COMPARING CLINICAL JUDGMENT COMPETENCY BETWEEN ACCELERATED AND TRADITIONAL BACHELOR OF SCIENCE IN NURSING STUDENTS DURING HIGH FIDELITY SIMULATION

By

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ABSTRACT

Background: Evidence suggests that competency in clinical judgment may be lacking in new graduate nurses. Graduates from accelerated baccalaureate nursing (ABSN) programs have even less time to develop clinical judgment competency. Various simulation modalities, including high-fidelity manikin and virtual reality, have been used to develop clinical judgment in pre-licensure students. However, the outcomes of these simulation modalities on clinical judgment in accelerated and traditional baccalaureate nursing students (TBSN) is not well understood.

Method: Using Tanner's Clinical Judgment Model as the theoretical framework, a quasi-experimental design compared clinical judgment competency between two interventions groups using a manikin with TBSN participants and virtual simulation with ABSN participants.

Results: ABSN participants had statistically significant higher noticing, interpreting, and overall clinical judgment competency scores that the TBSN group.

Conclusion: Findings from this study indicate accelerated nursing programs are effective in developing clinical judgment competency. However, results may have been affected by the simulation modality used in the TBSN group. Future research should include comparison studies aimed at examining the effect of these modalities with students in both traditional and accelerated programs.

Key Words: clinical judgment, high-fidelity manikin simulation, virtual reality simulation, baccalaureate nursing students

COMPARING CLINICAL JUDGMENT COMPETENCY BETWEEN ACCELERATED AND TRADITIONAL BACHELOR OF SCIENCE IN NURSING STUDENTS DURING HIGH FIDELITY SIMULATION

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By

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DEDICATION

There are many friends and family who have provided prayer, support, and encouragement to me during these last 4 and a half years, but several stand out. My 94-year-old mom, Virginia, who instilled deep within me a value and love of learning, as well as my children Graham (Becca & Wright), James, Win and Sam who were literally my loudest cheerleaders. But the person to whom I owe this above all others is my husband and love of my life Jay Martin. His devotion, care, support (both emotional and physical) and deep love are what truly carried me across the finish line. Thank you, Jay, my heart has been and will always be, yours.

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CHAPTER 1: INTRODUCTION

Problem Statement

Clinical judgment aptitude is a vital skill for the professional nurse to deliver safe and competent patient care. However, competency related to aspects of clinical judgment may be lacking in the new graduate nurse (Jessee, 2021; Kavanagh & Sharpnack, 2021; Kavanagh & Szweda, 2017). After a strategic practice analysis, the National Council of State Boards of Nursing (NCSBN, 2018) found that 50% of new graduate nurses had been involved in practice errors with the majority of these errors related to poor clinical decision making. To prevent these types of errors, it is incumbent upon schools of nursing to foster clinical judgment competency in the student nurse in order to transition safe, new graduate practitioners into the workforce (AACN, 2021; NCSBN, 2018).

Historically, schools of nursing used clinical agency patient care experiences to develop student nurses' clinical judgment (Benner et al., 2010); however, as facility sites have become limited, the use of simulated learning activities have been used to offset the reduction in clinical hours (Hayden et al., 2014). The NCSBN National Simulation Study conducted by Hayden and colleagues (2014) demonstrated that substituting high quality simulation experiences for up to half of a program's clinical time did not alter student outcomes or hamper readiness for practice. Even previous to this time, simulation laboratories using human patient simulators, task trainers, and models had become standard practice in pre-licensure nursing programs. Recently, the COVID-19 global pandemic put additional limitations on clinical agency access for pre-licensure students (Kavanagh & Sharpnack, 2021). For this reason, the American Association of Colleges of Nursing ([AACN], 2020a) in conjunction with state boards of nursing, encouraged schools of nursing to expand the use of manikin as well as virtual reality simulated experiences.

Traditional Bachelor of Science in nursing (TBSN) programs have two years to develop clinical judgment competency. However, with accelerated Bachelor of Science in Nursing (ABSN) programs, this time frame is shortened. ABSN programs range from 11 to 18 months to complete, less than half the time of their traditional baccalaureate counterparts (AACN, 2019). With an abbreviated period for academic preparation, examining the most effective simulation experiences for clinical judgment formation in students enrolled in accelerated programs is essential. Further, there is a lack of evidence comparing clinical judgment competency between TBSN and ABSN students prior to transition into the workforce. Therefore, the purpose of this study is to compare clinical judgment competency between final semester TBSN and ABSN students during a medical-surgical scenario using high-fidelity manikin simulation (HFMS) in the TBSN group and virtual reality simulation (VRS) in the ABSN group. Chapter One will provide the background of ABSN programs and learners, clinical judgment processes, manikin and virtual reality simulation modalities, the significance of the research, and the research questions. Tanner's Clinical Judgment Model that guides the study, the philosophical underpinnings, as well as theoretical and operational definitions will also be discussed.

Background and Significance

The Bureau of Labor Statistics (2021) reported the need for registered nurses to increase by nine percent from 2020-2030. Similarly, the AACN (2020b) projected that over 1 million nurses will retire and leave the work force by 2030 and that the current enrollment in pre-licensure baccalaureate nursing programs has not been increasing sufficiently to meet this demand. With a worsening nursing shortage, the complexities of the healthcare environments encountered by new graduate nurses entering the profession are known to be expanding. With this in mind, the Institute of Medicine ([IOM], 2010) Future of Nursing report recommended

increasing the ratio of nurses with baccalaureate degrees to 80% of the nursing workforce by 2020 to address these multifaceted and evolving issues.

Accelerated Baccalaureate Nursing Students

After AACN's projections of a nursing shortage and the IOM report, ABSN programs began proliferating in the United States. The AACN (2019) reported a 22.6% increase in ABSN programs from 2013-2018. These programs accomplish their terminal objectives with a rigorous, accelerated curriculum. ABSN programs typically enroll students who hold a non-nursing baccalaureate degree and then build upon previous academic experiences (AACN, 2019).

ABSN and TBSN students differ in their approaches to learning. First, the typical ABSN student is older and has higher academic expectations of their faculty and the learning environment than TBSN learners (AACN, 2019; Christoffersen, 2017). Secondly, ABSN students prefer active educational strategies (demonstrations, case studies, web-enhanced activities, group work) to reinforce theoretical content (Christoffersen, 2017; Kemsley et al., 2011); as well as assignments that analyze and synthesize concepts to apply solutions to real-life problems (Rawls & Hammons, 2012). Thirdly, ABSN students experience a higher level of self-efficacy than TBSN students (Durkin & Feinn, 2017). Lastly, ABSN students seek to integrate coursework and clinical experiences in an ongoing fashion and demonstrate high levels of motivation toward becoming nurses (AACN, 2019; Christoffersen, 2017; El-Banna et al., 2017; Kemsley et al., 2011). These findings may contribute to ABSN students showing better standardized exit exam scores and national licensure examination (NCLEX-RN®) pass rates than their traditional BSN counterparts (Lee & Song, 2021). However, research also suggests ABSN learners may lack competency in informatics, perhaps due to the age difference between the typical ABSN versus TBSN student (Payne & Mullen, 2014).

Clinical Judgment Competency

With accelerated programs graduating nurses in half the time of traditional baccalaureate programs, the need to ensure safe practitioners is paramount. Clinical judgment competency is found to minimize nurse errors and improve patient outcomes (Cappelletti et al, 2014; Dickison et al., 2019; NCSBN, 2018). Thus, it is deemed a vital skill for new graduate nurses to be safe, entry level practitioners (NCSBN, 2018). Success on the NCLEX-RN® should indicate that the new graduate nurse meets these competency standards. However, the NCSBN (2018) determined that the examination in its current format measured clinical judgment in a limited capacity. Consequently, the Next Generation of NCLEX-RN® (NGN) based on the Clinical Judgment Model is being tested, refined, and launches in 2023 (NCSBN, 2018). By utilizing alternate item formats such as case studies and patient chart information, the NGN incorporates and extends test items to determine the graduate nurse's ability to analyze information and respond appropriately (NCSBN, 2018).

Clinical judgment is a dynamic, complex, and iterative process nurses employ to make clinical decisions. It incorporates patient assessment, analysis, critical thinking, prioritization, competency in action, and reflection to apply theoretical knowledge into practice (Bussard, 2018; NCSBN, 2018; Tanner, 2006). Deficient clinical judgment competency jeopardizes patient safety, specifically being linked to preventable nursing errors such as inaccuracies in medication administration (Treiber & Jones, 2018), or failure to recognize a decline in patient status (Al-Moteri et al., 2019; Kavanagh & Sharpnack, 2021; Murray et al., 2019; Mushta et al., 2018; Treacy & Stayt, 2019). These error rates are higher among new graduate nurses than their more experienced colleagues (Murray, et al., 2019; Treiber & Jones, 2018). Further, other research showed that only 20% of health care agency employers were satisfied with the decision-making

skills of new graduate nurses upon hire (NCSBN, 2018). In research trending practice readiness of new graduate nurses over a six-year period, results showed that 23% of new graduate nurses met acceptable entry-level competencies in 2015, followed by a steady annual decline. In 2020, only 9% met this acceptable competency level. Researchers speculated that the findings of the most recent analysis may be due to the COVID-19 pandemic when in-person classroom and clinical instruction pivoted to online and asynchronous platforms (Kavanagh & Sharpnack, 2021).

While these findings are sobering, they are not surprising. Tanner's (2006) seminal work projected this reality, noting the increasing ambiguity of clinical situations combined with competing demands, particularly for the beginning nurse, to develop a "nuanced ability to recognize the salient aspects of an undefined clinical situation, interpret their meanings, and respond appropriately" (p.205). Benner et al. (2010) concurred, noting the need for a paradigm change in nursing education. Employing pedagogical strategies that foster a sense of salience, situated cognition and action, as well as an emphasis on clinical reasoning are essential to address an ever more complex health care environment.

Considering these realities, the AACN (2021) has adopted a new model for preparing entry-level and advanced practice nurses. Competency-based nursing education will be the framework guiding the implementation of 10 new core competencies, or Essentials, for professional nursing education. These 10 domains aim to reflect and solidify nursing's unique contribution to the interdisciplinary healthcare team as well as prepare graduates from baccalaureate and advanced practice programs for an evolving and complicated health care environment. In the new paradigm, clinical judgment is considered as one of the foundational concepts integrated throughout the new competencies (AACN, 2021).

Simulated Learning Strategies

The impetus to develop clinical judgment competency is at the forefront of pre-licensure nursing programs. By using a variety of educational strategies, including simulated learning activities, schools of nursing aim to foster clinical judgment aptitude (AACN, 2021; Benner et al., 2010; Hayden et al., 2014). The International Nursing Association for Clinical Simulation and Learning ([INACSL] Standards Committee, 2021) categorized simulation into high, medium, and low fidelity to equate to the degree of realism. High-fidelity simulation includes full scale computerized patient simulators, virtual reality simulators and/or standardized patients (live actors portraying the role of the patient). Mid-fidelity simulation utilizes manikins without fully computerized capabilities. Low-fidelity simulation includes paper case studies, static manikins/task trainers and role playing.

High-fidelity simulation is well documented as an intervention to develop clinical judgment competency in the pre-licensure nursing student (Cazzell & Anderson, 2016; Chmil et al., 2015; LeFlore et al., 2012; Shin et al., 2015; Weatherspoon & Wyatt, 2012). With the high degree of realism found in both high-fidelity manikin simulation (HFMS) and virtual reality simulation (VRS), simulated activities can be useful from fundamental skill acquisition in the beginning student, to honing assessment and management of a rapidly deteriorating patient in the advanced student (Cant & Cooper, 2017). Employing simulated learning for high-risk, low frequency patient care scenarios provides the student with a safe environment to learn, all the while mirroring real practice. Consequently, nurse educators can design simulated learning activities for any disease process, with varying levels of complexity.

HFMS incorporates computerized software within a manikin to mimic the sensations and sounds a real person would have with a similar condition (Lioce et al., 2020). Use of HFMS in schools of nursing requires dedicated simulation laboratories with trained technicians. In

contrast, VRS utilizes a computer-generated reality for learners to make clinical decisions (Lioce et al., 2020). The interactive three-dimensional world provides the learner with varying degrees of immersion to interact with patients, the interdisciplinary team, and replicate real-life healthcare situations and procedures (Shin et al., 2019). Research shows VRS increases flexibility of instruction as it can be accessed 24 hours per day and incorporated into classroom, lab, or clinical activities; is reproducible; and eliminates the limitations of simulation lab access, staff availability, and cost of purchase and upkeep of high-fidelity manikins (Durmaz et al., 2012; Foronda & Bauman, 2014; Redmond et al., 2020; Verkuyl & Mastrilli, 2017). A cost analysis between the two simulation modalities finds virtual simulation platforms to be one-third the cost of high-fidelity manikin simulators, citing $10.89/learner as compared to $36.55/learner (Haerling, 2018).

While HFMS is well documented in the literature to positively impact clinical judgment attributes (Carman et al., 2016; Chen et al., 2018; Chmil et al., 2015; Shin et al., 2015; Tamaki et al., 2019), less is known about VRS effects on clinical judgment formation. Foronda et al. (2020) conducted a systematic review on VRS and found limited synthesized knowledge about student outcomes and its use in nursing pedagogy. Therefore, as the number of ABSN programs rises and the use of simulation increases in pre-licensure baccalaureate students, it is critical to compare simulation modalities and their impact on clinical judgment. The following sections will discuss the purpose of this study, the research questions, the philosophical underpinnings, and theoretical model guiding the research, as well as the theoretical and operational definitions.

Purpose of Proposed Study

The purpose of this dissertation study was to compare clinical judgment competency between final semester TBSN and ABSN students during a medical-surgical scenario using HFMS in the TBSN group and VRS in the ABSN group.

Research Questions

The goal of this research was to answer the following research questions:

RQ_1. What is the level of clinical judgment as measured by the Lasater Clinical Judgment Rubric (LCJR) dimensions (*Noticing*, *Interpreting*, *Responding*, and *Reflecting*) and total LCJR scores among final semester TBSN students using a HFMS and ABSN students using a VRS?

RQ_2. What is the level of competency (Beginning, Developing, Accomplished, Exemplary) exhibited by the TBSN and ABSN study groups on the LCJR behavior dimensions and subdimensions?

RQ_3. What is the relationship between HESI® scores, LCJR dimension and sub-dimension scores, and LCJR total scores among the TBSN (HFMS) students and the ABSN (VRS) students?

RQ_4. Are there differences in knowledge acquisition between the TBSN and ABSN students following the simulated learning activity?

Philosophical and Theoretical Underpinnings

A complimentary philosophy and adult learning theory underpin the proposed study: pragmatism and constructivism.

Pragmatism

Pragmatism constitutes a principle of inquiry that asserts for any philosophical statement, thought, or concept to be true it should be tested with scientific experimentation, work properly, and have practical implications (Burch, 2021; Legg & Hookway, 2019). If theories fail to be useful, they should subsequently be rejected. Therefore, pragmatism acknowledges that "truth" is what works in the lives of individuals or populations (Atkin, n.d.; McCready, 2010). John Dewey was an educator and one of the founding fathers of American pragmatism (Hildebrand, 2018).

Dewey had a holistic approach to his pragmatic views. He saw the human experience as creative, physical, psychological, and practical. It included one's habits, cultural norms, social environments and even instincts. Humans adapted to their environments and the problems therein in an ongoing, complex, and transactional process that continued throughout life. He described the process of active problem solving as identifying a problem, followed by hypothesis construction, segueing into reasoning through meanings and contradictions, and concluding with evaluating and testing the hypothesis (Hildebrand, 2018). For Dewey, it was the process of inquiry in the context of experience that revealed knowledge and truth (Hildebrand, 2018). Dewey aimed to revolutionize current educational pedagogies to incorporate more pragmatic approaches. Learning should seek to incorporate the learner in the educational process by utilizing active learning and problem-based strategies, as well as considering the student's cultural and personal background (Hildebrand, 2018). Learning should also incorporate "reflective practice." Dewey described this reflective practice as an active, careful consideration of knowledge and the evidence that supports it (Hitchcock, 2018).

This problem-centered pedagogy guides the learner through experiential methods to identify problems, gather data about the issue, formulate hypotheses and then employ

interventions to resolve them. “Live” thinking encourages the learner to “grow from within” and become life-long learners. It also transforms educational methods to be “inquiry-based” or “research-led” (Legg & Hookway, 2019). This paradigm shift in educational pedagogy translates to many academic arenas of which nursing is one. Current trends in nursing pedagogy support and implement a myriad of active learning strategies. The use of simulation is one example of Dewey’s experimentalism in nursing education. Placing a student in a situation where they must identify a problem and determine the best course of action, see the consequences of those actions, and then actively reflect on them has been shown to enhance clinical judgment (Bussard, 2018), critical thinking (Cazzell & Anderson, 2016), knowledge, skill acquisition, and self-efficacy (Bowling & Underwood, 2016) in pre-licensure nursing students.

Constructivism

Like pragmatism, constructivism views truth through the practical lens of reasoning. The cognitive activity of reasoning to construct knowledge is a key feature of this adult learning theory (Bagnoli, 2021). From a teaching and learning perspective, cognitive development is inclusive of both mental activity and the social and cultural contexts of the learner and the learning environment (Lee et al., 2018). As learners interact with their environments, they utilize their prior learning, cultural backgrounds, and personal histories to construct new knowledge. Therefore, knowledge is actively created and dependent upon the perspective from which the learner approaches it (Epp et al., 2021). In this context, faculty become facilitators of learning. By designing pedagogical strategies and creating active learning environments, educators help students assimilate new understanding into existing knowledge and foster a deeper learning than rote memorization (Benner et al., 2010; Epp et al. 2021).

These philosophies underpin the dissertation study in two ways. First, simulation as a learning modality has its basis in constructivist theory (INACSL, 2021), as well as pragmatism. As an active learning modality, learners are immersed into an environment where they draw from their prior experiences, apply their current understanding for the presenting problem, and then reflect upon their actions to construct new knowledge (INACSL, 2021; Tanner, 2006). Secondly, ABSN students bring with them a wealth of past educational, vocational, and life experiences (AACN, 2019). Employing active learning strategies with a deliberate attempt to integrate previous learning with new knowledge is essential for this population (Christoffersen, 2017).

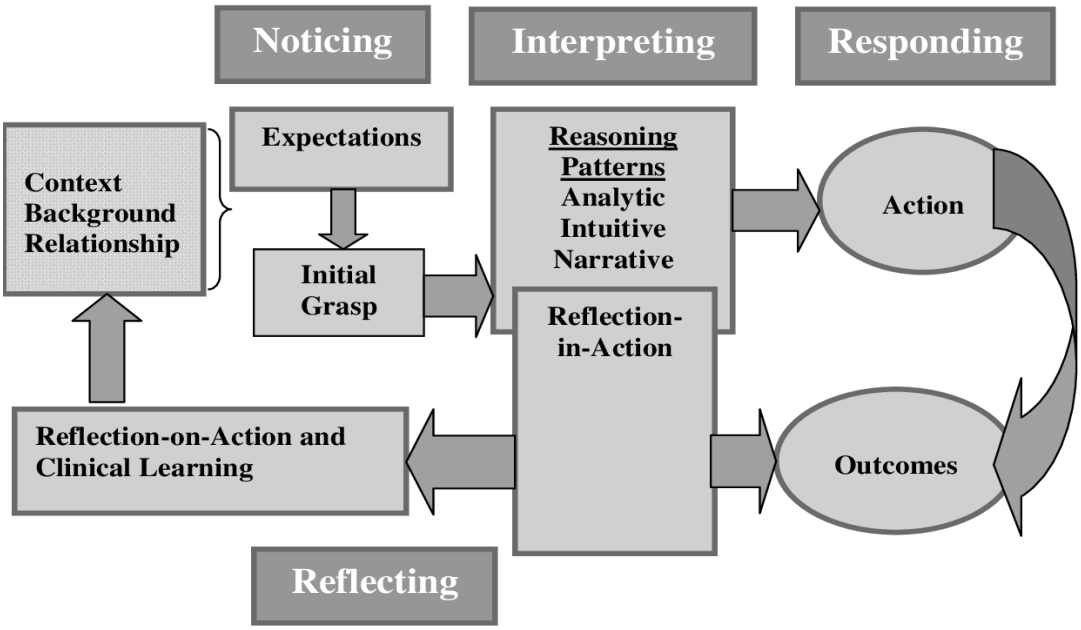
Theoretical Model

There are specific attributes of clinical judgment cited in nursing literature including critical thinking, clinical reasoning, clinical decision making, problem solving, knowledge acquisition, and prioritization. Tanner (2006) synthesized these findings and compared them to the traditional nursing process model of problem solving. While the nursing process model of assessment, nursing diagnosis, planning, implementation, and evaluation may be a helpful framework for a beginning nursing student, it failed to capture the complex and dynamic process of clinical judgment in the practicing nurse. Tanner (2006) concluded: "(1) Clinical judgments are more influenced by what nurses bring to the situation than the objective data about the situation at hand; (2) Sound clinical judgment rests to some degree on knowing the patient and his or her typical pattern of responses, as well as an engagement with the patient and his or her concerns; (3) Clinical judgments are influenced by the context in which the situation occurs and the culture of the nursing care unit; (4) Nurses use a variety of reasoning patterns alone or in combination; (5) Reflection on practice is often triggered by a breakdown in clinical judgment

and is critical for the development of clinical knowledge and improvement in clinical reasoning" (p.204). As a result of this analysis, Tanner's Clinical Judgment Model included four distinct, yet interconnected aspects of clinical judgment: *Noticing*, *Interpreting*, *Responding*, and *Reflecting* (Figure 1).

Figure 1

Tanner's Clinical Judgment Model



Tanner, C.A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education, 46*(6), 204-211. https://doi.org/10.3928/01484834-20060601-04

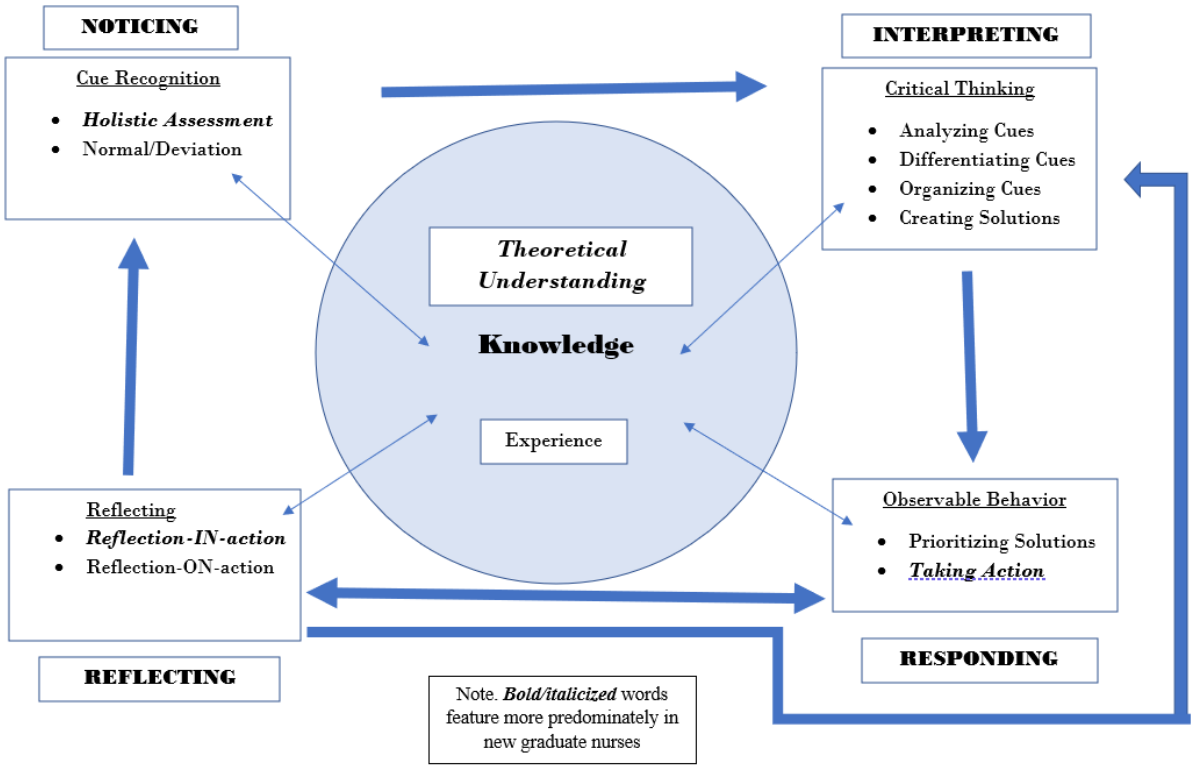
Research Study Model

While Tanner's model sheds light on the complex process of clinical judgment for the experienced nurse, it does not show how this process differs in new graduate nurses. As beginning practitioners, new graduate nurses lack experience in situations where they are

expected to make clinical judgment decisions (Benner, 1982; Lasater et al., 2015; Miraglia & Asselin, 2015). They differ from experienced nurses in each of the four aspects of clinical judgment represented in Tanner's model. Therefore, the Clinical Judgment Model for New Graduate Nurses is an adapted model by this researcher to reflect aspects of clinical judgment in the beginning nurse (Figure 2). Differences in each of the clinical judgment aspects will be discussed in the context of the new graduate nurse.

