq .05$). Review of the trends of the

previous three years of NCLEX pass rate variability data for all Washington state nursing programs reveal no significant differences in pass rate variations over time. This lends credence to the conclusion that no significant impact to pass rates occurred because of the past year of increased simulation experiences in substitution for unavailable traditional clinical experiences. Most of this was done at a 2:1 ratio.



Simulation Education in the Time of Covid-19

On March 9th, 2020, Seattle University IRB notified that this study was exempt and the survey could proceed. On March 11th, the World Health Organization (WHO) declared COVID-19 formally a pandemic (Considerations for COVID-19 preparedness and response in US schools of nursing, 2020). By March 18th Centers for Disease Control and Prevention (CDC) provided updated guidelines for institutions of Higher Education that drove a significant upset in how nursing education was delivered. On March 20th, NCQAC issued the first of many updates on nursing education and nursing practice in Washington State, including that most clinical sites

were closed consequent to the state emergency proclamation and widespread school closures. In a very short period, the world of nursing and nursing educations was turned upside down.

On March 30th, the governing boards of INACSL and the Society for Simulation in Healthcare (SSH) issued a joint position statement supporting the use of virtual, now computer-based, simulation during the pandemic, helping pave the way for clinical nursing education to continue in a different means. They affirmed that computer-based simulation had been used successfully in healthcare education for more than a decade. Computer-based simulation experiences are associated with student achievement of learning outcomes. The resolution stated, "based on the current and anticipated shortage of healthcare workers, we propose that regulatory bodies and policymakers demonstrate flexibility by allowing the replacement of clinical hours usually completed in a healthcare setting with that of virtually simulated experiences during the pandemic" (Position statement on use of virtual simulation during the pandemic, 2020).

By the end of March, not only were on-site clinical experiences canceled but most simulation labs and centers were closed as well, all in compliance with "Stay Home Stay Healthy" social distancing recommendations. On March 30th, a letter, supported by 30 faculty experts and academic leaders in nursing higher education in Washington, was presented to NCQAC. These leaders asked that for the duration of the public health emergency, a transition to 100 % clinical simulation until opportunities to return to safe, live-site clinical settings were possible. They further asked that all clinical simulation hours be considered sufficient to meet program outcomes and affirm those simulation hours as intensive, interactive learning worthy of a 2:1 hour replacement ratio, two hours of traditional clinical replaced with one hour of high quality stimulation. All simulations were to be conducted per INACSL standards. The NCQAC

agreed to support the use of INACSL standards-based, high-quality simulation with 50% of total program required clinical hours replaced as simulation. Initially, these simulations were maintained at the 1:1 ratio but ultimately were approved as a 2:1 ratio (Washington State Nursing Care Quality Commission, 2020).

Nationally and globally, similar experiences in rapid-cycle change, ambiguity, and crisis in continuing nursing education and graduating desperately needed new nurses to assist in the emergency were experienced. All reported similar themes of concern for student safety, faculty safety, and lack of clinical site access as well (Dewar, et al., 2020; Fogg, et al., 2020).

The current program evaluation focused on pre-Covid-19 simulation education practices. After a year of rapid cycle change in the delivery of clinical nursing education, it seemed essential to revisit some of the areas surveyed last year to see what had changed, what remained the same, and what we have learned. In addition to the rapid changes in policy and practice, academic leaders and students alike have experienced the downstream physical and mental health stresses associated with information ambiguity and a prolonged pandemic crisis (Garfinet al., 2020). To further explore these questions, a follow-up survey was developed. After an inquiry to Seattle University IRB yielded no additional needs from a human subject's standpoint, the follow-up survey was sent to the ten nursing programs that had provided data in the original survey of the previous year. (See Appendix B)

Six programs responded and provided the following insights into clinical nursing education and simulation over the past year during Covid-19:

- All used 00% computer-based simulation in spring quarter 2020 during the stay-at-home order.

- Return to in-person skills and simulation rolled back into the education model based on county and program ability to meet CDC and Washington state recommendations.
- One program has not resumed in-person simulation yet; all others have. Most with modification to support social distancing and meet mask mandates.
- Regarding platforms, all used vSim, three used Shadow Health, two used Ontario, four used Homegrown, one used Swift River iHuman.
- Clinical courses taught with simulation were Foundations one, Peds five, Mental health, OB, and Adult four. One program did not use simulation in place of traditional clinical experience.
- Platforms used to support virtual simulation experiences included Big Blue Button and Zoom. One program used pre-recorded pre-brief; the remainder of the programs did pre-brief live for each simulation session. Time ranged from 15 to 60 minutes for Prebrief and 45-60 minutes for Debrief. Scenarios run time ranged from 20 min to 2 hours.
- What Worked Well: faculty energy and willingness to work on campus or remotely, used SBAR to faculty to practice communication, access to the college of nursing supports including tech, access to faculty development materials from the University of Washington, use of unfolding case studies, scenarios with video or interactive type of engagement.
- What Did Not Work as Well: variation in PPE availability for the centers doing some in-person activities, increased costs for simulation programs, faculty cost, and laundry, challenges in practicing communication, student and faculty learning curve with the technology and the structure of the scenario and accompanying briefs, students completing at different rates so increased down time for some.