Figure 2

Proposed Research Study Model



Noticing or Cue Recognition

Cue recognition is derived from the nurse's theoretical knowledge, their past experiences, and their knowledge of patients' typical response patterns gathered during holistic assessment (Ashley & Stamp, 2014; Cappelletti et al, 2014; Dickison et al., 2019; Tanner, 2006). Guided

primarily by theoretical knowledge and holistic assessment findings, the nurse begins to recognize normal patterns and thereby deviations (Ashley & Stamp, 2014; Miraglia & Asselin, 2015). Noticing these deviations is critical for cue recognition and is found to be lacking in new graduate nurses (Ashley & Stamp, 2014).

Interpreting or Critical Thinking

Critical thinking is a cognitive process utilizing analytical and non-analytical (intuition) methods that allows the nurse to analyze the cues and discriminate important data from irrelevant information in order to generate a list of possible concerns and solutions (Ashley & Stamp, 2014; Cappelletti et al., 2014; Dickison et al., 2019; Johansen & O'Brien, 2016; Ludin, 2018; Manetti, 2019; NCSBN, 2018; Tajvidi, et al., 2014). New graduate nurses lack the ability to recognize and judge salient aspects of patient conditions due to lack of experience (Benner, 1982; Benner et al., 2010).

Responding

Once solutions are generated in "interpreting," they are prioritized in order of importance, followed by the nurse taking action or implementing the prioritized interventions. In prioritization, the nurse uses the same mental processes to make these determinations as with critical thinking (Dickison et al., 2019; Manetti, 2019; Sabei & Lasater, 2016). New graduate nurses lack proficiency in setting priorities and perceiving meaningful patterns in patient situations (Benner, 1982).

Reflecting

Reflection examines the decision-making process and involves two distinct phases (Tanner, 2006). First, reflection-in-action notes how the patient responds to the actions taken by

the nurse and may lead to the nurse revising the interventions or generating new solutions to re-prioritize. Second, reflection-on-action by the nurse considers what is gained from the experience, what is learned, how different decisions may have altered the outcome and what may be done differently next time. By employing both phases of reflection, the nurse allows clinical judgment to become an iterative process, noting what facilitates or inhibits the other four aspects (Ashley & Stamp, 2014; Cappelletti et al., 2014; Manetti, 2018; Sabei & Lasater, 2016). Reflection is a skill that takes intentionality and time to acquire. When new graduate nurses consider both successful actions as well as errors made, practical knowledge develops and their clinical judgment competency strengthens (Ashley & Stamp, 2014; Benner et al., 2010; Cappelletti et al., 2014; Manetti, 2019, Tanner, 2006). Accordingly, the new graduate nurse is a beginning reflective practitioner.

Knowledge: Theoretical Understanding and Experience

The foundational aspect of the Clinical Judgment Model for New Graduate Nurses rests on the knowledge of the nurse and is the primary difference from Tanner's original model. In this context, knowledge has two dimensions. First, knowledge relates to the nurses' theoretical understanding of an array of nursing content from disease processes to medications to treatments. This connects directly to educational practices and features prominently in new graduate nurses transitioning to practice (Cappelletti et al., 2014; Chmil, et al., 2015; Dickison et al., 2019; Kavanagh & Szweda, 2017; NCSBN, 2018). Secondly, knowledge relates to the nurses' experience. Johansen and O'Brien (2016) note that nurses make a large percentage of decisions based upon their experiential knowledge. This includes past patient encounters similar to a current situation or knowledge of particular patients and their responses to nursing care over time (Cappelletti et al., 2014). Knowledge from both theoretical understanding and from experience

are essential for clinical judgment. However, for the new graduate nurse, knowledge from theoretical understanding exceeds that of experiential knowledge. According to Benner (1982), experience allows the nurse to see the patient situation as a "complete whole in which only certain parts are relevant" (p.402).

Theoretical and Operational Definitions

Clinical Judgment

Tanner (2006) defined clinical judgment as "an interpretation or conclusion about patient's needs, concerns, or health problems, and/or the decision to take action (or not), use or modify standard approaches, or improvise new ones as deemed appropriate by the patient's response" (p.204). It involves four distinct yet interconnected aspects: *Noticing, Interpreting, Responding,* and *Reflecting.* In this study, clinical judgment will be measured using the Lasater Clinical Judgment Rubric (LCJR) (Lasater, 2007). LCJR utilizes Tanner's Clinical Judgment Model (*Noticing*, *Interpreting*, *Responding*, and *Reflecting*) and expands on the four aspects further defining each of them to have 11 dimensions of behaviors, categorizing them as Beginning, Developing, Accomplished or Exemplary.

Noticing

Noticing is a "perceptual grasp of the situation at hand" (Tanner, 2006, p.208). In this study, *Noticing* will be measured by the actions of the student nurse in obtaining subjective and objective assessment findings, recognizing deviations from expected patterns, and seeking additional information from the patient.

Interpreting

Interpreting is "developing a sufficient understanding of the situation [in order] to respond" (Tanner, 2006, p. 208). For this study, *Interpreting* will be measured by the student nurse critically analyzing the cues gathered during holistic assessment and generating a list of possible problems, prioritizing the most important problem, and developing corresponding solutions.

Responding

Responding is "deciding on a course of action deemed appropriate for the situation, which may include 'no immediate action'" (Tanner, 2006, p.208). In this study, *Responding* will be evaluated by the student nurse performing prioritized interventions in a timely fashion, with correct skill, appropriate communication, and in a calm and confident manner.

Reflecting

Reflection-in-action refers to "attending to patients' responses to the nursing action while in the process of acting" (Tanner, 2006, p.208). While Reflection-on-action encompasses "reviewing the outcomes of the action, focusing on the appropriateness of all the preceding aspects (i.e., what was noticed, how it was interpreted, and how the nurse responded)" (Tanner, 2006, p.208). For this study, student nurses will modify their actions based on the patient's response demonstrating *Reflection-in-action*. Additionally, student nurses will respond in writing to debriefing questions regarding an analysis of their clinical performance, strengths and weaknesses, and how this experience will influence future decision making. In responding to the debriefing questions, the participants will demonstrate *Reflection-on-action.*

Pre-licensure Baccalaureate Nursing Student

A student nurse enrolled in an accredited Bachelor of Science in Nursing program that has not taken the national licensure examination (NCLEX-RN®) to become a licensed registered nurse (AACN, 2022). For this study, pre-licensure baccalaureate nursing students will be enrolled in one of two baccalaureate program types (ABSN or TBSN) in the College of Nursing at East Carolina University.

Accelerated Bachelor of Science in Nursing Student

A student nurse who is enrolled in a fast-track baccalaureate nursing program (AACN, 2019). In this study, an ABSN student will be a student nurse, in their final semester, who holds at least a non-nursing baccalaureate degree, and is enrolled in East Carolina University's accelerated baccalaureate nursing program.

Traditional Bachelor of Science in Nursing Student

A student nurse who is enrolled in a traditional baccalaureate nursing program (AACN, 2019). In this study, a TBSN student will be a fourth semester student nurse enrolled in East Carolina University's traditional baccalaureate nursing program.

Simulation

"An educational strategy in which a particular set of conditions are created or replicated to resemble authentic situations that are possible in real life. Simulation can incorporate one or more modalities to promote, improve, or validate a participant's performance" (INACSL Standards Committee, 2021, p.62). In this study, two high-fidelity modalities will be employed as the intervention to investigate clinical judgment in pre-licensure baccalaureate students. Both modalities will follow the same National League for Nursing (NLN) template scenario of a

chronic condition with an acute complication. In the NLN Simulation in Nursing Education SimMan® scenarios, this is designated a complex medical case (Laerdal, 2010). Failure to recognize an acute deterioration and intervene appropriately is associated with a lack of clinical judgment competency and is more prevalent in new graduate nurses (Murray et al., 2019).

High-fidelity Manikin Simulation

Life-like, human mechanisms that incorporate computerized software within the manikin to mimic the sensations and sounds of human anatomy, physiology, and pathophysiology with a high degree of realism (fidelity) creating realistic patient scenarios (Lioce et al, 2020). In this study, TBSN students will participate individually in a 25-minute simulation using a high-fidelity manikin. The NLN simulation scenario involves a patient admitted with the diagnosis of Chronic Obstructive Pulmonary Disease (COPD) experiencing a spontaneous pneumothorax (Laerdal, 2010).

Virtual Reality Simulation

"A simulation-based learning activity designed to provide an experience through the direct or assisted-use of an electronic medium. Formerly confined to computers, this field is evolving with the applications of technology and relates to learners being able to complete specific tasks in a variety of immersive environments, use information to provide assessment and care, make clinical decisions, and observe the results in action" (INACSL, 2021, p.63). For this study, ABSN students will participate in a 25-minute computer-based simulation using a virtual reality scenario (vSim for Nursing®/ Medical-Surgical solutions) involving a patient admitted with the diagnosis of COPD experiencing a spontaneous pneumothorax (Laerdal Medical & Wolters Kluwer Health, 2022). The VRS scenario follows the same NLN simulation template as the HFMS scenario.

Summary

The purpose of this dissertation study is to compare the clinical judgment competency between final semester TBSN and ABSN students using HFMS and VRS, respectively. Pragmatism and Constructivism are complimentary philosophies that underpin this investigation. Tanner's Clinical Judgment Model, through the lens of the new graduate nurse, provides the guiding framework. Outcomes of this study may inform nursing pedagogical practices for ABSN and TBSN students in the development of their clinical judgment competencies prior to transition to professional practice.

This dissertation will follow the two-manuscript option as outlined in the College of Nursing Ph.D. handbook. Chapter two is an integrative review of the literature published by the *Journal of Nursing Education* in December of 2022. Chapter three will discuss methodology of the dissertation study. Chapter four will describe the pilot study conducted in October of 2021 that investigated the feasibility and methodological procedures for using a VRS platform. Finally, chapter five will discuss the findings of this dissertation study and be the final manuscript.

CHAPTER 2: EFFECT OF MANIKIN AND VIRTUAL SIMULATION ON CLINICAL JUDGMENT: AN INTEGRATIVE REVIEW MANUSCRIPT

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Abstract

Background: Evidence suggests that competency in clinical judgment may be lacking in new graduate nurses. Graduates from accelerated baccalaureate nursing programs have even less time to develop clinical judgment competency. Various simulation modalities, including high-fidelity manikin and virtual reality, have been used to develop clinical judgment in pre-licensure students. However, the outcomes of these simulation modalities on clinical judgment in accelerated nursing students is not well understood.

Method: An integrative literature review was conducted from five databases with primary research examining the effect of manikin or virtual simulation on clinical judgment in baccalaureate nursing students.

Results: 14 studies were included in this review with findings organized using Tanner's Clinical Judgment Model.

Conclusion: Findings from this review are mixed and there is a lack of evidence comparing the two modalities. Future research should include comparison studies aimed at examining the effect of these modalities with students in accelerated programs.

Key Words: clinical judgment, high-fidelity manikin simulation, virtual reality simulation, baccalaureate nursing students, integrative review

Clinical judgment aptitude is a vital skill for the professional nurse to deliver safe and competent patient care. Deficient clinical judgment jeopardizes patient safety, specifically being linked to preventable nursing errors such as inaccuracies in medication administration (Murray et

al., 2019; Treiber & Jones, 2018), or failure to recognize a decline in patient status (Al-Moteri et al., 2019; Murray et al., 2019; Mushta et al., 2018; Treacy & Stayt, 2019). These error rates are higher among new graduate nurses than their more experienced colleagues (Murray, et al., 2019; Mushta et al., 2018; Treiber & Jones, 2018). To prevent these types of errors, it is imperative schools of nursing foster clinical judgment competency in the student nurse (AACN, 2021; NCSBN, 2018). Historically, nursing programs use a myriad of strategies to develop clinical judgment competency including clinical agency placement and simulation. Research has shown high quality simulation experiences may be used for up to half of a program's clinical time and not alter student outcomes or hamper readiness for practice (Hayden et al., 2014). While traditional baccalaureate nursing programs typically have two years to develop clinical judgment competency, the time is shorter for accelerated baccalaureate nursing programs. With these programs on the rise, examining the most effective simulation experiences for clinical judgment formation in students enrolled in accelerated programs is essential.

Background

The Institute of Medicine ([IOM], 2010) Future of Nursing report recommended the increase of baccalaureate degrees to 80% among the nursing workforce by 2020. As a result, accelerated Bachelor of Science in nursing (ABSN) programs proliferated in the United States. The American Association of Colleges of Nursing ([AACN], 2019) reported a 22.6% increase in ABSN programs from 2013-2018. These programs typically enroll students with a previous baccalaureate degree and range from 11 to 18 months to complete (AACN, 2019). This time to completion can be half the time of their traditional baccalaureate counterparts.

Coupled with a shortened academic preparation, the complexities of the health care system are intensifying. Research shows nurses transitioning into practice are underprepared to

manage increasing patient acuities and demonstrate insufficient clinical judgment competency in the practice arena (Jessee, 2021; Kavanagh & Sharpnack, 2021; Kavanagh & Szweda, 2017). Tanner's (2006) seminal work projected this reality, noting the increasing ambiguity of clinical situations together with competing demands pose a challenge, particularly for the beginning nurse, to develop a "nuanced ability to recognize the salient aspects of an undefined clinical situation, interpret their meanings, and respond appropriately" (p.205). Clinical judgment incorporates patient assessment, analysis, competency in action and reflection to apply theoretical knowledge into practice (Bussard, 2018; NCSBN, 2018; Tanner, 2006). There are specific attributes of clinical judgment cited in nursing literature including critical thinking, clinical reasoning, clinical decision making, knowledge acquisition, and prioritization. Tanner (2006) synthesized these findings and discovered four distinct aspects of clinical judgment: *Noticing*, *Interpreting*, *Responding*, and *Reflecting*.

Clinical judgment is a dynamic, complex, and iterative process nurses employ to make clinical decisions. Traditionally, schools of nursing used clinical agencies to provide patient care experiences in order to develop student nurses' clinical judgment. However, there were mounting barriers to high-quality clinical experiences. In conducting the National Simulation Study, Hayden and colleagues (2014) cited several reasons for these limitations. First, agency sites became more limited as the number of pre-licensure programs increased. Secondly, acute care facilities restricted both the number of students allowed on in-patient units and the skills they could perform. Thirdly, higher patient acuities and shortened lengths of stay limited clinical opportunities (Hayden et al., 2014). Consequently, the use of simulated learning activities was used to address these impediments as simulation laboratories became standard practice in pre-licensure nursing programs (Hayden et al., 2014). Recently, the COVID-19 global pandemic put

additional limitations on clinical agency access for pre-licensure nursing students (Kavanagh & Sharpnack, 2021). As such, the AACN (2020) encouraged schools of nursing to expand the use of manikin as well as virtual reality simulated experiences.

High quality simulation is well documented as an intervention to develop clinical judgment competency in the pre-licensure nursing student (Cazzell & Anderson, 2016; Chmil et al., 2015; Shin et al., 2015). Specifically, the versatility of manikin and virtual simulated activities can be useful in fundamental skill acquisition in the beginning student, to honing assessment and management of a rapidly deteriorating patient in the advanced student (Cant & Cooper, 2017). Employing simulated learning for high-risk, low frequency patient care scenarios provides the student with a safe environment to learn, all the while mirroring real practice. As such, nurse educators can design simulated learning activities for any disease process, with varying levels of complexity.

High-fidelity simulation (HFS) incorporates computerized software within a manikin to mimic the sensations and sounds a real person would have with a similar condition (INACSL, 2016). Use of HFS in schools of nursing requires dedicated simulation laboratories with trained technicians. In contrast, virtual reality simulation (VRS) utilizes a computer-generated reality for learners to make clinical decisions (INACSL, 2016). The interactive three-dimensional world provides the learner with varying degrees of immersion to interact with patients, the interdisciplinary team, and replicate real-life healthcare situations and procedures (Shin et al., 2019). Research shows VRS increases flexibility of instruction as it can be accessed 24 hours per day and incorporated into classroom, lab, or clinical activities; is reproducible; and eliminates the limitations of simulation lab access, staff availability, and the cost of purchase and upkeep of high-fidelity manikins (Durmaz et al., 2012; Foronda & Bauman, 2014; Redmond et al., 2020;

Verkuyl & Mastrilli, 2017). A cost analysis between the two simulation modalities, finds virtual simulation platforms to be one-third the cost of high-fidelity simulators, citing $10.89/learner as compared to $36.55/learner (Haerling, 2018).

While HFS is well documented in the literature to positively impact clinical judgment attributes (Carmen et al., 2016; Chen et al., 2018; Chmil et al., 2015; Shin et al., 2015; Tamaki et al., 2019), less is known about VRS effect on clinical judgment formation. Foronda et al. (2020) conducted a systematic review on VRS and found limited synthesized knowledge about student outcomes and its use in nursing pedagogy. Therefore, as the number of ABSN programs rises and the use of simulation increases in pre-licensure baccalaureate students, it is critical to compare simulation modalities and their impact on clinical judgment. Thus, the initial aim of this integrative review was to synthesize the state of the science between HFS and VRS effect on clinical judgment in ABSN students. Initial findings revealed few studies (n = 4) with exclusive sample populations of ABSN students. Due to these limited findings, the aim was expanded to include synthesis of studies with ABSN and/or traditional BSN (TBSN) students, if clinical judgment outcomes were stratified between groups.

Method

The Whittemore and Knafl (2005) framework was used to guide the integrative review process. The framework includes five stages: problem and purpose identification, literature review, data evaluation, data analysis, and presentation of findings. In January of 2022, a comprehensive literature search was conducted utilizing CINAHL® Plus, PubMed®, Scopus®, ERIC™ and ProQuest® databases. An academic reference librarian was consulted for the literature search and two certified health simulation educators verified simulation search terms to ensure comprehensive findings. Various combinations of search terms and keywords included simulation *(high-fidelity manikin simulation, patient simulations, simulation education, human*

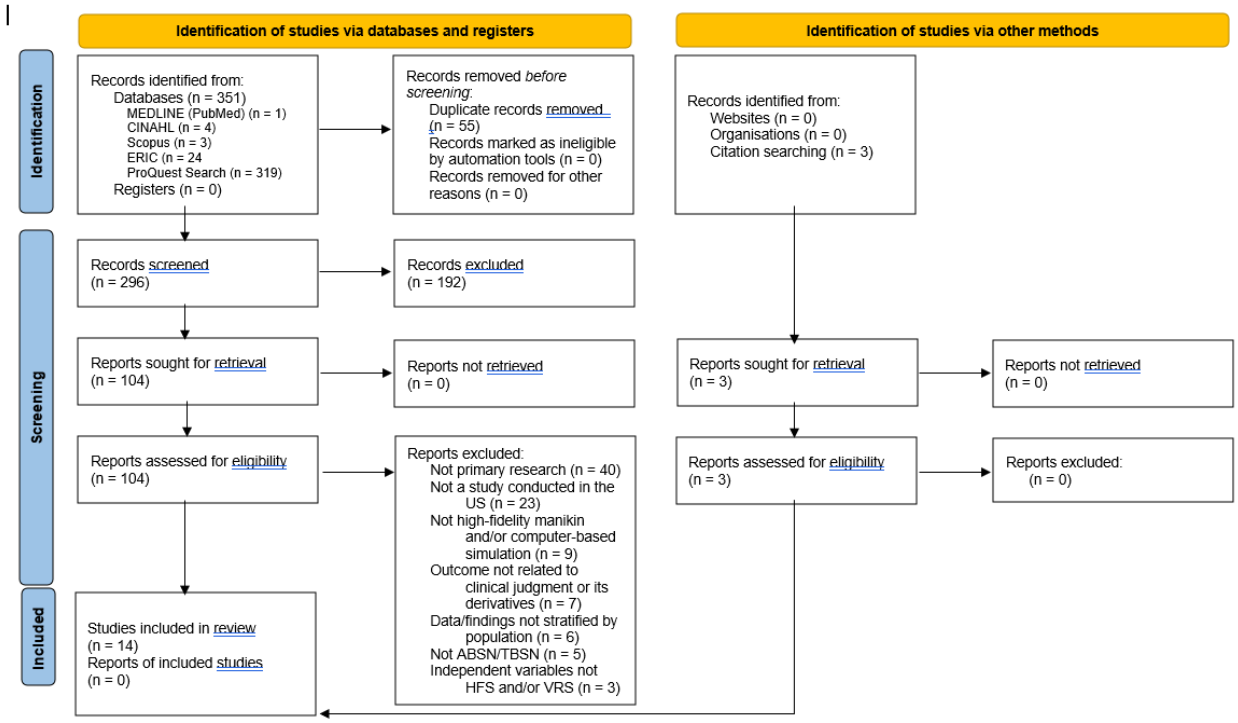
patient simulator, objective structured clinical evaluation, virtual reality, computer based simulation, game based simulation, virtual patient simulation); clinical judgment *(clinical decision making, clinical reasoning, critical thinking, prioritization, problem solving)*; accelerated Bachelor of Science in nursing *(accelerated baccalaureate nurse, accelerated baccalaureate nursing, accelerated nursing program, second-degree accelerated nursing program).*

To capture studies published after the IOM report, inclusion criteria included, peer-reviewed studies between 2010 and 2022; primary research with ABSN or TBSN students in the sample (if findings were stratified by group); studies utilizing high-fidelity manikins and/or virtual reality simulation; and findings related to clinical judgment or its attributes. Exclusion criteria included master's level accelerated programs, BSN students who already held a registered nurse (RN) license, and studies that included other pre-licensure program types such as associate degree or diploma students in the sample. In addition, studies conducted outside of the United States were excluded because of varied educational practices as well as credentialling requirements of accelerated programs.

The initial search yielded 296 publications after duplicates were removed. The titles and abstracts were reviewed and compared with inclusion/exclusion criteria by two researchers, retrieving 104 studies for full text review. When disagreement regarding inclusion occurred (n=3), a third party with experience in nursing education and certification in healthcare simulation education was consulted. Eleven studies were included that resulted from the database search and three additional studies were found via ancestral searching, resulting in a total of 14 studies for a final analysis. The review process is presented in the Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) flow diagram in Figure 3 (Page et al., 2021).

Figure 3

PRISMA Diagram



The 14 studies were evaluated and synthesized by two certified nurse educators. The first author, who also has extensive simulation experience with pre-licensure nursing students, reduced the data to a manageable format, by color coding on a matrix the simulation type, sample, instrument, and attribute of clinical judgment. Due to the diverse sample of primary resources, reports were appraised for quality using the Mixed Methods Appraisal Tool (MMAT) by both authors individually then collaboratively. The MMAT is a standardized method to evaluate the quality of empirical studies utilizing experiment, observation, or simulation that employ common methodologies of qualitative, quantitative, or mixed methods designs (Hong et al., 2018). To be included in this review, quality appraisals of studies required a clearly stated purpose, appropriate design and data collection to answer the research question(s), and clear

connection between the data and interpretation of findings. Extracted data from the included studies were further synthesized to show HFS or VRS effect on clinical judgment attributes (Table 1). The first author identified main findings of the included studies, created a graphic display, and then discussed with the second author similarities and differences among them, correlating them to sample and mode of simulation, in order to develop categories and themes.

Results

Of the 14 studies in this review, 10 were quantitative consisting of the following designs, randomized controlled (n=5), nonrandomized (n=3), and descriptive (n=2). Two studies were qualitative and two with mixed methods. Studies investigated either HFS (n=8), VRS (n=5), or compared the two modalities (n=1). The majority of studies included samples of TBSN students (n=10), in comparison to ABSN students (n=3), and both ABSN and TBSN students (n=1). Sample sizes varied greatly ranging between six and 279 with four studies conducting *a priori* power analyses to determine sample size. A myriad of instruments (n=17) was used for data collection, with multiple attributes of clinical judgment identified. Due to the diversity of attributes found, Tanner's Clinical Judgment Model (2006) was used as a guiding framework to define the terms, structure the categories, and organize the findings. Findings were organized using the four distinct yet interconnected aspects of clinical judgment: *Noticing*, *Interpreting*, *Responding*, and *Reflecting*.

Table 1

Summary of Included Studies

Author/Year	Purpose	Design/Sample	Simulation Element	Clinical Judgment Effect Tanner's Model Positive Effect (+)
Beroz, 2016	To examine the performance outcomes of final semester nursing students in a multiple patient simulation.	Quantitative: Descriptive 12 ABSN students	HFS	Noticing (+) Interpreting Responding (+)
Blakeslee, 2020	To examine the differences in critical thinking scores from pretest to posttest and between HFS and written case studies.	Quantitative: Randomized controlled trial 69 TBSN students	HFS	Interpreting
Donovan et al., 2018	To examine undergraduate nursing students' perceptions & experiences with computer-based simulation as preparation for manikin simulation lab.	Mixed Methods 82 TBSN students	VRS	Interpreting Responding
Ertmer et al., 2010	To examine critical thinking and "habits of the mind" during HFS and how it varies across roles.	Qualitative 17 TBSN students	HFS	Interpreting (+) Responding (+) Reflecting (+)
Foronda et al., 2012	To determine the impact of virtual simulation to teach nursing students concepts of disaster triage.	Mixed Methods 6 ABSN students	VRS	Responding
Hall, 2015	To examine the effectiveness of HFS versus hospital based clinical instruction on critical thinking and potential NCLEX performance.	Quantitative: Non-randomized 279 TBSN students	HFS	Noticing (+)
LeFlore et al., 2012	To compare achievement of learning outcomes of undergraduate nursing students using a virtual computer platform versus traditional lecture.	Quantitative: Randomized controlled trial 93 TBSN students	VRS	Noticing (+) Responding (+)

Author/Year	Purpose	Design/Sample	Simulation Element	Clinical Judgment Effect Tanner's Model
Kaddoura et al., 2016	To explore the perceptions of ABSN students regarding the benefits and challenges of exposure to multiple HFS scenarios.	Qualitative 107 ABSN students	HFS	Noticing (+) Interpreting (+)
Sarasnick et al., 2017	To examine the effects of HFS and computerized case studies.	Quantitative: Non-randomized 35 ABSN students 62 TBSN students	HFS	Noticing (+)
Shinnick & Woo, 2013	To explore impact of HFS on critical thinking and identify predictors of higher critical thinking scores.	Quantitative: Non-randomized 154 TBSN students	HFS	Noticing (+) Interpreting
Tseng & Hill, 2020	To examine the effects of HFS on flexible and reflective thinking and to examine the relationship between flexible and reflective thinking.	Quantitative: Descriptive 90 TBSN students	HFS	Noticing (+) Interpreting (+) Reflecting (+)
Weatherspoon & Wyatt, 2012	To examine feasibility of using computer-based simulation to improve clinical judgment skills.	Quantitative: (Pilot study) Randomized controlled trial 23 TBSN students	VRS	Interpreting (+) Responding (+)
Weatherspoon et al., 2015	To examine the use of electronic interactive simulation versus traditional paper case study on BSN clinical judgment by evaluation of critical thinking and accuracy & efficiency of situational decision making.	Quantitative: Randomized controlled trial 117 TBSN students	VRS	Interpreting (+) Responding
Wilson et al., 2014	To determine if difference exists in learner performance and type/frequency of diagnostic reasoning skills used between HFS and VRS.	Quantitative: Randomized controlled trial 54 TBSN students	HFS and VRS	Noticing (HFS>VRS) Interpreting (VRS>HFS) Responding (HFS>VRS)

Note. ABSN = accelerated Bachelor of Science in nursing; TBSN = traditional Bachelor of Science in nursing; HFS = high-fidelity simulation; VRS = virtual reality simulation; > = greater effect

Noticing

Tanner (2006) defined *Noticing* as "the perceptual grasp of the situation at hand" (p.208). It is derived from the nurse's textbook knowledge, their past experiences, and their knowledge of patients' typical response patterns gathered during holistic assessment (Ashley & Stamp, 2014; Cappelletti et al., 2014; Dickison et al., 2019; Tanner, 2006). Novice nurses begin to form practical knowledge by recognizing pertinent assessment cues and identifying how a portion of theoretical understanding applies to a given patient situation (Ashley & Stamp, 2014; Miraglia & Asselin, 2015; Tanner, 2006).

One facet of *Noticing* is knowledge development. Six studies, five examining HFS and one VRS, found knowledge to be positively impacted by simulation regardless of modality, sample, or research design. Of the studies investigating HFS, Sarasnick et al. (2017) and Hall (2015) examined the effect of HFS as compared to traditional clinical experiences on knowledge acquisition. Both studies found statistically significant increases in knowledge scores in favor of HFS. Sarasnick et al. (2017) also found ABSN students outpaced TBSN students in knowledge gains. Similarly, Shinnick and Woo (2013) and Tseng and Hill (2020) found statistically significant gains in knowledge and understanding among TBSN students. Qualitative inquiry has also explored HFS intervention effect on student outcomes. Kaddoura et al. (2016) surveyed ABSN students after seven HFS scenarios. One of the five resulting themes showed repeated exposure to HFS helped participants identify knowledge deficits and facilitated integration of theoretical knowledge into practice. In the one study examining VRS, LeFlore et al. (2012) found statistically significant higher knowledge scores in TBSN students compared to those who had didactic lecture.

In addition to knowledge development, *Noticing* also involves the nurse's accurate appraisal of the holistic assessment findings from the patient. Two studies examined this facet of *Noticing*. Beroz (2016) found 75% of ABSN students were able to identify subtle cues that indicated a complication and deviation from expected findings with the use of HFS scenarios. In a comparative study between HFS and VRS, Wilson et al. (2014) found students were better able to identify pertinent assessment findings with HFS. The authors speculated this finding may be attributed to the multisensory effects of the manikin as opposed to the computerized patient.

Interpreting

After the initial grasp of the patient situation, the nurse uses various reasoning patterns for *Interpreting* the meaning of the data, differentiating relevant from irrelevant findings, and formulating hypotheses with potential solutions (Tanner, 2006). This critical appraisal and reasoning process is often termed "critical thinking". Of the 14 studies in this review, 10 reported on this aspect of clinical judgment but vary in methodologies, sample sizes, instruments, and modes of simulation. Findings from the research studies were mixed.

In studies employing HFS intervention, Kaddoura et al. (2016) and Ertmer et al. (2010) found improved reasoning skills with drawing inferences and making conclusions about appropriate actions to take. Likewise, Tseng and Hill (2020) found increases in mean scores with statistically significant increases in one dimension of critical thinking. Conversely, Blakeslee (2020) and Shinnick and Woo (2013) found no statistically significant increase in critical thinking scores. Although one covariate of critical thinking did show statistical significance, older students demonstrated improved critical thinking capabilities as compared to younger peers (Shinnick & Woo, 2013). Additionally, Beroz (2016) found 41% of ABSN students were unable to utilize critical thinking skills during HFS scenarios.

Of the three studies employing VRS, findings were also mixed. Weatherspoon and Wyatt (2012) found statistically significant improvement in analysis of the computerized patient compared to those who had paper case studies. In a follow up study, Weatherspoon et al. (2015) had similar findings with statistically significant gains in critical thinking scores with TBSN students. However, Donovan et al. (2018) found while critical thinking improved, it was not statistically significant. Interestingly, in the comparative study between HFS and VRS, Wilson et al. (2014) found VRS more beneficial in data analysis.

Responding

Responding is determining a course of appropriate action based on the interpretation of the patient data (Tanner, 2006). As potential solutions are generated by the nurse, prioritizing them in order of importance is necessary, followed by making a clinical decision. Eight studies reported findings related to features of *Responding*.

Five studies examining this aspect of clinical judgment utilized a VRS intervention, with mixed results reported. Weatherspoon and Wyatt (2012) and LeFlore et al. (2012) found statistically significant improvement in decision making efficiency and timely performance of nursing tasks with TBSN students. Conversely, Foronda et al. (2016) and Donovan et al. (2018), discovered no statistically significant improvement in prioritization. Weatherspoon et al. (2015) found similar results with no statistical difference in accuracy and efficiency of decision making.

When HFS was employed as the intervention, significant increases in clinical decision making were found regardless of study design or student type. Beroz (2016) noted 92% of ABSN students provided appropriate patient care during the simulations. While Ertmer et al. (2010) found TBSN students increased in their ability to apply clinical standards, treat the patient, and

judge the situation to make clinical decisions. The comparative study corroborated these findings, indicating HFS yielded better overall synthesis of the patient situation (Wilson, et al., 2014).

Reflection

Reflection is the final aspect of clinical judgment and combines two distinct features. First, *Reflection-in-action* is the evaluation by the nurse of the patient's response to the performed interventions. Secondly, *Reflection-on-action* is what the nurse gains from the experience that contributes to their ongoing practical knowledge development. This reflective learning impacts the other aspects of clinical judgment and completes the cycle (Tanner, 2006).

Two studies with TBSN students, found HFS positively affected their reflective practice. Tseng and Hill (2020) found statistically significant correlations between understanding and reflection, indicating HFS promoted integration of information and transfer of previous experience into newly constructed knowledge. Similarly, Ertmer et al. (2010) reported increase in both facets of *Reflection*. First, students evaluated the effectiveness of their interventions in the nurse role, demonstrating *Reflection-in-action*. Secondly, participants appraised what occurred in HFS and compared this to their previous knowledge of how to notice, interpret, and respond, showing *Reflection-on-action.*

Discussion

Key findings from this review reveal results vary on the effect of HFS or VRS on aspects of clinical judgment. Within Tanner's Model of Clinical Judgment, *Noticing, Interpreting, Responding,* and *Reflecting*, most studies reported mixed findings with the use of HFS/VRS learning activities. The exception was with *Noticing* as studies examining this aspect (n=6)

reported knowledge development regardless of modality. This cognitive growth was supported in other research investigating the impact of VRS or HFS on clinical judgment (Akalin & Sahin, 2020; Cant & Cooper, 2017; Chen et al., 2020). In the one comparison study, HFS resulted in better student outcomes in *Noticing* and *Responding*, coinciding overall with the studies included in this review. However, VRS showed more impact in the aspect of *Interpreting*. The other studies (n=10) were inconclusive on which modality had a greater effect on *Interpreting*. This may be due to the heterogeneity between the studies, in terms of methods and instruments used. Other scholars also found inconsistent results when evaluating the effectiveness of simulation on critical thinking potentially due to the variety of instruments and scenarios utilized (Adib-Hajbaghery & Sharif, 2017).

In terms of *Reflecting*, HFS had statistically significant effect on this aspect, however no studies were found examining VRS impact. This may be due to the asynchronous nature of VRS and the absence of the typical debriefing sessions that follow HFS (Lapum et al., 2019). MacKenna et al. (2021) reported while varying depth of reflective thinking occurs after VRS, structured self-debriefing strategies promoted reflection despite the absence of a facilitator. Reflection is a skill that takes intentionality and time to acquire. When nursing students consider both successful actions as well as errors made, practical knowledge develops and their clinical judgment competency strengthens (Ashley & Stamp, 2014; Benner et al, 2010; Cappelletti et al., 2014; Manetti, 2019, Tanner, 2006). In this regard, *Reflecting* could be considered the cornerstone as it hones the other aspects of clinical judgment. Additionally, fostering reflective practice in the student nurse likely ensures a reflective practitioner, one who is better equipped to handle the evolving health care environment (Benner et al., 2010)

Of the 14 studies in this review, there were methodological issues within the research designs. Limitations were related to bias, confounding variables, data collection miscues, and sample size. Of particular note were the varied instruments used in the studies (n=17) and lack of adequate instrument psychometrics (n=8). In their meta-analysis of simulation-based learning, Cant and Cooper (2017) also found questionable validity and reliability of simulation assessment instruments. These methodological issues hamper the interpretation and generalizability of the findings and reveal the need for more rigor in educational research to determine best pedagogical practices.

In comparing ABSN to TBSN student groups, this review evidences a gap in research with the ABSN student population and the impact of simulation on their clinical judgment formation. Scholars suggest ABSN learners prefer active educational strategies to reinforce theoretical content (Christoffersen, 2017; Kemsley et al., 2011); as well as assignments that analyze and synthesize concepts to apply solutions to real-life problems (Rawls & Hammons, 2012). Consequently, simulated learning activities seem to be advantageous in this population. However, we found only four studies examining the effect of HFS or VRS with an ABSN sample. Additionally, in the one comparison study, ABSN participants were not included in the sample. Of the four studies with ABSN students, findings suggested HFS promoted better student outcomes than VRS, but considering the limitations cited, this finding should be interpreted with caution.

While the results of this review are inconclusive in regard to which simulation modality is more effective, findings suggest that both HFS and VRS positively impact some of the specific aspects of the clinical judgment process. This is an important discovery for nurse educators and aligns with Tanner's (2006) application of the model in nursing education. As faculty assist

students to identify deficiencies in a particular aspect of clinical judgment, active learning strategies best designed to develop that area may follow. This review provides preliminary evidence that certain simulation modalities may be better than others to hone deficiencies in clinical judgment processes, guiding pre-licensure programs to employ best educational strategies.

Implications and Recommendations for Future Study

For more than a decade, Benner et al. (2010) call for a shift in nursing pedagogies that foster a sense of salience, situated cognition, and action. Learning through simulation allows theoretical knowledge to be applied contextually, reflecting the realities of the practice environment (Maude et al., 2021). With simulated learning activities prevalent in pre-licensure nursing curricula, more rigorous educational research is needed examining their effect on clinical judgment. With a lack of comparative studies examining HFS and VRS modalities, this evidences a need for more educational research to inform best practice. Akalin and Sahin (2020) also found a lack of evidence comparing the effectiveness of simulation with other educational strategies, calling for more comparative research in nursing education. Comparative evidence is necessary to ensure the correct ratio of virtual options to manikin scenarios for baccalaureate students. Additionally, ABSN students may be at a disadvantage given their shortened academic preparation to develop clinical judgment aptitude. With the paucity of studies examining clinical judgment formation in this population, more research is necessary to determine effective pedagogies with purposeful intent to incorporate these approaches to promote strong clinical competencies (Lee & Song, 2021). Therefore, we propose conducting rigorous, comparative research between HFS and VRS modalities with an ABSN population. By using valid and reliable instruments and adequately sized, heterogeneous ABSN student samples, findings will

contribute to the body of evidence and promote generalizability. Additionally, research exploring self-directed debriefing strategies with VRS is necessary to analyze their effect on reflective learning. These research efforts will address the gaps in the science lending valuable insight into innovative educational practices.

Limitations

A potential limitation in this review pertains to the literature search process. Original search terms included only accelerated nursing keywords but captured traditional baccalaureate samples as well when studies were rescreened in the review process. As a result, inadvertent exclusion of some studies with traditional baccalaureate student groups may have occurred. Likewise, due to the credentialling requirements of accelerated programs, only studies published in the United States were included. Accelerated nursing programs exist worldwide, therefore expanding to include international studies may have elucidated findings. Lastly, the time frame was limited from 2010 onward to reflect the national proliferation of ABSN programs. As these programs have existed for several decades, studies published before 2010 could have provided additional insight.

Conclusion

It is essential for nurse educators to ensure all pre-licensure students receive optimal pedagogies to equip them for an increasingly complex health care environment. Scholarly publications included in this integrative review shed light on the positive effect HFS and VRS has on clinical judgment competencies in pre-licensure baccalaureate students. However, research comparing simulation modalities in effectively meeting clinical judgment competencies is lacking. Accelerated baccalaureate programs are increasing nationwide and yet there remains a lack of evidence related to this specific student population. Therefore, further exploration on the

optimal use of simulation as an effective pedagogical strategy with pre-licensure ABSN students is imperative before a crisis in clinical judgment competency ensues. Ultimately, by analyzing and addressing gaps in clinical judgment processes, clinical judgment aptitude will develop, and a safe and competent new graduate work force be generated.

CHAPTER 3: METHODOLOGY

This chapter outlines the methodology used to examine the differences in clinical judgment between final semester TBSN and ABSN students during a medical-surgical scenario using HFMS in the TBSN group and VRS in the ABSN group. Key findings from a pilot study are discussed throughout the chapter to provide support for the methods described. Full description of the pilot study is presented in Chapter four. For the dissertation study, research design, setting, participants, ethical considerations, simulation protocols, instruments, potential limitations, and data analysis plan are discussed. UMCIRB approval was obtained for the pilot study and the dissertation study (Appendix A). Both were designated Exempt-Category Two.

The methodology for this dissertation study is designed to answer the following research questions:

RQ_1. What is the level of clinical judgment as measured by the Lasater Clinical Judgment Rubric (LCJR) dimensions (*Noticing*, *Interpreting*, *Responding*, and *Reflecting*) and total LCJR scores among final semester TBSN students using a HFMS and ABSN students using a VRS?

RQ_2. What is the level of competency (Beginning, Developing, Accomplished, Exemplary) exhibited by the TBSN and ABSN study groups on the LCJR behavior dimensions and sub-dimensions?

RQ_3. What is the relationship between HESI® scores, LCJR dimension and sub-dimension scores, and LCJR total scores among the TBSN (HFMS) students and the ABSN (VRS) students?

RQ_4. Are there differences in knowledge acquisition between the TBSN and ABSN students following the simulated learning activity?

Research Design

This study employed a quasi-experimental design with pretest-posttest assessment of knowledge related to the content of a medical-surgical scenario. The quasi-experimental design is used when comparing interventions between two or more groups in the absence of randomization, where one of the groups may function as a control group (Polit & Beck, 2017). In this study, two intervention groups were compared.

Setting

The setting for the proposed study was a College of Nursing (CON) in a large public university in the southeastern United States. The ABSN participants were in the Learning Resource Center (LRC) housed within the CON. The LRC is a computer laboratory on the second floor of the CON on the Health Sciences campus. The 30 feet by 50 feet space houses 30 stationary computer terminals. These computers are serviced by the Instructional Technology (IT) staff of the CON and have the latest upgrades of computerized software. IT personnel were present during the ABSN participants' VRS learning activity to problem solve any technological issue that may have occurred. The learning activity occurred during the ABSN students' normal laboratory time and was proctored by the dissertation chair of the principal investigator (PI) and faculty involved in the ABSN students' NURS 4942 Transition to Interprofessional Practice course.

The TBSN participants were in one of the state-of-the-art simulation laboratories in the CON. The Concepts Integration Laboratories (CILs) are comprised of over 7700 square feet of

advanced simulation lab space on the second, third, and fourth floors of the CON. CILs staff conducted over 140 simulations in the 2019-2020 academic year for both pre-licensure BSN students and advanced practice nursing students. The CILs have over 55 simulation manikins, with 10 being high-fidelity, of diverse age, race, and gender. Fully accredited in the areas of teaching and education, this accreditation demonstrates CILs' compliance with core educational standards determined by the Society for Simulation in Healthcare (SSH).

The TBSN students were in one of five designated simulation laboratories that have mounted video cameras and microphones to record simulated activities. These labs have the following equipment and medical supplies: 1) compressed air to simulate medical air, oxygen, and suction; 2) current medical devices including intravenous infusion pumps, beds, and cardiac monitors; 3) non-durable supplies, such as syringes, needles, and simulated medications needed for the care of patients. Each simulation laboratory has an observation room that houses the computer that runs the high-fidelity manikin, various camera display screens, and a two-way mirror. The CILs technician and the principal investigator (PI) were the only persons in the observation room during the simulated learning activity. All simulations occurred during weekdays.

Participants

A convenience sample was sought from East Carolina University (ECU) CON because it has both ABSN and TBSN student populations. Seeking a sample from one institution ensures that the BSN program's terminal objectives are consistent between groups. All pre-licensure baccalaureate nursing students in their final semester were eligible to participate and recruited at similar points in their respective curricula.

In conducting *a priori* power analysis for two groups with a power of 0.80 and a significance level of 0.05, a minimum of 64 participants in each group (N=128) would be needed (M. Swanson, personal communication, March 2021). Due to the small number of students enrolled in the accelerated option (n=18) and to ensure consistency between groups, TBSN students were recruited until an equitable sample size was reached (n=28). Inclusion criteria were enrollment in the ABSN cohort or fourth semester TBSN cohort. Exclusion criteria was any TBSN student not in their fourth semester.

Both groups were recruited during their first two weeks of class in their final semester. TBSN students were recruited in small clinical group gatherings as well as in a large theory class, with consent obtained by the PI. The PI is both a faculty member who teaches throughout the ABSN curricula and is the program's director. To protect the ABSN students from coercion, consents were obtained by the PI's co-investigator and were stored in a locked file cabinet in the Nursing Science division administrative assistant's CON office and not reviewed by the PI until post student graduation. After recruitment, ABSN students (n=18) and TBSN (n=28) consented to participate. However, only (n=17) TBSN students completed the study, representing a 40% attrition rate. Please see Appendix B for the consent forms used during the dissertation study. Other protections of ABSN participants included data collection and analysis processes and will be discussed in those sections.

Instruments and Data Collection

Demographic Survey

On the day of their scheduled simulation, participants completed a researcher developed paper demographic survey (Appendix C). Specific demographic variables obtained included age,

race, identified gender, first degree (if applicable), and if they had repeated any nursing course during their respective programs. TBSN students placed the demographic survey in an envelope retained in a locked filing cabinet in the PI's office in the CON. ABSN participants placed their surveys in a sealed envelope, which was collected and retained in a locked filing cabinet by the administrative assistant for ECU CON, Nursing Science division. ABSN demographic surveys were not to be obtained from the Nursing Science department administrative assistant until after student graduation at the conclusion of the semester.

HESI® RN Exit Exam

The Elsevier Health Education Systems Incorporated (HESI®) RN Exit Exam (E2) is a product that is predictive of pre-licensure nursing students' success on the NCLEX-RN® examination. The exam consists of 150 scored questions and 10 pilot or non-scored items covering the same content areas as the NCLEX-RN® examination. Varied item-response formats align with the alternate item formats seen on the NCLEX-RN® (Evolve, 2022). HESI® E2 scoring ranges reflect performance levels of the students and correlate to NCLEX-RN® success probability. Scores >900 indicate Recommended Performance, 850-899 indicate Acceptable Performance, 750-849 indicate Below Acceptable Performance, and scores below 750 indicate Needs Further Preparation (Evolve, 2022).

Multiple studies in the last decade have investigated the predictive validity of HESI® E2 (Barton et al., 2014; Langford & Young, 2013; Riley & Gouveia, 2022; Young & Willson, 2012; Zweighaft, 2013). Shah et al. (2022) examined the relationship between E2 scores and first-time NCLEX-RN® pass rates with data from over 40 pre-licensure programs in the United States. For first time test takers, findings indicated that students with an E2 score of greater than 900 had a pass rate of 97.29% on the NCLEX-RN®, scores between 850-899 had a pass rate of 96.33%,

and students with E2 scores below 850 had a first-time pass rate of 86.57%. Using the Kuder Richardson 20 (KR20) measure for internal consistency, HESI® E2 has an average reliability of 0.90, indicating satisfactory reliability (Vesey & Brunnert, 2019).