- Technology Issues: sometimes tech worked well, other times not so much. Issues with student and faculty access to high-speed internet and other technology, distractions in the environment such as children or pets, lack of bonding within the cohort by being on Zoom rather than in person.
- Barriers: learning curve for faculty, especially adjunct, the context of the emotionally burdensome pandemic in the setting of local, national, and global crisis, some students could not see the value so did not maximize learning,
- Experience of faculty: all needed basic simulation pedagogy training, frustration with the learning curve with little time to become proficient, "only 2 of 36 chose not to return after the first quarter as a result of not liking virtual teaching," frustration with technical and scenario-specific difficulties and content that was incorrect or outdated. It did allow for rich discussion during debriefing.
- Changes Made and Plans for Moving Forward: moving back to in-person lab and simulation but continuing to use homegrown and no-cost computer-based scenarios as an adjunct, happy to return to in-person clinical but plan to augment with computer-based simulation as needed, especially for clinical hours make-up, learning how to evaluate student performance, continue to use for specific clinical such as peds, OB, and mental health that may be difficult to provide adequate in-person clinical hours. Some students continue to have simulation; others have been able to return to live clinical experiences.
- All programs will continue to use some level of computer-based simulation moving forward.
- One of five respondents used the 1:1 ratio in hours substitution; the remainder used the 2:1 ratio approved by NCQAC.

The social disruption caused by Covid-19 left its impact on how programs of nursing education meet the needs of students and faculty. With minimal warning, programs were pushed to re-tool all aspects of their programs and step into unknown territory. Preexisting attitudes regarding virtual learning, remote learning, Information Technology (IT) infrastructure, and faculty and student willingness and ability to make such a sudden shift have influenced the past year. Similar impacts and changes have affected clinical care at the patient and community level (Carolanet al., 2020). As is seen in the stories shared in the follow-up survey, nurses and nursing education are resilient. They have succeeded in continuing forward in a transformational way despite the barriers imposed by Covid-19. Respondents were asked to reflect over the past year of Covid-19 and provide a take a way word. "Flexibility" was the predominant takeaway from the participants in this study. (See Figure 3).

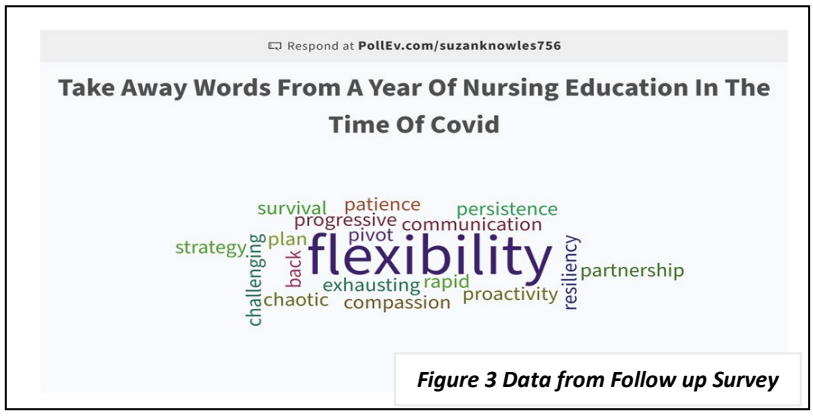


Figure 3 Data from Follow up Survey

Discussion

Project Aims

The first aim of this program evaluation was to understand how simulation is being used as clinical hours replacement in pre-Covid-19 state of Washington pre-licensure nursing programs. Unfortunately, the survey for this program evaluation study was launched only days

after initiating the lockdown in Washington State due to Covid-19. As a result, response rates to the survey were lower than expected, impacting the generalizability of findings.

Although small numbers of respondents, there was balance in the responding programs between ADN and BSN reflective of the ratio of types of pre-licensure nursing programs in Washington state. When looking at a total of twenty-five possible ADN programs, this study has data from six or 24%. Similarly, with a total of twelve BSN programs in the state, survey responses represent four or 33% of possible BSN program respondents. With respect to the sample location, most of the programs were in Western Washington, one university and one community college respondent were from the state's eastern side.

The second aim of this program evaluation was to evaluate the use of simulation experiences in the context of simulation-based education best practice standards. Once again, the low response rate is a similar limitation in achieving this aim. While the low response rate is a limiting factor, the programs that did respond provided a glimpse into the status of simulation as an active pedagogy in support of student learning before the arrival of Covid-19.

Key Findings

Key findings related to the aim of understanding hours substitution for traditional clinical hours demonstrated that there is significant variation in this practice between the reporting nursing programs. Variations were noted in the number of hours required per course and how simulation was used to support those individual courses. The use of simulation in substitution for traditional clinical hours was not consistent, with a little over half reporting some use of simulation hours in this regard. All programs that used simulation pre-Covid-19 for hours, reported use of a 1:1 hour ratio, per WAC 246-840-534.