All pre-licensure students within the CON take the HESI® E2 twice during their final semester, once during their first two weeks and again during their last two weeks. The CON sets the benchmark for all pre-licensure students who take the exam at 850. Students scoring below the requisite benchmark after the first exam receive additional tutoring prior to the second examination. For the dissertation study, HESI® E2 scoring for participants was obtained following their first attempt and divided into three categories. Participants scoring above 900 will be coded as having an excellent probability of passing NCLEX-RN®, those scoring 850-899 - average probability of passing NCLEX-RN®, and those scoring below 850- below average probability of passing NCLEX-RN®.

Lasater Clinical Judgment Rubric

A modified Lasater Clinical Judgment Rubric (LCJR) was used to score the clinical judgment of the participants. LCJR utilizes Tanner's Clinical Judgment Model (*Noticing*, *Interpreting*, *Responding*, and *Reflecting*) expanding each of the four aspects to have 11 dimensions of behaviors, categorizing them as Beginning, Developing, Accomplished or Exemplary (Lasater, 2007). The dimensions of behavior include 38 specific items related to *Noticing*, 18 items related to *Interpreting*, 29 items related to *Responding*, and 23 items related to *Reflecting*. Those dimensions were used to score participants in the dissertation study to determine competency level. The LCJR has been used in pre-licensure nursing curricula in multiple ways to measure a student's progress in clinical judgment, particularly with high-fidelity simulation (Adamson et al., 2012). Miraglia and Asselin (2015) noted LCJR Cronbach's

alpha scores of 0.80-0.97 for internal consistency, and interrater reliability scores of 0.90 and 0.96 with simulation scenarios.

In terms of validity, Victor-Chmil and Larew (2013) examined LCJR for content, construct, and convergent validity by a review of the literature. Their findings indicated that the LCJR had good to very good construct validity depending on the dimension analyzed, and well-established content validity, noting the ability of LCJR to effectively measure all three learning domains of the students (cognitive, affective, and psychomotor). In terms of convergent validity, the need for more research was recognized.

With permission from K. Lasater, vSim for Nursing® modified the LCJR, identifying expected actions from the participants for each of the four aspects (J. Semaan, Wolters Kluwer Nurse Educator Consultant, personal communication, November 10, 2021; see Appendix D). The same modified rubric was utilized for both student groups with the PI scoring all participants. TBSN participants were scored during their HFMS scenario. To ensure accuracy, these scenarios were video recorded for later viewing if needed. At the conclusion of the computerized scenario, the vSim® program gives students a detailed feedback log, with time points and specific actions taken. This feedback log was used to score the ABSN students' post-graduation. During the pilot study, scenario specific actions with time frames were utilized to increase accuracy in categorizing participants' level of competency. Lapses in time may indicate a lack of confidence, with students unsure of appropriate actions to take (Semaan, 2022). For the dissertation study, applying scenario specific actions with corresponding time frames was utilized for both TBSN and ABSN student groups to determine level of competency (Appendix E).

The final aspect of the LCJR is reflecting. Participants in each group responded to the same post-simulation reflection questions regarding their actions and perceptions during their simulated scenarios (Appendix F). The reflective questions are based on Quality and Safety Education for Nurses (QSEN) competencies which include Patient-centered Care, Teamwork and Collaboration, Evidence-based Practice, Quality Improvement, Safety, and Informatics. The questionnaire is designed to promote reflective practice, reinforce learning, and improve future performance. Hence, they were used as a guided self-debrief for both student groups. The reflective questions used during the pilot study were researcher generated and deemed too generic to foster deeper reflective practice. These yielded poor overall reflective scores from the ABSN participants and may not have accurately captured this aspect of clinical judgment as measured by the LCJR.

The TBSN participants placed their completed reflective questions in an envelope which was stored in a locked file cabinet in the PI's office in the CON. ABSN students placed their completed reflective questions in an envelope obtained by the administrative assistant for ECU CON Nursing Science Department, who stored them in a locked filing cabinet with the consents and demographic surveys. ABSN reflective questions were not accessed or evaluated until after student graduation. A faculty guide was used to evaluate the reflective question responses of both groups (Appendix G).

Ensuring reliable scoring of the modified LCJR from both student groups is essential to have reliable findings. Therefore, the dissertation chair for the PI who is a Certified Healthcare Simulation Educator, randomly selected 10% of each group's participants (N=4) and independently scored their simulations using the modified LCJR. A form of interrater reliability was determined by comparing the final LCJR scores between the two evaluators. The average

difference in scores was 0.95. We considered that these differences in total LCJR scores was strong evidence that the two evaluators were following the rubric in a similar manner and that the PI was producing reliable scores. Having a single rater scoring all participants and verifying results with another rater knowledgeable about simulation rubrics enhanced the reliability of the findings.

Pre-simulation and Post-simulation Quizzes

To examine knowledge acquisition related to the medical-surgical scenarios, participants took a pre-simulation quiz, completed their respective scenarios, and then completed a post-simulation quiz. The pre-simulation quiz presented a series of questions related to the specific simulation scenario, whereas the post-simulation quiz tested knowledge of concepts related to the completed scenario. Answers to both pre-simulation and post-simulation quizzes were provided to students following completion of the respective quiz. Knowing pre-simulation correct and incorrect quiz responses may have allowed students to improve their patient care performance during the simulation scenario. Similarly, knowing correct and incorrect responses on post-simulation quizzes may have fostered deeper analysis and reflection of performance.

Both student groups took the same pre- and post-simulation quizzes. The TBSN students took a paper version, hand-scored by the PI. The ABSN students took the quizzes as part of their VRS experience. In vSim® students are allowed to take the quizzes multiple times. For this study only the first attempt scores for both the quizzes were retrieved after student graduation and used in data analysis. For the ABSN students, quiz answers are provided by vSim® following the submission of the quiz online. For TBSN students, answers were provided by the PI after each

quiz was completed. See Appendix G for paper versions of pre- and post-simulation quizzes with corresponding answer keys.

Simulation Protocols

Simulation-based learning activities require thoughtful and deliberate design, incorporating adult learning principles, and simulation pedagogy (INACSL Standards Committee et al., 2021). For both simulated learning experiences and to ensure consistency between groups, a procedural checklist (Appendix I) was followed for each phase of simulation: pre-brief, simulated scenario, and debrief. Healthcare Simulation Standards of Best Practice™ (INACSL Standards Committee et al., 2021) were used for each phase.

High-fidelity Manikin Simulation

After completing the demographic survey, the TBSN participants took the pre-simulation quiz. The PI scored the quiz and reviewed results with the participants, answering any questions. Then, using a pre-briefing guide (Appendix J) the PI oriented the participants to the simulation lab, the high-fidelity manikin, a description of the participant's role, the specific objectives, the length of the scenario and the Situation, Background, Assessment, Recommendation (SBAR) report on the patient (manikin). Students participated individually and assessed a patient with COPD experiencing a spontaneous pneumothorax. They analyzed assessment findings, responded by implementing prioritized interventions, and evaluated the response of the patient to actions taken. The scenario lasted 25-minutes and was video recorded. The HFMS scenario followed a standardized NLN simulation template (available on the NLN website) modified to match the VRS scenario. Following the scenario, students completed the paper post-simulation quiz and the guided reflection questions, placing them in the designated envelopes. These were

retained in a locked file cabinet in the PI's office in the CON. The allotted time to complete all components for the TBSN group was one hour per participant.

Virtual Reality Simulation

After completing the demographic survey, the ABSN participants were placed at their computer terminals, provided a student instruction sheet (Appendix K) and the guided reflection document. The con-investigator for the study used a pre-brief guide (Appendix J) to orient the ABSN participants to the LRC, the computerized program (vSim for Nursing®), a description of the participant's role, the specific objectives, and the length of the scenario. Next the students completed the pre-simulation quiz and accessed the vSim® scenario. SBAR report for the computerized patient along with the medical record was provided for the student to review before they began care of the patient. They assessed a patient with COPD experiencing a spontaneous pneumothorax. They analyzed assessment findings, responded by implementing prioritized interventions, and evaluated the response of the computerized patient to actions taken. In the vSim® environment, students conclude their own scenarios when they select a "patient hand-off" feature in the program. While participants may conclude their simulation at any point, the vSim® program will terminate the scenario after 25 minutes of activity. Following the scenario, students completed the electronic post-simulation quiz and the guided reflection questions. They placed their completed questionnaire in the designated envelope. The administrative assistant for ECU CON Nursing Science Department stored the reflections with the consents and demographic surveys in a locked filing cabinet in their CON office. The allotted time for the entire VRS experience was one hour per participant.

Data Analysis and Management

The IBM Statistical Package for the Social Sciences (SPSS version 27) was used for the data analysis. All data was screened for missing and out-of-range responses. Descriptive frequencies were used to summarize all categorical variables, while means and standard deviations were used to summarize all quantitative variables. Statistical testing included independent-samples t-tests, chi-square test for independence, and Pearson correlations. Statistical significance was evaluated at a p-value < .05. The following describes the statistical methods used for each research question.

RQ_1. What is the level of clinical judgment as measured by the Lasater Clinical Judgment Rubric (LCJR) dimensions (*Noticing*, *Interpreting*, *Responding*, and *Reflecting*) and total LCJR scores among final semester TBSN students using a HFMS and ABSN students using a VRS?

RQ_1 Statistical Analysis. Independent samples t-test were used to compare the mean LCJR dimension, subdimension and total scores between the two study groups.

RQ_2. What is the level of competency (Beginning, Developing, Accomplished, Exemplary) exhibited by the TBSN and ABSN study groups on the LCJR behavior dimensions and subdimensions?

RQ2 Statistical Analysis. Descriptive proportions of the competency levels achieved by the TBSN and ABSN study groups on LCJR behavior dimensions and subdimensions.

RQ_3. What is the relationship between HESI® scores, LCJR dimension, subdimension, and LCJR total scores among the TBSN (HFMS) students and the ABSN (VRS) students?

RQ_3 Statistical Analysis. Chi-square tests for independence were used to compare the proportion of each study group categorized as Excellent Probability of Passing NCLEX®,

Average Probability, and Below Average Probability. Spearman correlations were used to examine HESI® total scores with LCJR dimension, subdimension, and total scores within each study group.

RQ_4. Are there differences in knowledge acquisition between the TBSN and ABSN students?

RQ_4 Statistical Analysis. Independent samples t-test were used to compare mean knowledge gain scores between the two study groups.

Data management entails security of audiovisual recordings and paper documents for a period of seven years. All video recordings are housed on the password protected B-line SimCapture (Laerdal Medical) archive in the CON. Paper documents (pre-simulation and post-simulation quizzes of TBSN participants, and demographic surveys and LCJR for all participants) are retained in a locked file cabinet in the PI's office in the CON. Data generated during analysis is stored on password protected computers in ECU's secure nursing research PirateDrive.

Potential Limitations

The medical-surgical scenario chosen for the simulated activity was a chronic condition (COPD) with an acute complication (spontaneous pneumothorax). A potential confounding variable was the variety of faculty presenting this theoretical content and the length of time between student learning about COPD in the classroom and the simulated activity. For ABSN students, theoretical content related to COPD was taught in their first semester, approximately 9 months prior to this simulated learning activity. For TBSN participants, COPD content was also taught in their first semester, but approximately 15 months prior to the dissertation study.

Additionally, students entering their final semester have had various clinical experiences during their academic training. Some may have had more exposure to COPD patients than others. Since the pre-licensure students involved in this study have been in acute care facilities in eastern North Carolina (NC), the likelihood of caring for a patient with a diagnosis of COPD is high. According to NC State Center for Health Statistics (2016), eastern NC reports a higher incidence of COPD (8.3%) as compared to the rest of the NC population (7.3%). In terms of management of an acute pneumothorax with a chest tube, both student groups viewed the same video didactic lecture describing the complication with subsequent chest tube insertion and management. However, there was still a time variation of 7 months for ABSN students and 12 months for TBSN students before the simulated activity. To ameliorate this concern, one week prior to their scheduled simulation experience participants were emailed a resource packet with a power point overview of COPD and its management, along with a link to the pneumothorax-chest tube video lecture.

A second threat to validity pertained to the number of simulation exposures between TBSN and ABSN students. For TBSN participants, the number of face-to-face high-fidelity manikin simulations completed during their two-year program was six. ABSN students have had little exposure to virtual reality platforms. During the pilot study, students completed the vSim® tutorial and one practice medical scenario before completing the scenario on which they reflected and were scored using the LCJR. Qualitative findings indicated students were frustrated by not knowing how to navigate the virtual environment. Several identified knowing what to do, but not finding the needed action within the scenario as quickly as they would have liked. Indeed, this may have accounted for the time lags noted during the LCJR scoring. Consequently, for the dissertation study, ABSN students had six vSim® scenarios incorporated into didactic lecture and

laboratory sessions preceding the session involving the COPD with spontaneous pneumothorax patient. With 10 possible vSim® medical-surgical scenarios from which to select, the practice scenarios aligned with established course content and minimized technological frustrations with the computerized platform.

Thirdly, cross talk between students may have occurred within the TBSN group. Shinnick and Woo (2013) reported this as a limitation of their study. Cross talk occurs when students share their simulation experience with other participants. While ABSN participants completed the scenario simultaneously, thus eliminating this potential confounder, collecting data on all TBSN participants occurred over several weeks. All TBSN students signed a confidentiality agreement upon admittance to the traditional baccalaureate program, before their first simulated learning activity. Additional emphasis on the importance of not disclosing the specifics of the HFMS was stressed to participants by the PI at the conclusion of the learning activity.

Lastly, research findings from the TBSN group may be impacted by the Hawthorne effect. The Hawthorne effect describes the tendency, particularly in observational experiments, for participants to modify their behavior because they know they are being studied. This could potentially affect data collection, thereby altering the research findings (Payne & Payne, 2011) and limiting their generalizability (Sedgwick & Greenwood, 2015). Harrell et al. (2013) reported several ways to mitigate the Hawthorne effect during simulation studies. First, the researcher should develop rapport with the participants prior to the simulated activity. For this study, the researcher spent time with the TBSN participants during pre-brief session discussing their classes and future nursing plans. Secondly, participants should be reassured the purpose of the study is not to pass judgment on their performance but to compare clinical decision making between two groups of student learners. This was conveyed during room orientation. Interestingly, a noted

benefit of computer-based simulation is reasonable freedom from the Hawthorne effect (Harrell et al., 2013; Holmes, 2011). Thus, this was not a limitation for the ABSN group.

Conclusion

The methods and the procedures for the pilot study informed and guided the methodology for the dissertation study, with the expectation that the study protocols could be replicated for future research endeavors. For the dissertation study, generalizability was limited due to the small sample size of the ABSN group and the high attrition rate of the TBSN group. Therefore, ongoing research involving future ABSN and TBSN cohorts or with other ABSN programs would add to the evidence of this study, potentially validating the findings. Comparative evidence of clinical judgment competency between pre-licensure student groups at similar points in their curricula is beneficial to assess if a nursing program's terminal objectives are being reached. With ongoing emphasis in pre-licensure programs on clinical judgment competency, evaluating the effect of simulation modalities, particularly virtual platforms, is vital to transition safe, competent new graduates into the workforce.

CHAPTER 4: EXAMINING FEASIBILITY AND METHODOLOGICAL PROCEDURES FOR A COMPUTER-BASED SIMULATION TO EXAMINE CLINICAL JUDGMENT COMPETENCY WITH ACCELERATED BACHELOR OF SCIENCE IN NURSING STUDENTS: PILOT STUDY

This chapter describes a pilot study conducted in the fall of 2021. The purpose of the pilot study was to explore the feasibility and methodological procedures for a computer-based simulation to examine clinical judgment competency with accelerated Bachelor of Science in Nursing (ABSN) students. The research had three aims: 1) to determine the consent process for the ABSN participants since the principal investigator (PI) was director of their program; 2) to determine the protocol for a computer-based simulation, including the pre-brief, the simulated activity, and the debrief components; 3) to translate the computerized score of the simulated activity to a modified Lasater Clinical Judgment Rubric (LCJR). The University and Medical Center Institutional Review Board (UMCIRB) of East Carolina University approved the pilot study.

Consent Process

After UMCIRB approval and two weeks prior to the intervention, the ABSN students were told about the proposed study by the faculty supervisor for the project, who answered any questions. Recruitment script and consent forms (Appendix L) were signed by the participants in the study and placed in a sealed envelope which was collected by the Nursing Science division administrative assistant and retained in a locked cabinet in their office until after the students had graduated from the ABSN program the following December. After student graduation, the PI obtained the consent forms. Seventeen students consented to participate. However, two students

did not complete the final reflective questionnaire, yielding a sample size of n=15. This represented a 12% attrition rate.

Pilot Study Protocols

COVID-19 Protocols

Due to the ongoing COVID-19 pandemic, additional safety measures were utilized to protect the student participants. Since the investigation was occurring in the Learning Resource Center (LRC), a computer laboratory of East Carolina University's College of Nursing, all faculty (n=2) and staff (n=1) involved in the study were required to complete additional COVID-19 protocol training; the PI retained certificates of completion for the training, as well as the safety data and risk assessment forms detailing use of protective face masks and cleaning requirements. A faculty member in the ABSN program checked the COVID-19 symptom checker upon student arrival to the LRC and monitored compliance with masks and cleaning requirements. A tracking sheet confirmed student clearance and compliance with safety measures (Appendix M).

Simulation Pre-brief

Prior to the computer-based learning activity, a representative from Laerdal/Wolters Kluwer met virtually with the students during their regular class time to review the product (vSim for Nursing®, Medical-Surgical scenarios) and conduct a brief tutorial. At this time, students received trial licenses for up to 10 medical-surgical scenarios, their user identification codes, and log-on information. Student instructions (Appendix N) for the virtual learning activity were printed and given to students as well as placed in the learning platform (Canvas™) for the course.

Simulated Activity

The virtual simulation was part of a Transition into Interprofessional Practice course. This course has manikin-based simulations as an integral part of the learning activities. Like the manikin-based simulations, the virtual simulation aligned with course objectives and was scheduled during the students' regular laboratory time. Students arrived at the LRC at the prescribed time, completed the COVID-19 safety measures and cleaning requirements, and selected individual stationary computer terminals. However, when the students attempted to access the vSim® computerized tutorial and medical-surgical scenarios, their access was denied. With Instructional Technology (IT) staff available to troubleshoot the issue, it was found the user identification codes and log-on information had not been activated. The LRC session was terminated, and students were dismissed. In follow up with the Laerdal/Wolters Kluwer representative, a glitch in the user identification codes had occurred.

Since the computerized simulation was part of regular class activities, permission was sought from the UMCIRB to allow students to use their personal computers to complete the vSim® tutorials and the two assigned scenarios, in a place and time of their choosing. After approval from the UMCIRB (A. Mains, personal communication, October 18, 2021), the students participated in the vSim® scenarios on their own time in an un-proctored environment. A second student instruction sheet (Appendix O) was placed in the Canvas™ course, detailing instructions for the completion of the tutorial, the two scenarios, and the additional reflective questionnaire, which would be submitted when the students returned to class the following week.

The two assigned scenarios were both medical-surgical situations which combined a chronic disease process with an acute complication. Each scenario was preceded and followed by a brief quiz, reflecting the students' knowledge of the specific disease process. Students received

their pre-simulation quiz score with correct and incorrect responses prior to accessing each virtual simulation. The first scenario involved a patient with a diagnosis of COPD who experienced a spontaneous pneumothorax nine minutes into the simulation. In the second scenario, the patient had type I diabetes mellitus and experienced an acute hypoglycemic episode. In each scenario, students reviewed the chart, assessed the patient, implemented prioritized interventions, evaluated the patient's responses, and communicated with the patient and health care providers. Safety measures within the medical-surgical scenarios included hand washing, patient identification and allergy assessment before medication administration, and consents before invasive procedures. The scenarios concluded in one of two ways; the student would select a "hand patient off" feature in the program, or the scenario would time out after 25 minutes of activity.

Simulation Debrief

At the conclusion of each vSim® scenario, the students received a numerical percentage score on the simulation and a detailed feedback log of actions taken or not taken during the simulation. High priority mistakes were denoted with three red icons, moderate errors with two red icons and low-level misses with one red icon. The number and type of these errors determined their scoring percentage. Additionally, the feedback log provided the students with time stamps of actions taken and what they did well or did not do well during the scenarios. After reviewing the feedback log, the students answered the post-simulation quiz questions receiving a score along with correct and incorrect responses. Lastly, student participants were asked to complete a questionnaire about their experience. The reflective questionnaire (Appendix P) queried the participants: 1) "What went well in the last scenario?"; 2) "What did not go well in the last scenario?"; 3) "After the last scenario what would you do differently the next time?";

4) “What would you like for us to know about vSim for Nursing® and/or this computerized learning activity?”. At the next class day, students placed these questionnaires in a sealed envelope obtained by the administrative assistant for the Nursing Science division and stored them with the participants’ consent forms until after student graduation in December of 2021.

Reflective Questionnaire

In January of 2022, the PI collected the consents and reflective questionnaires from the Nursing Science division administrative assistant. The qualitative data were transcribed verbatim (Appendix Q) and read repeatedly by the PI to look for initial key words, which were then coded and grouped to identify themes. These qualitative findings modified aspects of the dissertation research study described in Chapter three and are specified in the discussion section. From the qualitative data, two major themes emerged.

Tech versus Touch was a theme seen in each of the four reflective questions. As participants reflected on what did go well, did not go well, or what they would do differently the next time, responses were divided between discussing the technological challenges or benefits within the scenario and the actual assessments, interventions, or interactions with the patient or the health care provider. Some participants combined these observations in their responses to the questions. In the first question of “What went well,” a typical response was “I was able to navigate the [second] vSim better; I identified the problem, called the provider quickly and got a blood sugar quickly… put him on a heart monitor earlier. Periodically took vitals and checked blood glucose.” For the second question “What did not go well,” one participant replied, “I did not do a full neuro assessment. I could not figure out how to introduce myself.” In answering what they would do differently the next time, one participant said “I would start the pt. on simple face mask w/ O^2 @ 10L/min…. I also would have started the IV earlier to get the fluids running

as opposed to wasting time trying to recall where the IV button was." This theme was carried through to the final question regarding what the participants would want the researchers to know about the computerized learning activity or vSim® in general. One participant replied:

> I enjoyed this vSim experience. It was frustrating at times because I wasn't sure what to do for the patient. I also became frustrated at times because it took a long time to complete some activities (wash hands, identify patient) and then I wasn't able to get informed consent before the provider inserted the chest tube, for example. I also had trouble determining when to hand the patient off.

A second theme that emerged from the qualitative data was *Importance of Feedback/Scoring*. Many participants remarked about the scores given for the pre- and post-simulation quizzes and the simulation overall. Some participants did not feel the scoring accurately represented their actions, as shown by the following comment:

> The only thing I didn't personally love is the fact that I got a 78% on scenario 2 because I didn't complete all the assessment pieces; however, I prioritized very well & did what I needed to do, so I don't believe the 78% reflects my work.

Many participants reported the pre- and post- simulation quizzes contributed to their learning, "I really liked the vSim and like the pre & post questions about the disease to get your head thinking about your interventions." Overwhelmingly, participants responded positively about the detailed feedback log provided at the conclusion of each scenario. As one student noted, "It gave great feedback and I was able to see the mistakes I made and fix them the next time I did the sim. The detailed feedback made it much easier to understand my errors."

Scoring with Lasater Clinical Judgment Rubric

One of the instructor options in the vSim for Nursing® platform is the ability to score participants with a modified Lasater's Clinical Judgment Rubric to measure clinical judgment competency (Semaan, 2022). For this pilot study, the PI utilized the modified LCJR and scored each of the 15 participants on the vSim® scenario involving the patient with COPD experiencing a spontaneous pneumothorax. This scenario was selected because it was identified as a complex medical-surgical scenario and had a corresponding manikin simulation template (Laerdal, 2010). Therefore, it was the preferred scenario for the dissertation study.

Using the detailed feedback log, specific actions and time stamps for those actions were noted for each participant. After all participants were scored, the actions and time stamps were examined and the LCJR was updated to include actions and time frames for each aspect of clinical judgment (*Noticing, Interpreting, Responding,* and *Reflecting*) within the 11 dimensions of behavior (Beginning, Developing, Accomplished, and Exemplary) (Appendix E). This was done to allow greater consistency in scoring the participants in the dissertation study.