Washington NCQAC requires compliance with INACSL Standards of Best Practice for programs that wish to use simulation for clinical experience (WAC 246-840-534). During the recent crisis in nursing education wrought by Covid-19, the commission supported the expanded use of simulation in substitution for traditional clinical hours with a 2:1 traditional hour to simulation hours ratio. The expectation remained that program meet the INACSL Best Practice Standards. Programs either with previous approval for use of simulation for clinical experience, or via attestation of current alignment with the existing WACS and INACSL Best Practice Standards were approved for this practice change during the crisis. In addition, expectations of nursing programs during this past year included 500 clinical practice hours for ADN degree and 600 clinical practice hours for BSN degree as required for graduation. This was not a change from pre-Covid-19 expectations. Compensation was made for 50% of clinical hours across the total number of clinical hours required at graduation to be computer or face to face-based simulation, as opposed to 50% of a given course. This allowed for clinical courses to be 100% simulation hours at the height of the pandemic.

The results of the PASS Tool Simulation Program Sustainability Survey elements, demonstrate the presence of 8 of the 14 elements (57%). Areas of concern included the lack of a long-range business plan and an inadequate numbers of simulation faculty. The limited findings of this small sample of programs suggest that additional evaluation of a larger number of nursing programs be the next step to ensure that simulation programs meet regulatory and quality expectations. Additionally, a focus on identifying what nursing programs need to successfully implement, fully, programs that meet simulation best practice standards should be a part of that work.

Programs were asked to identify program development needs, with INACSL Standards of Best Practice, Debriefing, and Interprofessional simulations being the most frequently selected topics. (Respondents could choose multiple topics on this question) This information can help guide statewide planning for meeting simulation development needs. The Pacific Northwest Healthcare Simulation Collaborative (PNWHSC) can be tasked with developing these and other topics under their mission of providing tools and resources in simulation training in the region (Pacific Northwest Healthcare Simulation Collaborative, n.d.).

While the past year of nursing education in a time of Covid-19 pandemic have been challenging at a level most have not experienced before, the responses from the follow up survey provide a positive outlook. The "words" shared in response to the final question of the survey are predominately positive. "Flexibility" and the other positive words represent the resilience of nurses and nursing education in even the most difficult times.

During academic year 2020/2021, students experienced continued limitations to traditional clinical experiences and as a result increased simulation experiences compared to students who graduated in academic year 2019/2020. Given this, it will be important to assess NCLEX pass rates for students testing after June and August 2021 graduations to assess for any differences in NCLEX outcomes related to the increased amount of simulation experiences theyu experienced during this time of Covid-19.

Limitations

Several limitations related to the timing of this program evaluation study were identified. As a result of Covid-19 pandemic impacts and timing of survey launch, the initial design was altered in respect to survey population. Rather than a focus on nursing programs in western Washington, a wider net was cast statewide. Access to individual nursing program respondents

was challenged with programs moving to remote learning limiting ability to connect the survey to appropriate respondents. As a result, the response rate to the survey was much smaller than originally anticipated. The original study design element that looked to include in person site visit and qualitative data collection was eliminated. Covid-19 impacted all aspects of nursing education driving a rapid transition in all elements of the education process. Nursing programs were consumed with movement of the didactic portions of programs to remote learning and clinical experiences to computer-based virtual simulation.

Recommendations

With the arrival of Covid-19 and its effects on the delivery of nursing education, beginning in March 2020, the follow-up survey results conducted in March of 2021 indicate significant shifts in the use of simulation as a substitution for traditional clinical hours. (See Appendix B) During the height of the pandemic in the spring and summer of 2020, most of student clinical experience was with computer-based or modified in-person simulation. With the permission of NCQAC, most programs counted these hours at a ratio of two hours of traditional clinical being replaced with one hour of a high-quality simulation. As noted in the results of this program evaluation, there appears to be no significant impact on NCLEX pass rates in 2020 related to the changes to clinical education delivery. It will be important to assess the impacts of the past year and a half on NCLEX pass rates in 2021. This group of students had a more significant impact to their nursing education than did the graduates in 2020.

It is recommended that a larger sample of Washington state nursing programs be surveyed regarding their clinical experience practices in the past year. NCLEX pass rates in 2021 should be compared to those of 2020 to evaluate for the impact of the larger number of simulation hours these graduates will have experienced in their nursing education. These results

can assist in developing a recommendation to NCQAC regarding a permanent regulatory change to a 2:1 traditional to simulation hours ratio for those programs meeting the regulatory expectation of compliance with INACSL Standards of Best Practice, thus being eligible for hours substitution. This real time experience of successfully graduating nursing students over the past two years is likely to support a policy change recommendation for the 2:1 substitution ratio of one hour of high-quality simulation substituting for two hours of traditional clinical. The survey results suggest additional progress is needed to affirm full implementation of INACSL Standards of Best Practice as required by Washington NCQAC regulations.

It would be helpful to explore the experience of healthcare organizations on the receiving end of these new graduate nurses who were "hatched" during this time of Covid-19. Have they found them prepared to step into successful new graduate nursing practice?

Finally, additional investigation into how both traditional and simulation clinical experiences promote learning is needed. While there is significant evidence gleaned over the past ten years of the effectiveness of simulation experience in nursing education, the means to which both clinical experience modalities support the development of critical thinking and clinical judgment in the new nurse remain unclear. The Empty Systematic Review by Leighton et al. (2021serves as a wake-up call to nursing education to further determine how nursing practice is best learned, with traditional and simulation experiences.

Conclusion

With a clear understanding of pre-Covid-19 simulation practices in pre-licensure nursing education in Washington State, nursing educators and nursing commission members can affirm progress in best practice implementation. Importantly, it is critical to learn more about nursing education's experiences because of Covid-19 and the changes required over the past year. It is

likewise essential to explore and understand the nursing student and "receiving-end healthcare organization" experiences of these new nurses who have been prepared during this time of pandemic. The already identified challenges of shortened patient length of stay, increased patient acuity, multiple nursing education programs competing for the limited availability of clinical placements, and student access to the electronic health record remain. The resilience demonstrated by nursing education, student, and faculty alike, over the past year give hope to our ability to succeed in resolving these barriers to nursing education success.

The experience of this past year with Covid-19 presented new, previously unheard-of challenges; there is much to learn from this experience as well. Continuing to identify areas for improvement will help inform the ongoing work to achieve cost-effective, resource utilization-effective, and student success regarding the transition to professional practice outcomes. The downstream impacts will include the successful creation and evolution to the nursing practice of competent, confident, new to practice registered nurses to fill the looming nursing shortage and assure quality care for clients and families in the future.

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Appendix A

On Line Survey Content

Page One Informed Consent

You are invited to take part in a research study being done by Suzan Griffis Knowles, MN, RN-BC at Seattle University, in Seattle Washington. Participation in this DNP project study is optional. Given the current Covid-19 impacts across all nursing programs and faculty workload, your willingness to participate in this graduate student project by sharing your time and insight on this topic is greatly appreciated.

You are being asked to complete a survey regarding your nursing program's use of simulation in your pre-licensure nursing program. Participation is optional. This survey will help me learn more about the use of simulation-based clinical education compared to traditional clinical education. The question I hope to address is, "how does simulation-based clinical education hours, compared to traditional clinical education hours affect end of program proficiency, readiness for nursing practice, and NCLEX exam pass rates? Additionally, questions will look to identify nursing program and faculty development related to simulation-based education and use of the INACSL simulation standards.

The survey will take approximately 20 minutes to complete. Your answers will be kept strictly confidential. You may opt out of survey completion at any time.

Thank you, in advance, for your investment of time and knowledge in furthering the understanding of the "current state" of simulation practice and substitution for traditional clinical hours in the state of Washington. (By "current state" I am referring to pre-Covid-19 simulation use status)

Questions? Please contact Suzan Griffis Knowles at knowlesu@seattleu.edu. If you have questions or concerns about your rights as a research participant, you can contact the Seattle University Institutional Review Board at irb@seattleu.edu.

If you consent to participate in this study, click the [*Agree, Accept, Next, Start*] button to start the survey."

Survey Questions

Demographics

Type of Program	Associate degree
	Baccalaureate degree
Type of Institution	Academic/teaching medical center
	University/college setting
	Community College/technical school

Annual average enrollment (past 5 years) _____

Number of pre-licensure graduates in the previous year (2019): _____

Total number of full time nursing faculty undergraduate program: 1-10 11-20 21-30 30-40 >40

Total number of part time undergraduate nursing faculty: 1-10 11-20 21-30 30-40 >40

All the following questions are regarding your pre-licensure RN program only

Clinical Hours Required

For the following courses how may clinical hours (defined as having patient contact and providing hand-on patient care) are associated with each:

Foundations _____

Mental Health _____

OB _____

Pediatrics _____

Adult Medical Surgical _____

Use of Simulation in Clinical Education

Use the following definitions in answering the following questions:

- **High Fidelity Simulation:** in healthcare simulation, high-fidelity refers to simulation experiences that are extremely realistic and provide a high level of interactively and realism for the learner. Can apply to any mode or method of simulation for example, human, manikin, task trainer, or virtual reality.
- **Low Fidelity Simulation:** Not needing to be controlled or programmed externally, for the learner to participate. Examples include case studies, role playing, or task trainers used to support students or professionals in learning a clinical situation or practice.
- **Task trainer:** A device designed to train in just the key elements of the procedure or skill being learned, such as LP, chest tube insertion, central line insertion, or part of a total system for example ECG simulator. A model that represents a part or region of the human body, such as an arm or an abdomen. Generally used to support procedural skills training, however they can be used in conjunction with other learning technologies.

J.O. Lopreiato, D. Downing, W. Gammon, L. Lioce, B. Sittner, V. Slot, Terminology & Concepts Working Group Healthcare simulation dictionary, Agency for Healthcare Research and Quality, Rockville, MD (2016) Retrieved from http://www.ssih.org/dictionary

Do you use high fidelity simulation in the following clinical courses?

Foundations Yes No
Mental Health Yes No
OB Yes No
Pediatrics Yes No
Adult Medical Surgical Yes No

If yes,

How many hours of high fidelity per student in each clinical course?