Participants were then rescored using the updated tool. Total scores, sub-scale scores, the amount of time taken to complete the scenario, and pre-simulation/post-simulation quiz scores were noted for each participant. Since participants could complete the simulated activity more than once, the PI also recorded the number of attempts, plus the percent score change from the first to the last attempt. All participants were scored on their first attempt, unless there was an error during that attempt, such as the scenario timing the student out, in which case the second attempt was scored. Means for each of these parameters were calculated. Findings are presented in Table 2.

Table 2 – Summary of Pilot Study Quantitative Findings

STUDENT	TOTAL LCJR SCORE	NOTICING	INTERPRETING	RESPONDING	REFLECTING	TIME	PRE-QUIZ (1st att)	POST-QUIZ (1st att)	vSIM % 1ST attempt unless noted	# Attempts	Score change first to last
1	**8.05**	2.3	2.5	1.75	1.5	18:19	28.57	100	70% (2nd att)	6	50% points
2	**7.95**	2.7	1.5	2.25	1.5	21:49	42.86	80	70% (2nd att, 1st timed out)	2	9% points
3	**9.5**	3	2.5	2.5	1.5	27:02	71.43	80	69%	2	7% points
4	**8.2**	2.7	2.5	2	1	28:55	100	100	71%	2	18% points
5	**5.05**	1.3	1	1.25	1.5	16:10	85.71	100	58%	2	9% points
6	**11.17**	2.7	2	3.5	3.0	27:15	71.43	90	100% (2nd att 1st timed out)	2	25% points
7	**5.25**	1	1	1.25	2.0	30:00	41.86	70	69% (scored only att, but timed out)	1	N/A
8	**5.8**	1.3	1.5	1.0	2.0	30:00	85.71	100	68% (scored 2nd att, timed out on all 3)	3	21% points
9	**8.05**	2.3	2	2.25	1.5	22:20	100	100	78%	1	N/A
10	**10.3**	2.3	3.5	2.5	2.0	21:22	100	100	88% (scored 2nd att, timed out on 1st)	2	21% points
11	**7.3**	1.3	2	2	2.0	25:07	85.71	100	61%	2	14% points
12	**12.55**	3.3	3	2.75	3.5	25:13	71.43	90	76% (scored 2nd att -timed out 1st att)	2	9% points
13	**8.2**	2.7	2.5	2	1	18:20	71.43	90	82% (scored 3rd att, 1st timed out, 2nd appeared to be aborted)	4	48% points
14	**8.5**	3	2.5	1.5	1.5	27:50	100	100	65%	2	25% points
15	**7.8**	2.3	2.5	1.5	1.5	24:51	57.14	80	57%	2	18% points
	Mean: 8.24 High: 12.55 Low: 5.05	**Mean: 2.28 High: 3.3 Low: 1**	**Mean: 2.17 High: 3.5 Low: 1**	**Mean: 2.0 High: 2.75 Low: 1**	**Mean: 1.8 High: 3.5 Low: 1**	**Mean: 24.16 min**	**Mean: 69.5%**	**Mean: 92%**	**Mean: 72.13**	**Mean: 2.3 Mode: 2**	**Mean: 21% points**

One challenge encountered in the scoring process involved the *Reflecting* aspect of clinical judgment. For the pilot study the reflective questionnaire was created by the PI and asked broad questions related to the participant experience. These yielded poor overall reflective scores from the ABSN participants and may not have accurately captured this aspect of clinical judgment as measured by the LCJR. Indeed, in comparing the four aspects of clinical judgment, *Reflecting* had the lowest mean score. For the dissertation study, participants used the guided reflection questions that are part of the vSim® Instructor Resources. The questions are based on Quality and Safety Education for Nurses (QSEN) competencies and ask in depth questions regarding the scenario.

Discussion

Each of the three aims in this pilot study were met. First, the consent process performed in the study protected a vulnerable population of student participants from coercion since the PI was the director of their program. No change was necessary regarding the consenting process for future research involving this PI and student participants.

The second aim explored the three main components of the simulated activity: pre-brief, the actual scenario, and debrief, but also included COVID-19 protocols. COVID-19 protocols may or may not be a component of future research studies as these are governed by institutional policies and continue to evolve. In the dissertation study no COVID-19 protocols were utilized as per university guidelines. In the pre-brief phase, clear directions provided the students with step-by-step instructions, even when this pivoted to an asynchronous, un-proctored environment. These guidelines generated clarity and consistency for the participants and data collection processes. Written instructions were used in the dissertation study to maintain this uniformity.

During the simulated activity, several issues emerged. First, initial log-on problems caused the proctored vSim® activity to be aborted. Despite the presence of IT staff to trouble-shoot unanticipated computer glitches, not all technological problems were solvable. Arranging for IT support through Laerdal/Wolters Kluwer during the proctored event may have rectified this access issue and was an important discovery for future research using this product. Secondly, while tutorials for the vSim® for Nursing product were part of the student orientation along with one trial scenario for practice, participants reported frustrations with technology in the qualitative findings. Many of these remarks focused on not being able to find certain actions within the vSim® environment. This hampered participants' perceptions of the effectiveness of the virtual platform and could potentially have altered their scores for timely interventions. Participants reflected as much about the technology as about the patient care, assessment, communication, and interventions performed. Student frustrations with simulation technology are cited in the literature for both virtual reality simulation (VRS) and high-fidelity manikin simulation (HFMS) modalities (Cobbett & Snelgrove-Clark, 2016; Foronda et al., 2016). For the dissertation study, six vSim® scenarios were incorporated as part of the course content prior to the scored vSim® activity. This optimized familiarity with the program's function and offset this negative aspect.

The debriefing phase of this virtual simulation centered around the reflective questionnaire, the post-simulation quiz scores, the simulation score, and the detailed feedback log the students received at the conclusion of the scenario. Participants were overwhelmingly positive regarding the detailed feedback received. These findings concur with other studies, noting the importance of reflection and feedback to foster clinical judgment formation (Ashley & Stamp, 2014; Benner et al., 2010; Cappelletti et al., 2014; Manetti, 2019; Tanner, 2006). However, participants did not discuss the simulation with a faculty person trained in debriefing

best practices. The literature supports the role of quality debriefing and guided reflection to foster a greater depth of understanding and growth of clinical judgment (International Nursing Association for Clinical Simulation and Learning [INACSL], 2021). A lack of debriefing in virtual simulations is noted in the literature as problematic (Lapum et al., 2019). Scholars suggest implementing asynchronous, guided debriefing questionnaires or synchronous sessions with a trained faculty person as options to enrich this important aspect (MacKenna et al., 2021). For the dissertation study with virtual simulation, an asynchronous, in-depth, debriefing questionnaire was utilized.

Conclusion

This pilot study explored the feasibility and methodological procedures of using a computerized simulation to examine student participants' clinical judgment competency. Three aims were determined and met. Findings from this study informed the dissertation research study with student participants, a virtual reality simulation platform, and the modified LCJR scoring rubric.

CHAPTER 5: COMPARING CLINICAL JUDGMENT COMPETENCY BETWEEN ACCELERATED AND TRADITIONAL BACCALAUREATE NURSING STUDENTS DURING HIGH-FIDELITY SIMULATION MANUSCRIPT

Background

Clinical judgment is a dynamic, complex, and iterative process nurses employ to make clinical decisions. Clinical judgment competency is a vital skill for the professional nurse to deliver safe and competent patient care. However, aptitude related to clinical judgment may be lacking in the new graduate nurse (Jessee, 2021; Kavanagh & Sharpnack, 2021). Deficient clinical judgment has been linked to preventable nursing errors such as inaccuracies in medication administration (Murray et al., 2019; Treiber & Jones, 2018) and failure to recognize a decline in patient status (Murray et al., 2019). To prevent these types of errors, it is imperative for nursing programs to foster clinical judgment competency in the student nurse (American Association of Colleges of Nursing [AACN], 2021). While traditional Bachelor of Science in nursing (TBSN) students typically have two years to develop clinical judgment competency, accelerated baccalaureate nursing programs range from 11 to 18 months to complete, often less than half the time of their traditional baccalaureate counterparts (AACN, 2019).

The impetus to develop clinical judgment competency is at the forefront of pre-licensure nursing programs. By using a variety of educational strategies, including clinical agency placement and simulated learning activities, schools of nursing aim to foster clinical judgment aptitude (AACN, 2021; Benner et al., 2010; Hayden et al., 2014). The NCSBN National Simulation Study, found that substituting high quality simulation experiences for up to half of a program's clinical time did not alter student outcomes or hamper readiness for practice (Hayden et al., 2014). Recently, the COVID-19 global pandemic put additional limitations on clinical

agency access for pre-licensure students (Kavanagh & Sharpnack, 2021). Consequently, the AACN (2020a) encouraged schools of nursing to expand the use of manikin as well as virtual reality simulated experiences.

Accelerated Baccalaureate Nursing Students

The AACN reported a 22.5% increase in accelerated Bachelor of Science in nursing (ABSN) programs from 2013-2018. This proliferation was in response to projected nursing shortages (AACN, 2020b) and the Institute of Medicine (IOM, 2010) Future of Nursing report recommending baccalaureate prepared nurses comprise 80% of the workforce by 2020. These programs accomplish their terminal objectives with a rigorous, accelerated curriculum and typically enroll students who hold a non-nursing baccalaureate degree (AACN, 2019). ABSN and TBSN students differ in their approaches to learning. The typical ABSN student is older, has higher academic expectations of their faculty and the learning environment (AACN, 2019; Christoffersen, 2017), experiences a higher level of self-efficacy than TBSN students (Durkin & Feinn, 2017), and demonstrates high levels of motivation toward becoming nurses (AACN, 2019; Christoffersen, 2017). These traits may contribute to ABSN students showing better standardized exit exam scores and national licensure examination (NCLEX-RN®) pass rates than their traditional BSN counterparts (Lee & Song, 2021).

Clinical Judgment Competency

With the shortened academic preparation found in ABSN programs, the need to ensure safe practitioners is paramount. In research trending practice readiness of new graduate nurses over a six-year period, results showed that 23% of new graduate nurses met acceptable entry-level competencies in 2015, followed by a steady annual decline. In 2020, only 9% met this

acceptable competency level (Kavanagh & Sharpnack, 2021). While these findings are sobering, they are not surprising. Tanner's (2006) seminal work projected this reality, noting the increasing ambiguity of clinical situations combined with competing demands, particularly for the beginning nurse, to develop a "nuanced ability to recognize the salient aspects of an undefined clinical situation, interpret their meanings, and respond appropriately" (p.205). Benner et al. (2010) concurred, noting the need for a paradigm change in nursing education. Employing pedagogical strategies that foster a sense of salience, situated cognition and action, as well as an emphasis on clinical reasoning are essential to address an ever more complex health care environment. Considering these realities, the AACN (2021) has adopted a new model for preparing entry-level baccalaureate nurses. Competency-based nursing education will be the framework guiding the implementation of 10 new core competencies, or Essentials, for professional nursing education. In the new paradigm, clinical judgment is considered as one of the foundational concepts integrated throughout the new competencies (AACN, 2021).

Simulated Learning Strategies

Simulation is categorized into high, medium, and low fidelity to equate to the degree of realism. High-fidelity simulation includes full scale computerized human simulators, and/or virtual reality simulators (Lioce et al., 2020). High-fidelity simulation is well documented as an intervention to develop clinical judgment competency in the student nurse (Cazzell & Anderson, 2016; Chmil et al., 2015; Shin et al., 2019; Weatherspoon & Wyatt, 2012). With the high degree of realism found in both high-fidelity manikin simulation (HFMS) and virtual reality simulation (VRS), simulated activities are used for fundamental skill acquisition in the beginning student, to honing assessment and management of a rapidly deteriorating patient in the advanced student

(Cant & Cooper, 2017). Consequently, nurse educators can design simulated learning activities for any disease process, with varying levels of complexity.

HFMS incorporates computerized software within a manikin to mimic the sensations and sounds a real person would have with a similar condition (Lioce et al., 2020). Use of HFMS in schools of nursing requires dedicated simulation laboratories with trained technicians. In contrast, VRS utilizes a computer-generated reality for learners to make clinical decisions (Lioce et al., 2020). The interactive world provides the learner with varying degrees of immersion to interact with patients, the interdisciplinary team, and replicate real-life healthcare situations and procedures (Shin et al., 2019). Research shows VRS increases flexibility of instruction as it can be accessed 24 hours per day and incorporated into a variety of learning contexts (Foronda & Bauman, 2014; Redmond et al., 2020). A cost analysis between the two simulation modalities finds VRS to be one-third the cost of HFMS, citing $10.89/learner as compared to $36.55/learner (Haerling, 2018).

While HFMS is well documented in the literature to positively impact clinical judgment attributes (Chen et al., 2018; Chmil et al., 2015; Tamaki et al., 2019), less is known about VRS effects on clinical judgment formation. Foronda et al. (2020) conducted a systematic review on VRS and found limited synthesized knowledge about student outcomes and its use in nursing pedagogy. Further, in a review of the literature Martin and Tyndall (2022) found a lack of evidence comparing the two modalities or the clinical judgment competency between ABSN and TBSN learners. Therefore, as the number of ABSN programs rises and the use of simulation increases for pre-licensure baccalaureate students, research comparing simulation modalities and their impact on clinical judgment prior to transition into the workforce is critical. The purpose of this study was to compare clinical judgment competency between final semester TBSN and

ABSN students during a medical-surgical scenario using HFMS in the TBSN group and VRS in the ABSN group.

Theoretical Framework

Tanner's Clinical Judgment Model (Tanner, 2006) was the theoretical framework guiding the study. Tanner's model synthesized specific attributes of clinical judgment cited in nursing literature. As a result of this analysis, Tanner's Clinical Judgment Model included four distinct, yet interconnected dimensions of clinical judgment: *Noticing*, *Interpreting*, *Responding*, and *Reflecting*. *Noticing* is derived from the nurse's textbook knowledge, their past experiences, and their knowledge of patients' typical response patterns gathered during holistic assessment (Tanner, 2006). After the initial grasp of the patient situation, the nurse uses various reasoning patterns for *Interpreting* the meaning of the data, differentiating relevant from irrelevant findings, and formulating hypotheses with potential solutions (Tanner, 2006). As potential solutions are generated, the nurse *Responds* by prioritizing them in order of importance and making a clinical decision (Tanner, 2006). *Reflection* is the final aspect of clinical judgment and combines two distinct features. First, *Reflection-in-action* is the evaluation by the nurse of the patient's response to the performed interventions. Secondly, *Reflection-on-action* is what the nurse gains from the experience that contributes to their ongoing practical knowledge development. This reflective learning impacts the other dimensions of clinical judgment and completes the cycle (Tanner, 2006).

Methods

Design

This study employed a quasi-experimental design with pretest-posttest assessment of knowledge related to the content of a medical-surgical scenario. In this study, two intervention groups were compared. The University and Medical Center Institutional Review Board (UMCIRB) approved the study.

Setting and Sample

A convenience sample was sought from a college of nursing (CON) in a large public university in the southeastern United States because it had both ABSN and TBSN student populations. Seeking a sample from one institution ensured that the BSN program's terminal objectives were consistent between groups. All pre-licensure baccalaureate nursing students in their final semester were eligible to participate and recruited during the first two weeks of their final semester. Exclusion criteria was any TBSN student not in their fourth semester. Due to the small number of students enrolled in the accelerated option (n=18) and to ensure consistency between groups, TBSN students were recruited until an equitable sample size was reached (n=28).

TBSN students were recruited with consent obtained by the principal investigator (PI). The PI teaches throughout the ABSN curricula and is the program's director. To protect the ABSN students from coercion, consents were obtained by the co-investigator for the study. Consents and all instruments used in data collection were retained and stored by the administrative assistant for the CON Nursing Science Department and not obtained for analysis until after ABSN student graduation. TBSN consents and instruments used in data collection

were retained and stored by the PI. Following recruitment, ABSN students (n=18) and TBSN (n=28) consented to participate. However, only (n=17) TBSN students completed the study, representing a 40% attrition rate. Participation was voluntary and no incentives were offered.

Instruments and Data Collection

Demographic Survey

On the day of their scheduled simulation, participants completed a researcher developed paper demographic survey. Specific demographic variables obtained included age, race, identified gender, first degree (if applicable), and if they repeated any nursing course during their respective programs.

HESI® RN Exit Exam

The Elsevier Health Education Systems Incorporated (HESI®) RN Exit Exam (E2) is a product that is predictive of pre-licensure nursing students' success on the NCLEX-RN® examination (Evolve, 2022). Shah et al. (2022) investigated the predictive validity between E2 scores and first-time NCLEX-RN® pass rates with data from over 40 pre-licensure programs in the United States. Findings indicated that students with an E2 score of greater than 900 had a pass rate of 97.29% on the NCLEX-RN®, scores between 850-899 had a pass rate of 96.33%, and students with E2 scores below 850 had a pass rate of 86.57%. Using the Kuder Richardson 20 (KR20) measure for internal consistency, HESI® E2 has a satisfactory reliability of 0.90 (Vesey & Brunnert, 2019).

All pre-licensure students within the CON take the HESI® E2 twice during their final semester, once during their first two weeks and again during their last two weeks. For this study, HESI® E2 scoring for participants was obtained following their first attempt and divided into

three categories. Participants scoring above 900 were coded as having an excellent probability of passing NCLEX-RN®, those scoring 850-899 - average probability of passing NCLEX-RN®, and those scoring below 850- below average probability of passing NCLEX-RN®.

Lasater Clinical Judgment Rubric

A modified Lasater Clinical Judgment Rubric (LCJR) was used by the PI to score the clinical judgment of all participants. LCJR utilizes Tanner's Clinical Judgment Model (*Noticing*, *Interpreting*, *Responding*, and *Reflecting*) expanding each of the four dimensions to have 11 sub-dimensions of behavior, 3 subdimensions related to *Noticing*, 2 subdimensions related to *Interpreting*, 4 subdimensions related to *Responding*, and 2 subdimensions related to *Reflecting.* The clinical judgment competency levels are categorized as Beginning, Developing, Accomplished or Exemplary (Lasater, 2007). The LCJR has been used in pre-licensure nursing curricula in multiple ways to measure a student's progress in clinical judgment, particularly with high-fidelity simulation (Adamson et al., 2012). Miraglia and Asselin (2015) noted LCJR Cronbach's alpha scores of 0.80-0.97 for internal consistency, and interrater reliability scores of 0.90 and 0.96 with simulation scenarios.

In this study, the modified LCJR identified expected actions from the participants for each of the 11 subdimensions indicating competency level (Appendices D&E). TBSN participants were scored during their HFMS scenario. For the ABSN participants, the computerized program gives students a detailed feedback log at the conclusion of the scenario, with time points and specific actions taken. This feedback log was used post-graduation to score the ABSN students' clinical judgment. The final aspect of the LCJR is reflecting. Participants in each group responded to the same post-simulation reflection questions regarding their actions and perceptions during their simulated scenarios. The reflective questions are based on Quality

and Safety Education for Nurses (QSEN) competencies and are designed to promote reflective practice, reinforce learning, and improve future performance. Hence, they were used as a guided self-debrief for both student groups.

The modified LCJR has no reliability data. Therefore, the co-investigator who is a Certified Healthcare Simulation Educator, randomly selected 10% of each group's participants (N=4) and independently scored their simulations using the LCJR. The scoring of the LCJR required the evaluators to determine the level of competency attained by each student on each subdimension. The score assigned to the students for each subdimension was based on the highest competency level attained and could range from 1 to 4. After determining subdimension scores, the four dimension (*Noticing, Interpreting, Responding, Reflecting*) scores were determined by averaging the corresponding subdimension scores also ranging from 1 to 4. The final LCJR score was the sum of the four dimension scores, ranging from 4 to 16. A form of interrater reliability was determined by comparing the final LCJR scores between the two evaluators. The average difference in scores was 0.95. We considered that these differences in total LCJR scores was strong evidence that the two evaluators were following the rubric in a similar manner and that the PI was producing reliable scores. Having a single rater scoring all participants and verifying results with another rater knowledgeable about simulation rubrics enhanced the reliability of the findings.

Pre-simulation and Post-simulation Quizzes

To examine knowledge acquisition related to the medical-surgical scenarios, participants took a pre-simulation quiz, completed their respective scenarios, and then completed a post-simulation quiz. Both student groups took the same pre- and post-simulation quizzes. The TBSN students took a paper version, hand-scored by the PI, with answers provided after each quiz was

completed. The ABSN students took the quizzes as part of their VRS experience. While the ABSN students could take the quizzes multiple times, only the first attempt scores for both the quizzes were used in data analysis. For the ABSN students, quiz answers were provided by the VRS program following the submission of the quiz online.

Simulation Protocols

Several measures were taken to ensure consistency between groups. First, one week prior to their scheduled simulation, all participants received via email a resource packet with an overview of the medical-surgical problem (COPD) and video link detailing management of a pneumothorax with a chest tube. Secondly, procedural checklists were followed for each phase of simulation: pre-brief, simulated scenario, and debrief, using Healthcare Simulation Standards of Best Practice™ (INACSL Standards Committee et al., 2021). Thirdly, ABSN students had six VRS scenarios incorporated into their theory course prior to data collection to equate to the number of previous HFMS experiences in the TBSN group.

High-fidelity Manikin Simulation

The TBSN participants were in a designated simulation laboratory in the CON. These labs are fully equipped to replicate the practice environment with both durable equipment and non-durable supplies; each simulation lab has an observation room that houses camera display screens, a two-way mirror, and the computer that runs the high-fidelity SimMan 3G manikin. After completing the demographic survey, the TBSN participants took the pre-simulation quiz with the PI reviewing the results with the participants. Then, using a pre-briefing guide, the PI oriented the participants to the simulation lab, the high-fidelity manikin, a description of the participant's role, the specific objectives, the length of the scenario, and the Situation,

Background, Assessment, Recommendation (SBAR) report on the patient (manikin). Students participated individually and provided care for a patient with COPD experiencing a spontaneous pneumothorax. The scenario lasted 25-minutes and was video recorded. The HFMS scenario followed a standardized NLN simulation template modified to match the VRS scenario. Following the scenario, students completed the post-simulation quiz and the guided reflection questions.

Virtual Reality Simulation

The ABSN participants were in the Learning Resource Center (LRC) in the CON. The LRC is a computer laboratory housing 30 stationary computer terminals. Instructional Technology staff were present during the VRS activity to solve any technological issue that may have occurred. The learning activity was proctored by the co-investigator. The VRS intervention utilized a Laerdal-Wolters Kluwer computerized program called vSim for Nursing®. To mitigate any potential conflict of interest, the PI did not seek or accept any donated resources from the company. Licensing fees for ABSN students were purchased with grant funds. After completing the demographic survey, the ABSN participants were placed at individual computer terminals, provided a student instruction sheet and the guided reflection document. The co-investigator used a pre-brief guide to orient the ABSN participants to the LRC, the computerized program, a description of the participant's role, the specific objectives, and the length of the scenario. Next the students completed the pre-simulation quiz and accessed the vSim® scenario. SBAR report for the computerized patient along with the medical record were provided for the student to review before the scenario began. Each student provided care for a patient with COPD experiencing a spontaneous pneumothorax. In the vSim® environment, students conclude their own scenarios when they select a "patient hand-off" feature in the program. While participants

may conclude their simulation at any point, the vSim® program will terminate the scenario after 25 minutes of activity. Following the scenario, students completed the electronic post-simulation quiz and the guided reflection questionnaire. Students were instructed not to review their feedback log until after they completed their reflection.

Data Analysis and Management

The IBM Statistical Package for the Social Sciences (SPSS v27) was used for the data analysis. Descriptive frequencies were used to summarize all categorical variables, while means and standard deviations were used to summarize all quantitative variables. Statistical testing included independent-samples t-tests, chi-square test for independence, and Spearman correlations. Statistical significance was evaluated at a p-value < .05. Data management entailed security of audiovisual recordings and paper documents. All video recordings were housed on the password protected B-line SimCapture (Laerdal Medical) archive in the CON. Paper documents (pre-simulation and post-simulation quizzes of TBSN participants, as well as demographic surveys, reflective questionnaires, and LCJRs for all participants) were retained in a locked file cabinet in the PI's office in the CON. Data generated during analysis was stored on a password protected secure research drive.