Foundations _____
Mental Health _____
OB _____
Pediatrics _____
Adult Medical Surgical _____

Do you use low fidelity simulation in the following clinical courses?

Foundations Yes No
Mental Health Yes No
OB Yes No
Pediatrics Yes No
Adult Medical Surgical Yes No

If yes,

How many hours of low fidelity per student in each clinical course?

Foundations _____
Mental Health _____
OB _____
Pediatrics _____
Adult Medical Surgical _____

Do you use task trainer-based simulation in the following clinical courses?

Foundations Yes No
Mental Health Yes No
OB Yes No
Pediatrics Yes No
Adult Medical Surgical Yes No

If yes,

How many hours of task trainer-based simulation per student in each clinical course?

Foundations _____
Mental Health _____
OB _____
Pediatrics _____
Adult Medical Surgical _____

Are there other types of simulation that you use in your clinical programs not covered by the 3 definitions above? ***(examples standardized patients, CD-ROM, Internet-based virtual hospital, Avatars, Virtual reality, other)***

Does your simulation laboratory offer any of the following learning opportunities?

Practice Procedures	Yes	No
Practice routine assessments	Yes	No
Practice patient scenarios	Yes	No
Practice high-risk patient scenarios	Yes	No
Remediation of skills	Yes	No
Other learning opportunities	Yes	No

- Examples of other opportunities provided:

Do your simulations require a scenario? Yes No

If so, what is the typical duration of a simulation scenario?

15 to 30 minutes_____
31 to 60 minutes _____
More than 60 minutes _____

How much time is spent in debriefing after the simulation scenario?

No debriefing _____
Debriefing takes less time than the scenario _____
Approximately the same time as the scenario ____
Debriefing takes more time than the scenario _____

Simulation Time and Usage

Has your program's use of simulation in clinical courses increased in the past 3 years? Yes No

Does student time in simulation count toward required traditional clinical hours?

No, simulation is a supplement to clinical hours
Yes, on occasion simulation is substituted for clinical
Yes, simulation hours are substitutes for clinical hours

If your program substitutes simulation for traditional clinical hours, what is the substitution ratio that is used?

One simulation hour is equal to less than one clinical hour
One simulation hour is equal to one clinical hour
One simulation hour is equal to two clinical hours
One simulation hour is equal to more than two clinical hours

If your program substitutes simulation for traditional clinical hours, what percentage of the course required clinical hours are substituted by simulation?

Mental Health _____
OB _____
Pediatrics _____
Adult Medical Surgical _____

For what reasons do you substitute simulation hours for clinical hours (select all that apply

_____Complement clinical experiences
_____Positive learning outcomes for students
_____Goal/objective driven education
_____Ability to practice patient safety
_____Provide best environment for student learning
_____Ability to evaluate student performance
_____Lack of traditional clinical hours placement time
_____Lack of preceptors in the clinical site
Other:

For your program, is there a maximum percentage of traditional clinical hours that you allow to be substituted? If so, what is that percentage?

What percentage of hours would your program like to substitute for traditional clinical hours?

_____ 10%
_____25%
_____30%
_____ 50%

What barriers have you identified to increasing simulation use?

_____ More faculty need to be trained in writing scenarios
_____ Faculty do not have enough time to write scenarios
_____More faculty need to be trained in debriefing simulations
_____More faculty need to be trained in facilitating simulations
_____Not enough staff to run the simulation controls
_____ Difficult to schedule additional time in the simulation center
Other:

Are you familiar with the NCSBN 2014 Simulation Study? Yes No

Are you familiar with the INACSL Simulation Standards of Best Practice? Yes No

Program Assessment Survey for Simulation (PASS): Academia 2018

Based on NCSBN Simulation Guidelines for Pre-licensure Nursing Programs (Alexander, et al., 2015), INACSL Standards of Best Practice: Simulation[s] (2016, 2017), SSH Core Standards (2015). The Program Assessment Survey for Simulation (PASS) was developed by Dr. Sabrina Beroz when Faculty Lead for the Maryland Clinical

Simulation Resource Consortium (MCSRC) authorized by the Nurse Support Program II, funded by the Health Services Cost Review Commission and administered by the Maryland Higher Education Commission and is used with permission

What is your primary purpose for using simulation? ***Select all that apply***

Increase NCLEX Scores _____
Increase enrollment _____
Increase use of clinical facilities _____
Increase retention _____
Increased patient safety _____
Other (Please elaborate)
_____
_____

Sustainability: Please select if your simulation program has the following:

a. _____ An established framework that provides adequate resources (fiscal, human and material) to support the simulation program.
b. _____ A vision or mission statement for the simulation program which is congruent with the institution.
c. _____ A policy and procedure manual to ensure quality-consistent simulation experiences for students and growth of the simulation program.
d. _____ An adequate number of dedicated-trained simulation faculty to support students in simulation-based experiences.
e. _____ Job descriptions for simulation faculty/facilitators.
f. _____ A formal plan for orienting/developing simulation faculty to their roles.
g. _____ An established needs assessment to determine scenario use.
h. _____ Adequate designated physical space for education, storage and debriefing.
i. _____ Use of a system to manage space, equipment and personnel resources.
j. _____ A process for identifying equipment and relevant technology needed for meeting program objectives/outcomes.
k. _____ Adequate equipment/supplies to create a realistic patient care environment
l. _____ Evaluation process for quality improvement of the simulation program.

m. _____ Administration has a long-range business plan for sustainability and growth
of the Simulation program.
n. _____ Perform needs assessment to gather information to determine needs?

Faculty Preparation: Quality of Simulation Experiences

a. Is your simulation program based on an educational theory? Yes _____ No _____
If yes, do you use one of the following: Experiential _____ Constructivism _____ Reflective Practice _____ NLN Jeffries Simulation Theory _____ Other _____
b. The program collects and retains evaluation data on the effectiveness of the simulation experience? Yes _____ No _____
If yes, do you collect information on the following: ***Select all that Apply***
Scenario utilization _____ Utilization of equipment _____
Utilization of space _____ Number of learners _____ Learner contact hours _____ Faculty/staff time _____ Scenarios developed _____ Other _____
c. The program collects and retains evaluation data on the effectiveness of the facilitator? Yes_____ No _____
d. How does your program provide faculty with simulation-related professional development?
_____
_____
e. The program collects and retains evaluation data on students? Yes_____ No _____
f. The program collects and retains evaluation data on curriculum gaps?
Yes _____No _____
g. Have you integrated simulation into your curriculum by establishing a curriculum map?
Yes _____ No _____
h. How do you decide what simulations are done in each course? *Select all that apply* Faculty choice _____ Exam results _____ NCLEX results _____ Clinical experiences _____ Other _____
i. Do you have a Simulation Committee? Yes _____ No _____
j. What is the primary role of the Simulation committee?
_____
___
k. Who is represented on the simulation committee?
_____
___

l. Do you have a dedicated Simulation Coordinator or equivalent? Yes _____ No _____ Full time _____ Part time _____
Are they on the Simulation Committee? Yes _____ No _____

m. Do you have a Simulation Technician? Yes _____ No _____ Is IT available to assist the technician when needed? Yes _____ No _____

Please state the degree to which your simulation program uses the INACSL Standards of Best Practice: Simulation

Standard	Criterion	A- Always B- Sometimes C- Never
Standard: Glossary	(1) Consistently utilizes defined simulation terminology: Example- Are you calling the educator a facilitator or the student a participant?	(1) _____
Standard: Professional Integrity	(1) Maintains ethics and professionalism of the role. (2) Maintains confidentiality of scenario and simulation experience (3) Delivers feedback respectfully	(1) _____ (2) _____ (3) _____
Standard: Outcomes and Objectives	Outcomes: (1) Scenarios meet program outcomes. Objectives are: (2) Specific (3) Measurable (4) Achievable (5) Realistic (6) Time-phased (7) Communicated to students prior to each simulation activity.	(1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ (7) _____

Standard: Facilitation	(1) Facilitators have skills and knowledge in simulation pedagogy. (2) Objectives leveled to learner. (3) Provides preparatory activities and pre-briefing before SBE (enhances psychological safety) (4) Delivers predetermined or unplanned cues during SBE. (5) Follows SBE with debriefing and after to support achievement of expected outcomes.	(1) _____ (2) _____ (3) _____ (4) _____ (5) _____
Standard: Debriefing	(1) Debriefers are competent in the process of debriefing. (2) Environment conducive for reflective learning (safe container). (3) Debriefer is able to devote enough concentrated attention to effectively debrief the SBE. (4) Debriefing based on a theoretical framework for debriefing. (5) Debrief is congruent with scenario objectives	(1) _____ (2) _____ (3) _____ (4) _____ Which one do you use _____ (5) _____ (6) _____ Which one do you use _____

	and outcomes of the SBE. (6) Debriefers are evaluated using a valid and reliable tool.	
Standard: Participant Evaluation	(1) Determines the method of participant evaluation prior to SBE. (2) Use of formative evaluation (3) Ratio is 1 facilitator to 3-5 participants. (4) Use of summative evaluation. (5) Use of high stakes (6) If using summative or high stakes evaluation, we evaluate simulation experiences using a valid and reliable tool. (7) If using summative or high stakes evaluation, we train the evaluators. (8) If using summative or high stakes evaluation, passing or cut scores are pre-determined. (9) If using high stakes, the evaluation is conducted by two unbiased evaluators either through direct observation or video recording. (10) If using high stakes evaluation, the participant is aware	(1) _____ (2) _____ (3) _____ (4) _____ (5) _____ (6) _____ (7) _____ (8) _____ (9) _____ (10) _____ (11) _____

	of the consequences and outcomes of the SBE. (11) If using high stakes evaluation, the tool was tested with like populations.	
Standard: Inter-professional (IPE) simulation	(1) Based on a theoretical or conceptual framework (2) Follows best practice for Sim-IPE (IPE competencies) (3) Recognizes and addresses potential barriers to Sim-IPE. (4) Established evaluation plan for Sim-IPE	(1) _____ (2) _____ (3) _____ (4) _____
Standard: Simulation Design (Many of the criterion are in other parts of the PASS therefore are not repeated)	(1) Structures the format of the simulation based on purpose, theory and modality for the SBE. (2) Designs scenarios to provide context for the SBE. (3) Uses various types of fidelity to create required perception of realism. (4) Pilot test all SBE before full implementation.	(1) _____ (2) _____ (3) _____ (4) _____
Standard: Operations (All criterion are located in other parts of the		