Results

Sample Demographic Comparison

Thirty-five students completed the study (ABSN [n=18] and TBSN [n=17]). As the ABSN group was composed of second-degree learners, it was expected their mean age would be higher than the TBSN group (M = 28.39 and M = 24.53, respectively). Gender was virtually identical with approximately 88.5% being female and 11.5% male in each group. Three racial groups were represented in the sample. Black participants represented 17.6% of the TBSN group

as compared to 11% in the ABSN group, White participants comprised 64.7% of the TBSN group and 72.2% of the ABSN group, while Asians comprised approximately 17% of each group. In terms of course repeat, 23.5% of TBSN participants had experienced one course repeat as compared to 5.6% of the ABSN participants. When demographic differences were analyzed, the groups were similar across all demographic variables (gender, race, age, course repeat) and no significant statistical differences were noted (Table 3).

Table 3

Participant Demographics

Variable	ABSN	TBSN
Age (M/SD)	28.39 (7.838)	24.53 (8.818)
Gender (%)		
Female	88.9	88.2
Male	11.1	11.8
Ethnicity (%)		
Black	11.1	17.6
White	72.2	64.7
Asian	16.7	17.6
Course Repeat (%)		
No course repeated	94.4	76.5
One course repeated	5.6	23.5

Note. ABSN (n = 18) = second-degree, accelerated BSN students, TBSN (n = 17) = traditional BSN students.

Clinical Judgment Comparison

Clinical judgment comparison is found in Table 4. ABSN participants had statistically significant higher mean scores in the *Noticing* dimension of the LCJR as compared to the TBSN participants (p = .041). One *Noticing* subdimension score showed ABSN participants had statistically significant higher mean *focused observation* scores than their TBSN counterparts (p

= .001). In the *Interpreting* dimension, ABSN students had significantly higher scores (p = .035) than TBSN participants with one subdimension, *making sense of the data*, also showing statistical significance (p = .003) in favor of the ABSN group. For the remaining two dimensions, *Responding* and *Reflecting*, no statistically significant differences were found between groups. Comparisons of total LCJR scores between groups showed that ABSN participants had statistically significant higher scores than the TBSN participants (p = .034).

Table 4

Means, Standard Deviations, and Independent-Sample t Test Clinical Judgment Comparisons

Dimension	ABSN		TBSN			
Sub-Dimension	M	SD	M	SD	t	*p*
Effective noticing dimension	2.53	0.58	2.09	0.63	2.13	.041
Focused observation	2.42	0.66	1.56	0.74	3.61	.001
Recognizing deviations	2.43	0.63	2.06	0.82	1.52	.139
Information seeking	2.75	0.65	2.69	0.71	0.24	.809
Effective interpreting dimension	2.54	0.51	2.15	0.54	2.20	.035
Prioritizing data	2.39	0.58	2.35	0.58	0.18	.856
Making sense of data	2.64	0.63	1.94	0.65	3.23	.003
Effective responding dimension	2.47	0.50	2.25	0.46	1.44	.158
Calm, confident manner	2.52	0.53	2.45	0.55	0.85	.731
Clear communication	2.99	0.58	2.69	0.71	0.41	.170
Well-planned intervention	2.25	0.82	1.97	0.45	1.24	.220
Being skilled	1.83	0.51	1.82	0.64	0.55	.960
Effective reflecting dimension	2.67	0.44	2.47	0.53	1.23	.229
Evaluation/self-analysis	2.81	0.41	2.63	0.54	1.09	.283
Commitment to improvement	2.48	0.57	2.25	0.60	1.17	.251

LCJR Total	2.50	0.37	2.22	0.39	2.21	.034

Note. ABSN (n = 18), TBSN (n = 17).

Competency Level Comparison

Table 5 presents the number of competency assessments and the proportion of those assessments at each competency level for all four dimensions on the LCJR. Further breakdown of the *Noticing* dimension and three subdimensions for the ABSN and TBSN students are presented in Table 6. For the *focused observation* subdimension of *Noticing*, most competency assessments for the TBSN students were at the Beginning level (60%) compared to 14.8% for the ABSN students. In the ABSN group, the largest number of assessments were at the Accomplished level (44.4%). For the *Noticing* dimension, the overall distribution of competency levels indicated that most of the assessments for the TBSN students were at the Beginning level (40.1%), while for the ABSN students most assessments were at the Accomplished level (54.2%).

The *Interpreting* dimension and its two subdimensions are presented in Table 7. For the *prioritizing data* subdimension, most ABSN participants were at the Accomplished level (47.2%) whereas most TBSN participants were at the Developing level (52.9%). Similarly, for the *making sense of data* subdimension, 51.8% of ABSN students fell at the Accomplished level but 41.2% of TBSN participants were at the Beginning competency level. The overall distribution of competency levels for the *Interpreting* dimension indicated over half of ABSN students were at the Accomplished level (51.1%) compared to most TBSN students falling into the Developing level (34.1%).

HESI®, NCLEX-RN®, and LCJR Comparison

An independent-samples t-test was conducted to compare HESI® scores for ABSN and TBSN students. There was no significant difference in scores for ABSN students (M = 850, SD

Table 5

Clinical Judgment Competency Levels for LCJR Four Dimensions

		Competency Level			
		B	D	A	E
Dimension	n	%	%	%	%
Dimension 1: effective noticing					
ABSN	147	11.4	31.0	53.7	3.9
TBSN	151	36.7	30.7	26.1	6.5
Dimension 2: effective interpreting					
ABSN	87	12.8	28.3	51.1	7.8
TBSN	77	30.6	34.1	31.5	3.8
Dimension 3: effectively responding					
ABSN	192	10.0	37.8	39.4	12.7
TBSN	186	13.2	48.3	31.5	6.9
Dimension 4: effectively reflecting					
ABSN	106	4.4	23.7	71.8	0.0
TBSN	98	7.8	41.8	49.4	1.0

Note. n = total number of assessments. B = beginning level, D = developing level, A = accomplished level, E = exemplary level. ABSN (n = 18), TBSN (n = 17).

Table 6

Clinical Judgment Competency Levels in Effective Noticing Dimension and Subdimensions

		Competency Level			
Sub-dimension		B	D	A	E
Dimension	n	%	%	%	%
Sub-dimension 1: focused observation					
ABSN	54	14.8	35.2	44.4	5.6
TBSN	60	59.3	31.9	2.9	5.9
Sub-dimension 2: recognizing deviations					
ABSN	54	11.1	35.2	53.7	0.0
TBSN	51	29.4	41.2	23.5	5.9
Sub-dimension 3: information seeking					
ABSN	39	5.6	19.4	69.4	5.7
TBSN	40	12.2	12.2	69.6	5.9
Dimension 1: effective noticing					
ABSN	147	11.4	31.0	53.7	3.9
TBSN	151	36.7	30.7	26.1	6.5

Note. n = total number of assessments. B = beginning level, D = developing level, A = accomplished level, E = exemplary level. ABSN (n = 18), TBSN (n = 17).

Table 7

Clinical Judgment Competency Levels in Effective Interpreting Dimension and Subdimensions

		Competency Level			
Sub-dimension		B	D	A	E
Dimension	n	%	%	%	%
Sub-dimension 1: prioritizing data					
ABSN	33	11.1	41.7	47.2	0.0
TBSN	26	6.0	52.9	41.2	0.0
Sub-dimension 2: making sense of data					
ABSN	54	13.0	22.2	51.8	13.0
TBSN	51	41.2	29.4	23.5	5.9
Dimension 2: effective interpreting					
ABSN	87	12.8	28.3	51.1	7.8
TBSN	77	30.6	34.1	31.5	3.8

Note. n = total number of assessments. B = beginning level, D = developing level, A = accomplished level, E = exemplary level. ABSN (n = 18), TBSN (n = 17).

= 71.1) and TBSN students (M = 878, SD = 152.4; t (33) = 0.71, p = .48, two-tailed). The magnitude of the difference in means = 28 was small (eta squared = .01).

The HESI® scores were further analyzed by categorizing the scores into below average probability for passing NCLEX-RN®, average probability, and excellent probability. Because of the small sample size, the average and excellent probability categories were combined. A chi-square test for independence was used to compare the proportion of ABSN and TBSN with average and excellent probabilities of passing NCLEX-RN®. There was no significant difference in the proportion of ABSN students (44.4%) and TBSN students (52.9%); χ^2 (1) = 0.25, p = .61, phi = .08 (small effect size). Notably, all participants in this study (N = 35) successfully passed the NCLEX-RN® examination on the first attempt.

The relationship between HESI® scores and LCJR dimension, subdimension and LCJR total scores for the ABSN and TBSN students was examined using Spearman correlations (Table 8). The largest correlations for the ABSN students included HESI® score and *Responding* sub-dimension *calm, confident manner* (.56), *Noticing* subdimension *focused observation* (.49), *Interpreting* dimension (.41), *Responding* subdimension *well-planned intervention* (.39), LCJR total score (.39), and *Responding* dimension (.38). For TBSN students, the largest correlations were observed for *Noticing* subdimension *focused observation* (.36), *Interpreting* dimension (.36), *Reflecting* subdimension *commitment to improvement* (.35), and *Interpreting* sub-dimension *making sense of data* (.33). The positive correlations noted indicated that the dimension or subdimension means scores were substantially larger for those students categorized as having average/excellent probability scores compared to students categorized with below average probability scores.

Knowledge Acquisition Comparison

The ABSN students had significantly higher pre-simulation and post-simulation knowledge scores than the TBSN students. On the pre-simulation quiz, 61% of the ABSN students had perfect scores compared to none of the TBSN students. On the post-simulation quiz, all the ABSN students scored at 80% or above with 12 (67%) scoring 100%. In the TBSN group, 12 (67%) scored at least 80% with 2 scoring 100% (Table 9).

When comparing knowledge gained in each student group independently (Table 10), the average gain in knowledge from pre-simulation to post-simulation for the ABSN students was a non-statistically significant gain of 9.52 points ($p = .052$). For the TBSN students, the average gain in knowledge from pre-simulation to post-simulation was a statistically significant gain of 15.49 points ($p < .001$). However, the higher average pre-simulation knowledge score of 84.92

for the ABSN students precluded a potential large gain on the 100-point percentage scale, compared to the pre-simulation mean knowledge score of 61.58 for the TBSN students.

Table 8

Spearman Correlations of HESI Level with LCJR Dimensions, Subdimensions and Total LCJR

Dimension Sub-Dimension	ABSN	TBSN
Effective noticing dimension	.31	.29
Focused observation	.49*	.36
Recognizing deviations	.19	.32
Information seeking	.19	.04
Effective interpreting dimension	.41	.36
Prioritizing data	.17	.13
Making sense of data	.41	.33
Effective responding dimension	.38	.14
Calm, confident manner	.56*	.30
Clear communication	-.06	.15
Well-planned intervention	.39	.24
Being skilled	.10	-.25
Effective reflecting dimension	.17	.29
Evaluation/self-analysis	.25	.18
Commitment to improvement	.03	.35
LCJR Total	.39	.24

Note. ABSN (n = 18), TBSN (n = 17). HESI level is a dummy variable coded as 0 = below average probability of passing NCLEX and 1 = average/excellent probability of passing NCLEX.
*$p < .05$.

Table 9

Student Group Differences in Knowledge Acquisition

	ABSN		TBSN				
Knowledge acquisition	M	SD	M	SD	t	*p*	η^2
Pre-simulation	84.92	25.68	61.58	17.22	3.14	.005	.23
Post-simulation	94.44	8.56	80.00	13.69	3.77	.001	.30
Pre-post gain	9.52	19.23	18.42	15.49	1.50	.144	.06

Note. ABSN (n = 18), TBSN (n = 17).

Table 10

Pre-Simulation to Post-Simulation Knowledge Gains in Student Groups

	Knowledge							
	Pre-Simulation		Post-Simulation		Difference			
Students	M	SD	M	SD	M	SD	t	*p*
ABSN	84.92	25.68	94.44	8.56	9.52	19.30	2.09	.052
TBSN	61.58	17.27	80.00	13.69	18.42	15.49	4.90	<.001

Note. ABSN (n = 18), TBSN (n = 17).

Discussion

The purpose of the study was to examine clinical judgment competency between two groups of BSN learners near the end of their respective curricula using two high-fidelity simulation modalities. Findings indicated ABSN students had significantly better *Noticing, Interpreting* and overall LCJR scores than the TBSN students. One subdimension of *Noticing, focused observation,* also showed statistical significance with most TBSN participants falling

into the Beginning competency level as compared to ABSN students at the Accomplished level. This finding may relate to the simulation modality used in the TBSN group. One Beginning level action in *focused observation* is "assessment errors made". Sixty-five percent of TBSN participants placed here, typically by making a mistake of auscultating lung sounds over a patient gown. While this could occur with HFMS, it could not with VRS. In the vSim® program, participants select "auscultate lung sounds" within the program and they are not given an option as to how to auscultate them. This discrepancy could be ameliorated with an immersive VRS platform or with supplemental questions regarding correct assessment procedures. When comparing HFMS to VRS, Wilson et al. (2014) found that HFMS supported better assessment performance over VRS. The converse is also true, when assessment errors are made it is more readily noted with a HFMS modality.

In terms of *making sense of the data* a subdimension of *Interpreting*, one action included how quickly the provider was notified once the patient complained of respiratory distress due to a pneumothorax. Seventy-six percent of TBSN students were in the Beginning level as compared to 33% of ABSN students. Again, this difference may be attributed to the modality versus the student, as VRS performs this behavior timelier by a selection in the program. HFMS is more realistic to real-world situations, as the learner must leave the patient, call the provider, and provide the information they deem important. Another action in the Beginning level of this sub-dimension was "has difficulty interpreting the data". TBSN students (29%) compared to 6% of ABSN students scored at this level. Reasons for this may be three-fold. First, research shows VRS provides better diagnostic analysis as compared to HFMS (Wilson et al., 2014). The second possible reason relates to student responses to a specific question on the reflective questionnaire. The question asked the students to analyze the laboratory results which included an arterial blood

gas (ABG) and relate those findings to the clinical presentation and chronic disease process. As ABSN students participated in this simulation as part of their scheduled lab activities, their responses were more detailed, yielding higher competency scores. The simulation for TBSN students was in addition to their full academic workload. As such, some TBSN students may not have taken the necessary time to analyze the diagnostics and provide an in-depth response. Third, the delay from didactic content related to ABG analysis varied between TBSN and ABSN groups, (12 months and 7 months, respectively) as did the faculty who taught the content.

Considering these variances within simulation modalities and analyses in scoring the LCJR, it is not surprising that ABSN participants had statistically higher overall clinical judgment competency scores than their TBSN peers. Other noteworthy results were the knowledge gains in both groups, but these were statistically significant with only the TBSN participants. This supports other research indicating either modality promotes knowledge acquisition (Martin & Tyndall, 2022) but HFMS provides a better overall simulation experience for development of clinical judgment competency (Wilson et al., 2014). Lastly, correlations between HESI® scores and LCJR dimensions and subdimensions reveal the strongest correlations for both ABSN and TBSN students were in *Noticing*, subdimension *focused observation* and in the *Interpreting* dimension. These findings are valuable for nurse educators and could expand the use of standardized exit exam scores to predict not only NCLEX-RN® success but to highlight specific areas of weakness related to aspects of clinical judgment. This aligns with Tanner's (2006) application of the Clinical Judgment Model in pre-licensure nursing education. As deficiencies in aspects of clinical judgment are identified, using the best educational modalities to address the gap is vital.

Implications and Recommendations for Future Study

For more than a decade, Benner et al. (2010) have called for a shift in nursing pedagogies that foster a sense of salience, situated cognition, and action. The AACN's New Essentials and Competency Based Education aim to prepare baccalaureate nursing students for the transition to professional nursing practice. Learning through simulation allows theoretical knowledge to be applied contextually, reflecting the realities of the practice environment (Maude et al., 2021). While simulated learning activities are prevalent in pre-licensure nursing curricula and an effective strategy for Competency Based Education, Martin and Tyndall (2022) report a lack of comparative studies examining HFMS and VRS modalities. Preliminary evidence suggests that HFMS and VRS platforms affect certain aspects of clinical judgment more so than others (Martin & Tyndall, 2022). Emerging technologies in VRS platforms may address some of the assessment limitations found in this study, but comparative evidence is still necessary to ensure the correct ratio of virtual options to manikin scenarios for baccalaureate students for optimal clinical judgment formation. Additionally, ABSN students may be at a disadvantage given their shortened academic preparation to develop clinical judgment aptitude. With the paucity of studies examining clinical judgment formation in this population (Martin & Tyndall, 2022), more research is necessary to determine how ABSN student attributes, their accelerated curricula, or other factors impact their clinical judgment competencies when compared to their TBSN counterparts.

While this study is a step in the right direction, questions remain how the results may be affected by student type or simulation modality. Therefore, more rigorous comparative research between HFMS and VRS modalities and between ABSN and TBSN samples is warranted. Additionally, further research into standardized exit exams and their relationship to dimensions

of clinical judgment will enable nursing faculty to identify and remediate nursing students' clinical judgment deficiencies prior to transition into the workforce. These research efforts will address the gaps in the science lending valuable insight into innovative educational practices.

Limitations

There were several limitations to this study. First, the small sample size from one school of nursing and the high attrition rate of the TBSN group limited the generalizability of the findings. Incentivizing the TBSN participants may have improved retention and fostered deeper reflection on the debriefing questionnaire. Second, there were variances in the delivery of the theoretical content in the simulated activity (COPD, pneumothorax, and ABG analysis) between ABSN and TBSN groups (7 months and 12 months, respectively) as well as with the faculty teaching the content with the PI teaching these content areas for ABSN students. The resource packet sent to all participants one week prior to their simulation aimed to ameliorate this concern, but this did not include ABG analysis information. Third, cross talk between students may have occurred within the TBSN group. Cross talk occurs when students share their simulation experience with other participants. While ABSN participants completed the scenario simultaneously, thus eliminating this potential confounder, collecting data on all TBSN participants occurred over several weeks. All TBSN students signed a confidentiality agreement with additional emphasis on not disclosing the specifics of the HFMS stressed by the PI. Lastly, research findings from the TBSN group may have been impacted by the Hawthorne effect. The Hawthorne effect describes the tendency in observational experiments, for participants to modify their behavior because they know they are being studied, thereby altering the research findings (Payne & Payne, 2011). To mitigate the Hawthorne effect, during the pre-brief session the researcher developed rapport with the TBSN participants by discussing their future nursing

plans, as well as reassuring the participants the purpose of the study was not to pass judgment on their performance but to compare clinical judgment between two groups of learners. Interestingly, a noted benefit of VRS is reasonable freedom from the Hawthorne effect (Harrell et al., 2013). Thus, this was not a limitation for the ABSN group.

Conclusion

Despite the limitations noted, this study provides comparative evidence of clinical judgment competency between ABSN and TBSN learners at similar points in their curricula as well as highlighting strengths and weaknesses between two simulation modalities. Findings suggest that accelerated programs are effective in developing clinical judgment competency despite the shortened academic preparation. Preliminary evidence from this study indicates standardized exit exam scores may correlate with specific dimensions of clinical judgment, perhaps being utilized to identify deficiencies in clinical judgment aptitude prior to transition to practice. Research involving future ABSN and TBSN cohorts or with other ABSN programs would add to the evidence of this study, potentially validating the findings. With emphasis in pre-licensure nursing programs on clinical judgment competency, evaluating the effect of simulation modalities, particularly virtual platforms, is vital to transition safe, competent new graduates into the workforce.

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APPENDIX A: NOTIFICATION OF UMCIRB APPROVAL

From:	Social/Behavioral IRB
To:	Jeanne Martin
CC:	Laura Gantt
Date:	7/8/2022
Re:	UMCIRB 21-000819 Comparing clinical judgment competency between accelerated and traditional baccalaureate nursing students during high-fidelity simulation

I am pleased to inform you that your research submission has been certified as exempt on 7/8/2022. This study is eligible for Exempt Certification under category # 1 & 2ab.

Amendment Approved

ID:	Ame1_UMCIRB 21-000819
Title:	Amendment 1 for IRB Study #UMCIRB 21-000819 Comparing clinical judgment competency between accelerated and traditional baccalaureate nursing students during high-fidelity simulation
Description:	Your amendment has been approved. To navigate to the project workspace, click on the above ID.

APPENDIX B: CONSENT FOR ABSN PARTICIPANTS

Recruitment Script

You are being invited to participate in a **research** study titled *"Examining Clinical Judgment Differences Between Traditional and Accelerated Baccalaureate Nursing Students Using High-fidelity Simulation"* being conducted by *Jeanne Martin*, a *PhD student* at East Carolina University in the *Nursing Science* department. The goal is to examine *19* individuals in *the learning resource computer laboratory at ECU College of Nursing during a computerized simulation*. The *simulation* will take approximately *1* hour to complete. *HESI exit exam score and NCLEX-RN result of each participant will be used in the data analysis.* It is hoped that this information will assist us to better understand *the clinical judgment differences between traditional and accelerated BSN students in their final semester during a high-fidelity simulation, with ABSN students using a virtual, computer-based platform and TBSN using high-fidelity manikins. Both groups will use the same medical-surgical scenario.* Your responses will be kept confidential, and no data will be analyzed until after your graduation in December 2022. Additionally, no data will be released or used with your identification attached. Your participation in the research is **voluntary**. You may choose not to answer any or all questions, and you may stop at any time. We ***will not*** be able to pay you for the time you volunteer while being in this study. There is **no penalty for not taking part** in this research study. Please call *Laura Gantt* at *252-744-6503……* for any research related questions or the University & Medical Center Institutional Review Board (UMCIRB) at 252-744-2914 for questions about your rights as a research participant.

I DO WISH TO PARTICIPATE IN THIS RESEARCH STUDY.

Signed: _____ Date: _____

If you decline to participate, please sign here:

I DO **NOT** WISH TO PARTICIPATE IN THIS RESEARCH STUDY.

_____

APPENDIX C: CONSENT FOR TBSN PARTICIPANTS

Recruitment Script

You are being invited to participate in a **research** study titled *"Examining Clinical Judgment Differences Between Traditional and Accelerated Baccalaureate Nursing Students Using High-fidelity Simulation"* being conducted by *Jeanne Martin*, a *PhD student* at East Carolina University in the *Nursing Science* department. The goal is to examine *22* individuals in *the Concepts Integration Laboratories at ECU College of Nursing during a high-fidelity manikin simulation*. The *simulation* will take approximately *1* hour to complete and *will be videorecorded*. *HESI exit exam score and NCLEX-RN result of each participant will be used in the data analysis.* It is hoped that this information will assist us to better understand *the clinical judgment differences between traditional and accelerated BSN students in their final semester during a high-fidelity simulation, with ABSN students using a virtual, computer-based platform and TBSN using high-fidelity manikins. Both groups will use the same medical-surgical scenario.* Your responses will be kept confidential and no data will be analyzed until after your graduation in December 2022. Additionally, no data will be released or used with your identification attached. Your participation in the research is **voluntary**. You may choose not to answer any or all questions, and you may stop at any time. We ***will not*** be able to pay you for the time you volunteer while being in this study. There is **no penalty for not taking part** in this research study. Please call *Jeanne Martin* at *252-945-3227……* for any research related questions or the University & Medical Center Institutional Review Board (UMCIRB) at 252-744-2914 for questions about your rights as a research participant.

I DO WISH TO PARTICIPATE IN THIS RESEARCH STUDY.

Signed: _____ Date: _____

Please print name: _____ Email address: _____

APPENDIX D: DEMOGRAPHIC SURVEY

Please answer the following questions.