PASS therefore are not repeated)		

n. Do you develop your own scenarios? Yes _____ No _____

o. Do you validate your scenarios? Yes _____ No _____
If yes, how do you validate the scenarios?
_____
_____
_____
Who validates your scenarios?
_____
What are their qualifications?
_____

p. Do you use standard evidenced-based peer-reviewed scenarios? Yes _____ No_____
If yes, do you use NLN/Laerdal _____ ACES scenarios _____ CAE _____
PNCI _____ Other _____

q. Do you evaluate your scenarios before use? Yes _____ No _____ If yes, what tool do you use for evaluation of new scenarios? _____

r. Who facilitates the simulation student experience: Dedicated simulation team _____
All faculty _____ Other (elaborate) _____

s. How many support personnel work solely in the simulation program? _____

t. What percent of faculty time is allotted to simulation? _____

u. Is there a champion for research in simulation? _____ If so, what are you studying?
_____

v. Are there any faculty/staff with CHSE or CHSE-A certifications? Yes _____ No _____
How many? _____

w. Are any of your simulation faculty/staff CHSOS certified? Yes _____ No _____
How many? _____

x. How were they trainer for certification? Course _____ Workshop _____ certificate program _____ Conference _____ Other _____

y. Is your Simulation Center or Lab accredited by SSH? _____
Are you in the process? Yes _____ No _____

II. Identify your program development needs: Please select all that apply

a. _____ Foundational

b. _____INACSL Standards of Best Practice: Simulation

c. Debriefing: _____ Beginning _____Advanced
d. _____ Curriculum integration
e. Evaluation: _____ Beginning _____ Advanced
f. _____ Simulation Research
g. _____ Inter-professional simulations
h. _____ Standardized patients
i. Other (elaborate)

_____

Appendix B

Follow up Survey Questions

So much has changed in the past year since you so graciously responded to my DNP project survey regarding the use of simulation in replacement for traditional clinical hours. I am very interested to learn more about your program's journey over this past year as we all have learned to navigate a computer-based virtual learning world with our nursing students. I was hopeful you would be willing to provide a glimpse into the clinical learning world you and your program have developed to further explore my research question.

As you might recall, the aim of my project is two-fold. I am exploring how simulation education is being used as clinical hour replacement in pre-licensure nursing programs, and does the simulation education being provided meet the NCSBN supported INACSL Simulation Standards for Best Practice? My PICO question focuses on pre-licensure nursing education programs and how simulation-based clinical education hours compared to traditional clinical education hours affect end of program NCLEX exam pass rates?

My hope is that the additional insights you have gained during this past year will better inform the recommendations that I hope to present from this program evaluation DNP project. The follow up survey attached is 10 questions. You may complete in the attached Word document version or with a "reply" to this mail complete the copy of the survey embedded in this email below. Whichever format is easiest for you to respond to will be welcomed.

Use of Simulation in Clinical Nursing Education

Please consider the following definitions as you entertain the questions below:

- **High Fidelity Simulation:** in healthcare simulation, high-fidelity refers to simulation experiences that are extremely realistic and provide a high level of interactively and realism for the learner. Can apply to any mode or method of simulation for example, human, manikin, task trainer, or virtual reality.
- **Low Fidelity Simulation:** Not needing to be controlled or programmed externally, for the learner to participate. Examples include case studies, role playing, or task trainers used to support students or professionals in learning a clinical situation or practice.
- **Task trainer:** A device designed to train in just the key elements of the procedure or skill being learned, such as LP, chest tube insertion, central line insertion, or part of a total system for example ECG simulator. A model that represents a part or region of the human body, such as an arm or an abdomen. Generally used to support procedural skills training, however they can be used in conjunction with other learning technologies.
- **Computer-Based Simulation:** The modeling of real-life processes with inputs and outputs exclusively confined to a computer, usually associated with a monitor and a keyboard or other simple assistive device (Textbook of Simulation). Subsets of

computer-based simulation include virtual patients, virtual reality task trainers, and immersive virtual reality simulation (ibid).

J.O. Lopreiato, D. Downing, W. Gammon, L. Lioce, B. Sittner, V. Slot, Terminology & Concepts Working Group Healthcare simulation dictionary, Agency for Healthcare Research and Quality, Rockville, MD (2020) Retrieved from http://www.ssih.org/dictionary

1. Describe your use of simulation-based learning experiences during this past year of Covid-19

Continued in person simulation?	Yes	No
Continued in person skills practice	Yes	No
Computer-based Virtual simulation platform	Yes	No

Used the following platforms

vSim	Yes	No	
Shadow Health		Yes	No
Ontario Simulation Alliance (OSA)	Yes	No	
"Home grown"		Yes	No
Other (list or describe)			

_____

2. What clinical courses were taught using simulation-based learning in place of traditional (on-site) in person clinical education?