NAME (please print): _____

Circle One: ABSN TBSN

AGE: _____

RACE: _____

IDENTIFIED GENDER: _____

FIRST DEGREE (if applicable): _____

Were you unsuccessful in a previous nursing course? If so, which one: _____

NOTE: **You may choose to omit answers to any of the above questions.**

APPENDIX E: LASATER CLINICAL JUDGMENT RUBRIC

Wolters Kluwer

VSIM FOR NURSING TO DEVELOP CLINICAL JUDGMENT FORMATION USING THE LASATER CLINICAL JUDGMENT RUBRIC

DIMENSION		EXEMPLARY (4)	ACCOMPLISHED (3)	DEVELOPING (2)	BEGINNING (1)
EFFECTIVE NOTICING INVOLVES:					

Focused Observation (Data refers to subjective and objective data)	**vSim Clinical Performance Indicator:**
	• Vital Signs
	• Assessments:
	  ○ HTT, Body Assessments, Auscultated Areas
	  ○ Allergies
	  ○ Postoperative Assessments
	• Dressings/Surgical Site
		☐ Focuses observation appropriately
		☐ Regularly monitors a wide variety of data
		☐ Uncovers useful information
		☐ Regularly observes and monitors data
			☐ Regularly monitors a variety of data
			☐ Most useful information is noticed
			☐ May miss the most subtle signs
			☐ Attempts to monitor a variety of data
				☐ Attempts to monitor a variety of data
				☐ Focuses on the most obvious data,
				☐ Missing some important information
					☐ Observation is not organized
					☐ Important data missed, and/or
					☐ Assessment errors are made
					☐ Confused by the clinical situation and the amount of data

		Observations:			
Recognizing deviations from expected patterns	**vSim Clinical Performance Indicator:** • Abnormal Data • Patterns and Deviations from Normal	☐ Recognizes subtle patterns ☐ Recognizes deviations from expected patterns in data ☐ Uses these to guide the assessment	☐ Recognizes most obvious patterns ☐ Recognizes deviations in data ☐ Uses data to continually assess	☐ Identifies obvious patterns and deviations ☐ Missing some important information ☐ Unsure how to continue assessment	☐ Focuses on one thing at a time ☐ Misses most patterns and deviations ☐ Misses opportunities to refine the assessment
		Observations:			
Information Seeking	**vSim Clinical Performance Indicator:** • Subjective Data Assessment • Asking Questions	☐ Assertively seeks information to plan intervention ☐ Carefully collects useful data from interacting with the patient and family ☐ Actively seeks subjective information about patient's situation	☐ Seeks information from the patient and family to plan interventions ☐ Occasionally does not pursue important leads	☐ Makes limited efforts to seek additional information ☐ Pursues unrelated information	☐ Is ineffective in seeking information ☐ Relies mostly on objective data ☐ Difficulty interacting with the patient and family and ☐ Fails to collect important subjective data
		Observations:			

Dimension		Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Effective Interpreting Involves:					
Prioritizing data	vSim Clinical Performance Indicator: • Action plan reflects most relevant or important problem	☐ Focuses on the most relevant and important data to explain the patient's condition	☐ Seeks further relevant information but also may attend to less pertinent data ☐ Makes an effort to prioritize data	☐ Makes an effort to focus on the most important, but also attends to less relevant or useful data	☐ Appears not to know which data are most important to the diagnosis ☐ Attempts to attend to all available data
		Observations:			
Making sense of data (Patterns include nursing knowledge base, research, personal experience, and intuition)	vSim Clinical Performance Indicator: • Action plan identified from identified patterns • Interventions in feedback log demonstrate plan of action • Nursing knowledge/Theory	Complex, conflicting, or confusing data present: ☐ Makes sense of patterns in patient data ☐ Compares data with known pattern ☐ Develop interventions that can be justified in terms of their likelihood of success	In most situations: ☐ Interprets the patient's data patterns ☐ Compares with known patterns to develop an intervention plan with rationale ☐ Rarely or in complicated cases, seeks the guidance of a specialist or a more experienced nurse	In simple, common, or familiar situations: ☐ Is able to compare the patient's data patterns with those known ☐ Develop or explain interventions plans, but difficulty with even moderately difficult data or situations within the expectations of students ☐ Inappropriately requires advice or assistance	Even in simple, common, or familiar situations: ☐ Has difficulty interpreting or making sense of data ☐ Has trouble distinguishing among competing explanations/appropriate interventions ☐ Requires assistance with diagnosing the problem and developing an intervention
		Observations:			

DIMENSION		EXEMPLARY (4)	ACCOMPLISHED (3)	DEVELOPING (2)	BEGINNING (1)
EFFECTIVELY RESPONDING INVOLVES:					
Calm, Confident Manner	vSim Clinical Performance Indicator: • Emotions described in debrief question • Statements to patient/family during simulation	☐ Assumes responsibility ☐ Delegates team assignments ☐ Assesses patients ☐ Reassures patient/families	☐ Generally displays leadership/confidence ☐ Able to control/calm most situations ☐ May show stress in difficult/complex situations	☐ Is tentative in the leader role ☐ Reassures patients and families in routine, simple situations ☐ Becomes stressed/disorganized easily	☐ Except in simple and routine situations, is stressed/disorganized, ☐ Lacks control ☐ Makes patients/families anxious or less able to cooperate
		Observations:			
Clear Communication	vSim Clinical Performance Indicator: • Communication with patient/staff/family • Patient Teaching • Assessment Questions	☐ Communicates effectively ☐ Calms/reassures patients and families ☐ Directs/involves team members ☐ Explains/gives directions	☐ Generally, communicates well ☐ Explains carefully to patients ☐ Gives clear directions to team ☐ Checks for understanding	☐ Could be more effective in establishing rapport ☐ Shows some communication ability ☐ Partly successful in communication with patients, families, and team members ☐ Displays caring but not competence	☐ Has difficulty communicating ☐ Explanations are confusing ☐ Directions are unclear/contradictory ☐ Patients and families are made confused/anxious and are not reassured
		Observations:			

Adapted with permission from "Clinical Judgment Development: Using Simulation to Create a Rubric", by Lasater, K., 2007, *Journal of Nursing Education, 46, 496-503.*

Dimension		Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Effectively Responding Involves: *(Cont.)*					
Well-planned Intervention/Flexibility	**vSim Clinical Performance Indicator:** • Assessment/Reassessments • Monitoring of patient progress • Actions prioritized for identified problem • Actions taken related to patient response: o Comfort Measures o Respiratory Interventions o Ventilation/Oxygenation o Cardiovascular Interventions o GI/GU Interventions o Post-Operative Interventions o Drug & IV Management	☐ Interventions tailored to the individual patient ☐ Monitors patient progress closely ☐ Adjusts treatment as indicated by patient response	☐ Develops interventions on the basis of relevant patient data ☐ Monitors progress regularly ☐ Does not expect to have to change treatments	☐ Develops interventions on the most obvious data ☐ Monitors progress; unable to make adjustments as indicated by the patient's response ☐ Focuses on developing a single intervention	☐ Addresses a likely solution, but it may be vague, confusing, and/or incomplete ☐ Some monitoring may occur
		Observations:			
Being Skillful	**vSim Clinical Performance Indicator:** • Timeline for skill implementation • Interventions chosen related to primary problem	☐ Shows mastery of necessary nursing skills ☐ Displays proficiency in the use of most nursing skills	☐ Could improve speed or accuracy, otherwise is proficient in nursing skills	☐ Is hesitant or ineffective in using nursing skills	☐ Is unable to select and/or perform nursing skills
		Observations:			

Dimension		Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Effective Reflecting Involves:					
Evaluation/Self-Analysis	vSim Clinical Performance Indicator: • Debriefing Question Responses: o Evaluation/Analysis of Clinical Performance o Strengths/Weaknesses o Answers to vSim for Nursing specific reflection questions	☐ Independently evaluates/analyzes personal clinical performance ☐ Notes decision points, elaborates on alternatives, and accurately evaluates choices against alternatives ☐ Evaluates and analyzes personal clinical performance with minimal prompting	☐ Primarily focuses on major events or decisions ☐ Key decision points identified, and alternatives are considered ☐ Even when prompted, briefly verbalizes the most obvious evaluations	☐ Has difficulty imagining alternative choices ☐ Is self-protective in evaluating personal choices	☐ Even prompted evaluations are brief, cursory, and not used to improve performance ☐ Justifies personal decisions and choices without evaluating them
		Observations:			
Commitment to Improvement	vSim Clinical Performance Indicator: • Debriefing Question Responses: o Plans for future use of learning o Strengths/Weaknesses o Answers to vSim for Nursing specific reflection questions	☐ Demonstrates commitment to ongoing improvement ☐ Reflects on and critically evaluates nursing experiences ☐ Accurately identifies strengths/weaknesses and develops specific plans to eliminate weaknesses ☐ Demonstrates a desire to improve nursing performance	☐ Reflects on and evaluates experiences ☐ Identifies strengths and weaknesses ☐ Could be more systematic in evaluating weaknesses	☐ Demonstrates awareness of the need for ongoing improvement ☐ Makes some effort to learn from experience/ improve performance ☐ Tends to state the obvious and needs external evaluation	☐ Appears uninterested in improving performance or is unable to do so ☐ Rarely reflects; is uncritical of self or overly critical (given level of development) ☐ Is unable to see flaws or need for improvement
		Observations:			

APPENDIX F: MODIFIED LASATER CLINICAL JUDGMENT RUBRIC

DIMENSION		EXEMPLARY (4)	ACCOMPLISHED (3)	DEVELOPING (2)	BEGINNING (1)
EFFECTIVE NOTICING INVOLVES:					
Focused Observation (Data refers to subjective and objective data)	**vSim Clinical Performance Indicator:** • Vital Signs • Assessments: ○ HTT, Body Assessments, Auscultated Areas ○ Allergies ○ Postoperative Assessments *N/A • Dressings/Surgical Site *CT dressing	Focuses observation appropriately Regularly monitors a wide variety of data Uncovers useful information Regularly observes and monitors data Obtains VS &O2 sat<2" IDs pt/Checks allergies <2" HTT assessment/ECG <5" Applies NIBP	Regularly monitors a variety of data Most useful information is noticed May miss the most subtle signs Attempts to monitor a variety of data Obtains VS &O2 sat<3" IDs pt/Checks allergies <3" HTT assessment/ECG <6"	Attempts to monitor a variety of data Focuses on the most obvious data, Missing some important information Obtains VS &O2 sat<4" IDs pt/Checks allergies <4" HTT assessment/ECG <7"	Observation is not organized Important data missed, and/or Assessment errors are made Confused by the clinical situation and the amount of data Obtains VS &O2 sat>4" IDs pt/Checks allergies >4" HTT assessment/ECG >7"
Recognizing deviations from expected patterns **NOTE:** spontaneous pneumothorax occurs at 9 min into scenario	**vSim Clinical Performance Indicator:** • Abnormal Data • Patterns and Deviations from Normal **Expected actions:** Assesses lung sounds/pain after pneumo Notifies MD Answer to Reflective question #3	Recognizes subtle patterns Recognizes deviations from expected patterns in data Uses these to guide the assessment **Observations**	Recognizes most obvious patterns Recognizes deviations in data Uses data to continually assess	Identifies obvious patterns and deviations Missing some important information Unsure how to continue assessment	Focuses on one thing at a time Misses most patterns and deviations Misses opportunities to refine the assessment
Information Seeking	**vSim Clinical Performance Indicator:** • Subjective Data Assessment • Asking Questions	Assertively seeks information to plan intervention Carefully collects useful data from interacting with the patient and family Actively seeks subjective information about patient's situation **Observations:** **Expected Actions:** Asks about pain, how pt is feeling, history, symptoms, meds After pneumo asks about pain After CT asks about how feeling/breathing	Seeks information from the patient and family to plan interventions Occasionally does not pursue important leads	Makes limited efforts to seek additional information Pursues unrelated information	Is ineffective in seeking information Relies mostly on objective data Difficulty interacting with the patient and family and Fails to collect important subjective data

Note. Blue comments are part of the modified LCJR in vSim® Instructor Resources. Red comments are PI comments and pertain to specific vSim® Scenario.

DIMENSION		EXEMPLARY (4)	ACCOMPLISHED (3)	DEVELOPING (2)	BEGINNING (1)
EFFECTIVE INTERPRETING INVOLVES:					
Prioritizing data	**vSim Clinical Performance Indicator:** • Action plan reflects most relevant or important problem NOTE: Analysis reflection question #2 will be helpful scoring this section	Focuses on the most relevant and important data to explain the patient's condition	Seeks further relevant information but also may attend to less pertinent data Makes an effort to prioritize data	Makes an effort to focus on the most important, but also attends to less relevant or useful data	Appears not to know which data are most important to the diagnosis Attempts to attend to all available data
		Observations: **Expected Actions:** Prioritizes VS/O2 sats/Respiratory components of assessment over other body systems After pneumo- are there non-priority actions or assessments done prior to stabilizing the patient and implementing orders?			
Making sense of data (Patterns include nursing knowledge base, research, personal experience, and intuition)	**vSim Clinical Performance Indicator:** • Action plan identified from identified patterns • Interventions in feedback log demonstrate plan of action • Nursing knowledge/Theory NOTE: Analysis reflection questions #2, #3, & #4 will be helpful scoring this section	Complex, conflicting, or confusing data present: Makes sense of patterns in patient data Compares data with known pattern Develop interventions that can be justified in terms of their likelihood of success Calls HCP w/in 1 min of pneumo Changes O2 delivery method based on sats (places NRB when sats low, changes to NC when >90%).	In most situations: Interprets the patient's data patterns Compares with known patterns to develop an intervention plan with rationale Rarely or in complicated cases, seeks the guidance of a specialist or a more experienced nurse Calls HCP w/in 2 min of pneumo Changes O2 delivery method based on sats but with time delay	In simple, common, or familiar situations: Is able to compare the patient's data patterns with those known Develop or explain interventions plans, but difficulty with even moderately difficult data or situations within the expectations of students Inappropriately requires advice or assistance Calls HCP w/in 3 min of pneumo Changes O2 delivery method based on sats but uses incorrect delivery system	Even in simple, common, or familiar situations: Has difficulty interpreting or making sense of data Has trouble distinguishing among competing explanations/appropriate interventions Requires assistance with diagnosing the problem and developing an intervention Calls HCP >3 min of pneumo Does not change O2 delivery method based on sats.
		Observations:			

Note. Blue comments are part of the modified LCJR in vSim® Instructor Resources. Red comments are PI comments and pertain to specific vSim® Scenario.

DIMENSION		EXEMPLARY (4)	ACCOMPLISHED (3)	DEVELOPING (2)	BEGINNING (1)
EFFECTIVELY RESPONDING INVOLVES:					
Calm, Confident Manner	**vSim Clinical Performance Indicator:** • Emotions described in debrief question • Statements to patient/family during simulation **NOTE:** *Analysis reflection questions #1 will be helpful scoring this section *Time lags overall in scenario reflects lack of confidence	Assumes responsibility Delegates team assignments Assesses patients Reassures patient/families	Generally displays leadership/confidence Able to control/calm most situations May show stress in difficult/complex situations	Is tentative in the leader role Reassures patients and families in routine, simple situations Becomes stressed/disorganized easily	Except in simple and routine situations, is stressed/disorganized, Lacks control Makes patients/families anxious or less able to cooperate
		Observations:			
Clear Communication	**vSim Clinical Performance Indicator:** • Communication with patient/staff/family • Patient Teaching • Assessment Questions **NOTE:** Reflective Question #6 will be used to evaluate communication with staff via SBAR report Reflective Questions #7 & #8 will further evaluate pt. teaching	Communicates effectively Calms/reassures patients and families Directs/involves team members Explains/gives directions Student communicates with pt multiple times throughout scenario	Generally, communicates well Explains carefully to patients Gives clear directions to team Checks for understanding Student communicates with pt at least twice during scenario	Could be more effective in establishing rapport Shows some communication ability Partly successful in communication with patients, families, and team members Displays caring but not competence Student communicates with pt at least once during scenario	Has difficulty communicating Explanations are confusing Directions are unclear/ contradictory Patients and families are made confused/anxious and are not reassured Student does not communicate with pt during scenario
		Observations: **Expected Actions:** Student calls provider at least once; Student provides education at least once			

Note. Blue comments are part of the modified LCJR in vSim® Instructor Resources. Red comments are PI comments and pertain to specific vSim® Scenario.

Dimension		Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Effectively Responding Involves: *(Cont.)*					
Well-planned Intervention/Flexibility	**vSim Clinical Performance Indicator:** • Assessment/Reassessments • Monitoring of patient progress • Actions prioritized for identified problem • Actions taken related to patient response: ○ Comfort Measures ○ Respiratory Interventions ○ Ventilation/Oxygenation ○ Cardiovascular Interventions ○ GI/GU Interventions ○ Post-Operative Interventions ○ Drug & IV Management	Interventions tailored to the individual patient Monitors patient progress closely Adjusts treatment as indicated by patient response Places O2-NRB when sats low, changes to NC when sats improve	Develops interventions on the basis of relevant patient data Monitors progress regularly Does not expect to have to change treatments Places O2-NRB when sats low, no change to NC when sats improve	Develops interventions on the most obvious data Monitors progress; unable to make adjustments as indicated by the patient's response Focuses on developing a single intervention Uses incorrect O2 delivery method for sats	Addresses a likely solution, but it may be vague, confusing, and/or incomplete Some monitoring may occur Does not address O2 sats
		Expected Actions: Raises HOB; Obtains ABG; Gives albuterol Reassesses respiratory after pneumo and after CT; CXR before and after CT Checks CT functioning Assesses/Obtains IV; Gives Morphine before CT inserted, after consent verified			
Being Skillful	**vSim Clinical Performance Indicator:** • Timeline for skill implementation • Interventions chosen related to primary problem	Shows mastery of necessary nursing skills Displays proficiency in the use of most nursing skills	Could improve speed or accuracy, otherwise is proficient in nursing skills	Is hesitant or ineffective in using nursing skills Albuterol stopped too soon Morphine given incorrectly (too fast or no IV flush) O2 not set up correctly (ex: NRB flow meter not at 10L/min)	Is unable to select and/or perform nursing skills Performs any interventions not ordered
		Expected Actions: Washes hands when beginning care Follows orders as prescribed, i.e., obtains consent > administers morphine > assists with CT insertion			

Note. Blue comments are part of the modified LCJR in vSim® Instructor Resources. Red comments are PI comments and pertain to specific vSim® Scenario.

APPENDIX G: REFLECTION QUESTIONAIRE

Name: _____

Guided Reflection Questions for Vincent Brody

Opening Question

How did the scenario make you feel?

Scenario Analysis Questions*

PCC When a patient develops a rapid onset of shortness of breath, what are the nurse's immediate priorities?

PCC What assessment findings would indicate that the patient's condition is worsening?

PCC/I Review Vincent Brody's laboratory results. Which results are abnormal? Discuss how these results relate to his clinical presentation and chronic disease process.

PCC/S What are safety considerations when caring for a patient with a chest tube?

PCC/S What key elements would you include in the handoff report for this patient? Consider the SBAR (situation, background, assessment, recommendation) format.

Concluding Questions

What patient teaching priorities would be important in the patient experiencing an acute exacerbation of COPD?

For a patient with COPD who is stable, what resources would you recommend?

What would you do differently if you were to repeat this scenario? How would your patient care change?

** The Scenario Analysis Questions are correlated to the Quality and Safety Education for Nurses (QSEN) competencies: Patient-Centered Care (PCC), Teamwork and Collaboration (T&C), Evidence-Based Practice (EBP), Quality Improvement (QI), Safety (S), and Informatics (I). Find more information at: http://qsen.org/*

APPENDIX H: FACULTY GUIDE FOR REFLECTION QUESTIONAIRE

Faculty Guide for Vincent Brody

Reactive Phase

1. How did the scenario make you feel?

(The answer to this question is subjective and dependent on the learner's past experiences.)
Learner's Response: The learner may express feelings of guilt and anxiety.

Analysis Phase

2. When a patient develops a rapid onset of shortness of breath, what are the nurse's immediate priorities?

Learner's Response: Expect the learner to discuss positioning, airway management, oxygenation, focused assessment, and therapeutic communication.

3. What assessment findings would indicate the patient's condition is worsening?

Learner's Response: Expect the learner to describe the symptoms of decompensation in COPD patients.

4. Review Vincent Brody's laboratory results. Which results are abnormal? Discuss how these results relate to his clinical presentation and chronic disease process.

Learner's Response: Expect the learner to critically analyze and integrate pertinent lab values related to the disease process, patient's age, medications, diagnostic studies, and appropriate interventions. The learner should correlate the abnormal ABG values and chest x-ray to the chronic history of COPD and spontaneous pneumothorax.

5. What are safety considerations when caring for a patient with a chest tube?

Learner's Response: Expect learner to list appropriate assessment and care of a chest tube system (e.g., fluctuation, output, color, and air leak).

Learner's Response: Expect the learner to discuss evidence-based practice safety measures needed in case of chest tube dislodgement. (e.g. hemostats, vaseline gauze at bedside)

6. What key elements would you include in the handoff report for this patient? Consider the SBAR (situation, background, assessment, recommendation) format.

Learner's Response: Expect learner to discuss the importance of oxygenation; therefore, key elements of the handoff should include focused assessment, history, insertion of chest tube, and interventions specific to chest tube management.

Summary Phase

7. What patient teaching priorities would be important in the patient experiencing an acute exacerbation of COPD?

Learner's Response: Expect the learner to discuss the importance of adhering to medication regimen, diet, and lifestyle modifications, and being aware of triggering events (e.g., environment, emotions, exercise).

8. For a patient with COPD who is stable, what resources would you recommend?

Learner's Response: Expect the learner to discuss outpatient community services available for the patient to use (e.g., social worker, durable medical equipment, medication assistance programs, home health referral).

9. What would you do differently if you were to repeat this scenario? How would your patient care change?

Learner's Response: Expect learner to identify and prioritize treatment using the detailed feedback log.

APPENDIX I: PRE-SIMULATION QUIZ

Name (please print): _____

Pre-simulation Quiz

1. Is the following statement true or false? Oxygen concentrations must be carefully titrated in patients experiencing chronic obstructive pulmonary disease (COPD) because some COPD patients may be oxygen sensitive, which can cause an increase in carbon dioxide.

____ True
____ False

2. The nurse recognized that risk factors for chronic obstructive pulmonary disease (COPD) include which of the following? **(Select all that apply.)**

____ Exposure to dust
____ Smoking tobacco
____ Secondhand smoke
____ Alpha1-antitrypsin excess
____ Air pollution

3. When assessing breath sounds in a patient experiencing chronic obstructive pulmonary disease (COPD), the nurse would expect which of the following signs and symptoms? **(Select ONE option.)**

_____ Frothy pink sputum
_____ Dyspnea with a chronic cough
_____ Tachypnea with an inspiratory wheeze
_____ Increase air entry to the lung bases

4. The nurse understands that for a patient with chronic obstructive pulmonary disease (COPD), chronic hypoxemia and thickening of the walls of the pulmonary vasculature can lead to which complication? **(Select ONE option.)**

_____ Pneumothorax
_____ Atelectasis
_____ Pneumonia
_____ Pulmonary hypertension

5. The nurse understands that the pathophysiology of chronic obstructive pulmonary disease (COPD) is related to which of the following? **(Select ONE option.)**

_____ Chronic inflammation and narrowing of airways
_____ Chronic vasoconstriction of airways
_____ Chronic decreased CO2 levels
_____ Chronic vasodilation and widening of airways

6. Arterial blood gas (ABG) levels may be obtained when the patient is experiencing exacerbations of chronic obstructive pulmonary disease (COPD). How would the nurse interpret the following ABSG levels? pH: 7.33 PaCO2: 55mmHg HCO3: 22 mEq/L PaO2 78mmHg. **(Select ONE option.)**

_____ Respiratory alkalosis with full compensation and normal oxygenation
_____ Respiratory alkalosis with no compensation and moderate hypoxemia
_____ Metabolic acidosis with partial compensation and severe hypoxemia
_____ Respiratory acidosis with no compensation and mild hypoxemia

7. In a patient with chronic obstructive pulmonary disease (COPD), the nurse would expect to observe which of the following clinical manifestations based on the arterial blood gas (ABG) results below? pH: 7.33 PaCO2: 55mmHg HCO3: 22 mEq/L PaO2 78mmHg, **(Select ONE option.)**

_____ Likely asymptomatic
_____ Mental cloudiness
_____ Increased blood pressure
_____ Tachypnea

APPENDIX J: PRE-SIMULATION QUIZ KEY

Pre-simulation Quiz

1. Is the following statement true or false? Oxygen concentrations must be carefully titrated in patients experiencing chronic obstructive pulmonary disease (COPD) because some COPD patients may be oxygen sensitive, which can cause an increase in carbon dioxide.