Foundations/Fundamentals			Yes	No
Mental Health	Yes	No		
OB/Maternity	Yes	No		
Pediatrics	Yes	No		
Adult Medical Surgical			Yes	No

3. Describe a typical computer-based simulation session
   a. Pre-brief
   b. Debrief
   c. How much time are you spending for pre-brief, debrief, and actual scenario time?
4. What worked well?
5. What didn't work well?
6. Any specific barriers to success identified?
7. What has been the experience of your faculty in adapting to computer-based virtual simulation as an educational approach?
8. What changes did you make as you progressed these past 10 months?
9. Identify three words that best describe your take-away from this past year?

10. Do you plan to continue using computer-based simulation learning after the Covid-19 crisis stabilizes?

Appendix C

IRB Approvals

March 9, 2020

Suzan Knowles
College of Nursing
Seattle University

Dear Suzan,

Thank you for your application for exemption. After careful consideration, I have determined your study **Simulation Use in Pre-Licensure Nursing Programs Assuring Excellence in New Nurse Competence and Confidence** exempt from IRB review in compliance with **45CFR46.104(d)**:

1) Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction (including most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods).

Note that a letter of exemption does **not** mean IRB "approval." *Do not include statements for publication or otherwise that the SU IRB has "reviewed and approved" this study*; rather, say the SU IRB has "determined the study to be exempt from IRB review in accordance with federal regulation criteria." Please retain this letter with your study files.

If your project alters in nature or scope, contact the IRB right away. If you have any questions, I'm happy to assist.

Best wishes,

Andrea McDowell, PhD
IRB Administrator

Email: irb@seattleu.edu
Phone: (206) 296-2585

cc: Dr. Carrie Miller, Faculty Adviser

INSTITUTIONAL REVIEW BOARD
Administration 201 901 12th Avenue P.O. Box 222000 Seattle, WA 98122-1090

Communication with IRB related to Follow up Survey

Dr McDowell

I was referred to you by the chair of my DNP project, Dr. Carrie Miller. I am approaching the conclusion of my project. Given the impacts of Covid-19 on nursing education over the past year, she and I have been discussing the potential additional insights a brief follow re-survey of the respondents to my initial survey a year ago could contribute to my final product. Attached is a copy of my proposed follow up survey.

Can you instruct me on what would be needed from an IRB perspective to move forward with this follow up survey? Thank you, in advance, for your wisdom and direction.

Sincerely,

Suzan Griffis Knowles, MN, RN-BC, DNP Student Healthcare Leadership
Instructor and Course Coordinator
COLLEGE OF NURSING | SEATTLE UNIVERSITY
206-296-2392 Cell: 425-246-7241
knowlesu@seattleu.edu

Hello, Suzan,

Thanks for your email. This follow-up survey doesn't raise risk levels or alter the nature of your project (determined as exempt in March 2020). I'll save the survey and this correspondence to your original file, and you can proceed. I appreciate your conscientiousness in checking on this alteration.

Have a good weekend, Andrea

Andrea Rossing McDowell, PhD

Administrator, SU Institutional Review Board
Lecturer, Business Communication -- Albers School of Business & Economics
Admin 201 | 206.296.2585 [***Please direct all IRB related correspondence to*** irb@seattleu.edu]
Pronouns: she/her (What does this mean?)

Appendix D

Data Tables

Clinical Hours per Clinical Course									
Course Focus/Name	Resp 1	Resp 2	Resp 3	Resp 4	Resp 5	Resp 6	Resp 7	Resp 8	**Mean**
Foundations	120	78	44	96	150	88	45	48	84
Mental Health	24	32	28	96	60	44	0	64	44
OB	24	8	16	96	60	88	36	80	51
Pediatrics	60	48	20	96	60	N/A	28	80	56
Adult Health	120	334	229	96	300	396	88	120	210

Simulation Program Sustainability N=9	**Percentage**	**Raw Score**
Perform needs assessment	44%	4
Admin long range business plan for	22%	2
Eval process for quality improvement	78%	7
Adeq equipment for realistic patient care environ	89%	8
Process identifying equipment and relevant tech	56%	5
System to manage space, etc	44%	4
Adequate physical space	78%	7
Needs assessment to determine scenario use	44%	4
A formal plan for orienting	78%	7
Job descriptions for simulation faculty/facilitators	78%	7
An adequate number simulation faculty	33%	3
A policy and procedure manual	78%	7
Vision or mission statement	78%	7
An established framework	89%	8

NCLEX Pass Rates 2020		
Program Code	Participant NCLEX Pass Rate 2020	NCSBN Benchmark 2020
A	90.32%	87.41%
B	93.75%	87.41%
C	87.50%	87.41%
D	92.31%	87.41%
E	96.84%	87.41%

F	87.01%	87.41%
G	93.33%	87.41%
H	93.81%	87.41%
I	95.24%	87.41%
J	100.00%	87.41%

2347

2348

2349