__X__ True
____ False

2. The nurse recognized that risk factors for chronic obstructive pulmonary disease (COPD) include which of the following? **(Select all that apply.)**

__X__ Exposure to dust
__X__ Smoking tobacco
__X__ Secondhand smoke
____ Alpha1-antitrypsin excess
__X__ Air pollution

3. When assessing breath sounds in a patient experiencing chronic obstructive pulmonary disease (COPD), the nurse would expect which of the following signs and symptoms? **(Select ONE option.)**

_____ Frothy pink sputum
__X__ Dyspnea with a chronic cough
_____ Tachypnea with an inspiratory wheeze
_____ Increase air entry to the lung bases

4. The nurse understands that for a patient with chronic obstructive pulmonary disease (COPD), chronic hypoxemia and thickening of the walls of the pulmonary vasculature can lead to which complication? **(Select ONE option.)**

_____ Pneumothorax
_____ Atelectasis
_____ Pneumonia
__X__ Pulmonary hypertension

5. The nurse understands that the pathophysiology of chronic obstructive pulmonary disease (COPD) is related to which of the following? **(Select ONE option.)**

__X__ Chronic inflammation and narrowing of airways
_____ Chronic vasoconstriction of airways
_____ Chronic decreased CO2 levels
_____ Chronic vasodilation and widening of airways

6. Arterial blood gas (ABG) levels may be obtained when the patient is experiencing exacerbations of chronic obstructive pulmonary disease (COPD). How would the nurse interpret the following ABSG levels? pH: 7.33 PaCO2: 55mmHg HCO3: 22 mEq/L PaO2 78mmHg. **(Select ONE option.)**

_____ Respiratory alkalosis with full compensation and normal oxygenation
_____ Respiratory alkalosis with no compensation and moderate hypoxemia
_____ Metabolic acidosis with partial compensation and severe hypoxemia
__X__ Respiratory acidosis with no compensation and mild hypoxemia

7. In a patient with chronic obstructive pulmonary disease (COPD), the nurse would expect to observe which of the following clinical manifestations based on the arterial blood gas (ABG) results below? pH: 7.33 PaCO2: 55mmHg HCO3: 22 mEq/L PaO2 78mmHg. **(Select ONE option.)**

__X__ Likely asymptomatic
_____ Mental cloudiness
_____ Increased blood pressure
_____ Tachypnea

APPENDIX K: POST-SIMULATION QUIZ

Name (please print): _____

Post-simulation Quiz

1. Which of the following are initial assessments the nurse understands as potential signs and symptoms of a pneumothorax? **(Select all that apply.)**

_____ Respiratory acidosis
_____ Increased SpO2
_____ Dyspnea
_____ Tachypnea
_____ Asymmetrical chest wall movement

2. The nurse understands that tidaling in the patient assessment chamber of a chest tube is which type of finding? **Select ONE option.)**

_____ Life-threatening
_____ Abnormal
_____ Emergency
_____ Normal

3. Vincent Brody was given morphine 2 mg IV prior to his chest tube insertion. The nurse must monitor for which of the following adverse effects with morphine administration? **Select ONE option.)**

_____ Tachypnea, diuresis, nausea
_____ Hypertension, increased alertness, tachycardia
_____ Respiratory depression, bradycardia, hypotension
_____ Tachypnea, tachycardia, diaphoresis

4. One hour after the chest tube is inserted, repeated arterial blood gases (ABGs) are done and the results are: pH: 7.35 PaCO2: 51mmHg HCO3-: 29mEq/L PaO2: 85mmHg. These results are compared to the ABG drawn earlier: pH: 7.33 PaCO2: 55mmHg HCO3: 22 mEq/L PaO2 78mmHg. What would a comparison of the two ABGs indicate to the nurse about the patient's condition? **Select ONE option.)**

_____ Worsening
_____ Staying within the same range
_____ Improving

5. A patient who currently has a chest tube in situ suddenly becomes short of breath with tracheal deviation. What does the nurse suspect has occurred? **Select ONE option.)**

_____ Spontaneous pneumothorax
_____ Tension pneumothorax
_____ Traumatic pneumothorax
_____ Simple pneumothorax

6. Which of the following is the correct analysis of the most recent arterial blood gas (ABG) result after insertion of a chest tube? pH: 7.35 PaCO2: 51mmHg HCO3-: 29mEq/L PaO2: 85mmHg. **Select ONE option.)**

_____ Metabolic acidosis with no compensation
_____ Metabolic alkalosis with no compensation
_____ Respiratory alkalosis fully compensated
_____ Respiratory acidosis fully compensated

7. Bronchodilators such as albuterol sulfate (Ventolin) are a common pharmacological treatment for patients experiencing chronic obstructive pulmonary disease (COPD). About which common adverse effects would the nurse educate the patient? **Select ONE option.)**

_____ Bradycardia, irritability, diaphoresis
_____ Bradycardia, hypotension, nasal dryness
_____ Tachycardia, hypotension, hoarseness
_____ Tachycardia, hypertension, tremor

8. The nurse assesses the patient with sudden shortness of breath. Which finding would suggest a potential left pneumothorax? **Select ONE option.)**

_____ Breath sounds greater on right than left
_____ Breath sounds decreased bilaterally in the bases
_____ Breath sounds absent on right
_____ Breath sounds greater on left than right

9. Which of the following does the nurse suspect as the most likely cause for a pneumothorax in a patient diagnosed with severe emphysema? **Select ONE option.)**

_____ Increasing percentage of oxygen
_____ Pursed-lip breathing
_____ Severe coughing episode
_____ Sitting up in chair

10. The nurse knows that a patient with a pneumothorax would exhibit which of the following signs and symptoms? **Select ONE option.)**

_____ Hypertension, bradycardia, hyper-resonant breath sounds
_____ Wheezing, hypo-resonant breath sounds, tachycardia
_____ Sudden chest pain, tachycardia, hypoxemia
_____ Gradual chest discomfort, bradycardia, hypoxemia

APPENDIX L: POST-SIMULATION QUIZ KEY

Post-simulation Quiz

1. Which of the following are initial assessments the nurse understands as potential signs and symptoms of a pneumothorax? **(Select all that apply.)**

_____ Respiratory acidosis
_____ Increased SpO2
__X__ Dyspnea
__X__ Tachypnea
__X__ Asymmetrical chest wall movement

2. The nurse understands that tidaling in the patient assessment chamber of a chest tube is which type of finding? **(Select ONE option.)**

_____ Life-threatening
_____ Abnormal
_____ Emergency
__X__ Normal

3. Vincent Brody was given morphine 2 mg IV prior to his chest tube insertion. The nurse must monitor for which of the following adverse effects with morphine administration? **(Select ONE option.)**

_____ Tachypnea, diuresis, nausea
_____ Hypertension, increased alertness, tachycardia
__X__ Respiratory depression, bradycardia, hypotension
_____ Tachypnea, tachycardia, diaphoresis

4. One hour after the chest tube is inserted, repeated arterial blood gases (ABGs) are done and the results are: pH: 7.35 PaCO2: 51mmHg HCO3-: 29mEq/L PaO2: 85mmHg. These results are compared to the ABG drawn earlier: pH: 7.33 PaCO2: 55mmHg HCO3: 22 mEq/L PaO2 78mmHg. What would a comparison of the two ABGs indicate to the nurse about the patient's condition? **Select ONE option.)**

_____ Worsening
_____ Staying within the same range
__X__ Improving

5. A patient who currently has a chest tube in situ suddenly becomes short of breath with tracheal deviation. What does the nurse suspect has occurred? **(Select ONE option.)**

_____ Spontaneous pneumothorax
__X__ Tension pneumothorax
_____ Traumatic pneumothorax
_____ Simple pneumothorax

6. Which of the following is the correct analysis of the most recent arterial blood gas (ABG) result after insertion of a chest tube? pH: 7.35 PaCO2: 51mmHg HCO3-: 29mEq/L PaO2: 85mmHg. **(Select ONE option.)**

_____ Metabolic acidosis with no compensation
_____ Metabolic alkalosis with no compensation
_____ Respiratory alkalosis fully compensated
__X__ Respiratory acidosis fully compensated

7. Bronchodilators such as albuterol sulfate (Ventolin) are a common pharmacological treatment for patients experiencing chronic obstructive pulmonary disease (COPD). About which common adverse effects would the nurse educate the patient? **(Select ONE option.)**

_____ Bradycardia, irritability, diaphoresis
_____ Bradycardia, hypotension, nasal dryness
_____ Tachycardia, hypotension, hoarseness
__X__ Tachycardia, hypertension, tremor

8. The nurse assesses the patient with sudden shortness of breath. Which finding would suggest a potential left pneumothorax? **(Select ONE option.)**

__X__ Breath sounds greater on right than left
_____ Breath sounds decreased bilaterally in the bases
_____ Breath sounds absent on right
_____ Breath sounds greater on left than right

9. Which of the following does the nurse suspect as the most likely cause for a pneumothorax in a patient diagnosed with severe emphysema? **(Select ONE option.)**

_____ Increasing percentage of oxygen
_____ Pursed-lip breathing
__X__ Severe coughing episode
_____ Sitting up in chair

10. The nurse knows that a patient with a pneumothorax would exhibit which of the following signs and symptoms? **(Select ONE option.)**

_____ Hypertension, bradycardia, hyper-resonant breath sounds
_____ Wheezing, hypo-resonant breath sounds, tachycardia
__X__ Sudden chest pain, tachycardia, hypoxemia
_____ Gradual chest discomfort, bradycardia, hypoxemia

APPENDIX M: PROCEDURAL CHECKLIST - ABSN PARTICIPANTS

1. PI will email participants the COPD-Chest Tube Management Resource packet with chest tube video link one week prior to scheduled simulation.
2. ABSN participants will report to Learning Resource Center (LRC) at the scheduled date and time.
3. ABSN participants will be proctored by the dissertation chair of the PI, and a faculty person in the NURS 4942 Transition to Interprofessional Practice course. Instructional Technology staff will be present to troubleshoot any potential technological issue.
4. ABSN participants will select a stationary computer terminal and be provided with headsets if they did not bring their own.
5. ABSN participants will complete the paper demographic survey and place in envelope.
6. Dissertation chair of the PI will read the Pre-brief Guide to the ABSN participants.
7. ABSN participants will use their assigned vSim® identification and password to log into the vSim® Medical-Surgical scenario of Vincent Brody.
8. ABSN participants will read the overview of the patient.
9. ABSN participants will take the electronic pre-simulation quiz and review their correct and incorrect responses.
10. ABSN participants will begin the vSim® scenario. ABSN participants will analyze assessment findings, respond by communicating with the interdisciplinary team, implement prioritized interventions, and evaluate the response of the patient to actions taken.
11. ABSN participants will conclude the scenario by the 25-minute mark by selecting the "Patient Hand-off" feature.
12. ABSN participants will NOT view the detailed feedback log until after the post-simulation quiz and reflection questionnaire is completed.
13. ABSN participants will complete the electronic post-simulation quiz and review their correct and incorrect responses.

APPENDIX N: PROCEDURAL CHECKLIST - TBSN PARTICIPANTS

1. PI will email participants the COPD-Chest Tube Management Resource packet with chest tube video link one week prior to scheduled simulation.
2. TBSN participants will report to assigned Pre-briefing room 15 minutes prior to assigned simulation time.
3. TBSN participants will complete the paper demographic survey and place in envelope.
4. TBSN participants will take the paper pre-simulation quiz and give to the PI. The PI will score and provide the TBSN participants with correct and incorrect responses.
5. The PI will follow the Pre-brief Simulation Guide to orient the participant to the scenario objectives, their role during the simulation, the simulation room; and review the confidentiality agreement.
6. The PI will provide SBAR report to participant.
7. The CILs technician will state “Scenario Begins” to indicate the start of the simulation to the TBSN participants.
8. TBSN participants will analyze assessment findings, respond by communicating with interdisciplinary team, implement prioritized interventions, and evaluate the response of the patient to actions taken. The scenario will last 25-minutes and be video recorded.
9. At the conclusion of 25 minutes, the CILs technician will announce, “Scenario Over”.
10. TBSN participants will complete the paper post-simulation quiz in the pre-briefing room and place in the designated envelope.
11. TBSN participants will complete the reflection questionnaire in the pre-briefing room and place in the designated envelope.
12. The PI will thank the TBSN participants for participating in the study.

APPENDIX O: PRE-BRIEFING GUIDE – ABSN

Participants will enter Learning Resource Center (LRC), stow belongings, and select a computer terminal. Provide headsets for students who did not bring. Give each student copy of the Demographic Survey, student instruction sheet, and the Debrief Reflection Questionnaire.

Welcome

- Thank you for participating in today's simulation!

Demographic Survey

- Please complete the demographic survey and give to Ms. Hughes. [Ms. Hughes places in designated envelope.]

Confidentiality—Read only if a student is absent from the vSim.

- Remember that what happens in sim-stays in sim. Please do not discuss today's events with other participants. The confidentiality agreement that you signed for simulation at the start of nursing school applies to today.

Objectives, Roles, and Timing

- The information packet you received last week indicated the type of patient you would be caring for today. The purpose of today's simulation will be to see how you care for a patient with a chronic disease process who has an acute complication. You will be the oncoming nurse. You will need to conclude the vSim scenario in 25 minutes, by selecting the "patient handoff" button.

Orientation to Environment

- Log in to the vSim environment and select Vincent Brody patient (allow students to do this). Please wait for my "GO" before you begin.
- Go through each of the following steps (Students will have printed copies of these steps at each of their computer terminals.)
    - Do Step #1-Read about the patient
    - Complete Step #2—Pre-simulation quiz
    - Complete Step#3—the vSim scenario; conclude the scenario in 25 minutes, using the "patient handoff" feature
    - Do **NOT** review your Feedback log, proceed directly to the post-simulation quiz
    - Complete Step #4—Post-simulation quiz
    - Complete the Debrief Reflection Questionnaire, **place your name at the top and answer all questions thoroughly**. When completed give to Ms. Hughes [Ms. Hughes places in designated envelope.]

You may leave the LRC once the guided reflection is given to Ms. Hughes.

Do you have any questions?

You may begin.

[Ms. Hughes takes both envelopes to 4165P, Laura Jackson's office.]

APPENDIX P: PRE-BRIEFING GUIDE – TBSN

Welcome

- Thank you for participating in today's simulation!

Confidentiality

- Remember that what happens in sim-stays in sim. Please do not discuss today's events with other participants. The confidentiality agreement that you signed for simulation at the start of nursing school applies to today.

Objectives and Expectations

- The information packet you received last week indicated the type of patient you would be caring for today. The purpose of today's simulation will be to see how you care for a patient with a chronic disease process who has an acute complication.

Orientation to Environment (start at phone and work clockwise around 4165 lab)

- **Phone:** select New Call, dial # on handset. Use for calling the HCP or any other interdisciplinary departments you may need.
- **Med Cart:** all medication for the scenario will be found in top drawer; there are gloves of various sizes beside the med cart
- **Supply Cart:** All supplies you will need for the simulation, including items for medication administration will be found in the rolling locker supply carts, or beside them. If you cannot find an item you are looking for, simply ask the room for its location.
- **IV Pump:** the IV pump will be set with a number on the front of the pump indicating the fluid rate. If this rate needs to be changed, please just verbalize aloud to the room.
- **O^2 Flowmeter:** If you use the O2 flowmeter or change oxygen administration levels, please verbalize to room, how many liters/min you are giving to the patient.
- **Monitor:** Touch once to activate ECG, O2 sats, RR, Temp. For BP, press NIBP (lower left corner) then press "Start/Stop" button to cycle. If there are any issues with the monitor, just ask the room for assistance.
- **Manikin:** The manikin is fully operational, with heart sounds, lung sounds, bowel sounds and pulses.
- **Do you have any questions?**

Roles

- You will be the oncoming nurse. I will be providing you with SBAR report as the night shift nurse, as well as the Health Care Provider during the scenario.

APPENDIX Q: STUDENT INSTRUCTIONS FOR VSIM

- Log in to the vSim environment and select Vincent Brody patient
- **DO NOT BEGIN UNTIL DIRECTED TO DO SO BY DR. GANTT**

- **Once you are told to begin complete the following steps:**
  - Do Step #1-Read about the patient
  - Complete Step #2—Pre-simulation quiz
  - Complete Step#3—the vSim scenario; conclude the scenario in 25 minutes, using the patient handoff feature
  - Do **NOT** review your Feedback log proceed directly to post-sim quiz
  - Complete Step #4—Post-simulation quiz
  - Complete the Debrief Reflection Questionnaire **place your name at the top and answer all questions thoroughly**. When completed give to Ms. Hughes.

APPENDIX R: RECRUITMENT SCRIPT

You are being invited to participate in a **research** study titled *"A Pilot Study to Examine the Feasibility and Methodological Procedures for a Computer-based Simulation with Accelerated Baccalaureate Nursing Students"* being conducted by *Jeanne Martin*, a *PhD student* at East Carolina University in the *Nursing Science* department. The goal is to examine *17* individuals in *the learning resource computer laboratory at ECU College of Nursing during a computerized simulation*. The *simulation* will take approximately *4* hours to complete. It is hoped that this information will assist us to better understand *how to conduct virtual simulations like vSim for Nursing and incorporate them into accelerated BSN curricula.* Your responses will be kept confidential, and no data will be analyzed until after your graduation in December 2021. Additionally, no data will be released or used with your identification attached. Your participation in the research is **voluntary**. You may choose not to answer any or all questions, and you may stop at any time. We ***will not*** be able to pay you for the time you volunteer while being in this study. There is **no penalty for not taking part** in this research study. Please call *Jeanne Martin* at *252-945-3227* for any research related questions or the University & Medical Center Institutional Review Board (UMCIRB) at 252-744-2914 for questions about your rights as a research participant.

Signed: _____ Date: _____

APPENDIX S: FACULTY INSTRUCTIONS FOR VSIM PILOT STUDY

October 14, 2021

CON LRC

1. When students arrive, ensure mask over nose and mouth and check symptom checker; record on student roster (see below)
2. Provide them with Student Instruction sheet and Reflection Question handout
3. Randomly place students at computer stations
4. Ensure they apply gloves and clean mouse and keyboard with sani-wipe and then perform hand hygiene
5. Jordan Taylor should be there to help them navigate any sign-on issues with vSim
6. When students finish the computer scenarios, they complete the reflection questions and place document in the manilla folder.
7. Students apply gloves and clean mouse/keyboard prior to departure
8. Text Laura Jackson (252-531-8864) to retrieve manilla envelope when last student has reflected and placed their document in the folder.

THANK YOU!!

ABSN Class of 2021

Name		Symptom Checker	Mask over nose and mouth?
Allen	**Camryn**		
Anderson	**Terra**		
Donovan	**Katherine**		
Faircloth	**Caroline**		
Frovarp	**Brooklyn**		
Heath	**Janelle**		
Herring	**Caroline**		
Japczyk Schuler	**Eric**		
Johnson	**Christy**		
Jones	**Ashlyn**		
McHugh	**Megan**		
Penaloza	**Nicole**		
Punt	**Rebekah**		
ReBarker	**Brooke**		
Tabb	**Hayley**		
Wilson	**Shannon (Bailie)**		
Yllanes	**Alexandra**		

APPENDIX T: STUDENT INSTRUCTIONS FOR THURSDAY, OCTOBER 14-PROCTORED

1. Enter LRC by 12:30 to have symptom checker screened by Ms. Rouse
2. Obtain Reflection Question handout
3. Select computer station
4. Apply gloves, obtain sani-wipe and disinfect the mouse and keyboard at computer station
5. Discard and perform hand hygiene
6. Log into vSim
    a. http://thepoint.lww.com/
    b. Use username and password
    c. Go to My Content—vSim for Nursing Medical-Surgical and select "Launch"
    d. Select "Content" on left side of screen
    e. Look at right side of screen Under Supplemental Resources and select "vSim-Medical Surgical: Video Tutorial"
    f. There are 15 short (1-2 minute videos about each component of vSim)
    g. Watch each video
7. Go to Assignments tab and Select "Medical Scenario #3-Vincent Brody"
    a. Complete the Pre-simulation Quiz
    b. Complete the vSim (when scenario begins scroll through "helpful tips" at the beginning)
        i. Review the detailed feedback tab
    c. Complete the Post-simulation Quiz
6. Go to Assignments tab and Select "Medical Scenario #5-Skylar Hansen"
    a. Complete the Pre-simulation Quiz
    b. Complete the vSim (when scenario begins scroll through "helpful tips" at the beginning)
        i. Review the detailed feedback tab
    c. Complete the Post-simulation Quiz
7. Close out vSim
8. Complete reflection questions and place in manilla folder on table.
9. Apply gloves, obtain sani-wipe and disinfect the mouse and keyboard at computer station
10. Discard and perform hand hygiene

APPENDIX U: STUDENT INSTRUCTIONS FOR VSIM-UNPROCTORED

1. Log into vSim
    a. http://thepoint.lww.com/
    b. Use username and password
    c. Go to My Content—vSim for Nursing Medical-Surgical and select "Launch"
    d. Select "Content" on left side of screen
    e. Look at right side of screen Under Supplemental Resources and select "vSim-Medical Surgical: Video Tutorial"
    f. There are 15 short (1-2 minute videos about each component of vSim)
    g. Watch each video
2. Go to Assignments tab and Select "Medical Scenario #3-Vincent Brody"
    a. Complete the Pre-simulation Quiz
    b. Complete the vSim (when scenario begins scroll through "helpful tips" at the beginning)
        i. Review the detailed feedback tab
    c. Complete the Post-simulation Quiz
3. Go to Assignments tab and Select "Medical Scenario #5-Skylar Hansen"
    a. Complete the Pre-simulation Quiz
    b. Complete the vSim (when scenario begins scroll through "helpful tips" at the beginning)
        i. Review the detailed feedback tab
    c. Complete the Post-simulation Quiz
4. Close out vSim
5. Complete reflection questions
6. Bring reflection questions to class on Monday, October 25 and place in manilla envelope.
7. Complete formative evaluation QR

APPENDIX V: REFLECTIVE QUESTIONS PILOT STUDY

Please answer the following reflection questions. **Name:** **_____**

1. **What went well in the last scenario?**

2. **What did not go well in the last scenario?**

3. **After the last scenario, what would you do differently next time?**

4. What would you like for us to know about vSim for Nursing and/or this computerized learning activity?

APPENDIX W: REFLECTION QUESTION RESPONSES—PILOT STUDY—FALL 2021—(N=15)

1. **What went well in last scenario?**
    - Knowing how to operate the software after doing scenario 1 made this scenario flow better, as well as helped me know what to look for.
    - I was able to perform better in the second scenario once I figured out how to navigate the program better.
    - I recognized quickly what was going on and I provided many of the expected treatments
    - Learned what buttons they were looking for me to press; Assessments needed and how to navigate.
    - When I first stated communicating with the patient and his eyes were closed, I was thinking that he was about to crash so I felt a little prepared for that. I think I did a good of doing more pertinent things initially because I knew it wasn't as important to get a temperature but rather calling the HCP to tell him/her that the patient was showing signs of hypoglycemia and now unconscious, so even though my percentage wasn't great, I feel good about the interventions I performed.
    - The last scenario went well in general for me. I was able to prioritize my assessments and interventions. I received a 100% on pre/post tests and the simulation itself. I felt that my response were close to how I would respond in real life.
    - I identified pt/name, DOB, allergies; assessed pain immediately put on cardiac monitoring; started continuous VS; sat patient up when oxygen was low; educated patient on hypoglycemia
    - Med administration; blood sugar checks frequently; good initial assessment; better idea of what to look for in a diabetic patient with low blood sugar.
    - Quickly administering dextrose IV; doing quick assessments; knowing where the takes were in the program; safety components (consent, pt ID, hand washing)
    - I was able to navigate the vSim better; I identified the problem, called the provider quickly and got a blood sugar quickly. I kept monitoring blood sugar. I gave 50mL of dextrose in 50 of H20 IV. I gave him food after. Put him on a heart monitor earlier. Periodically took vitals and checked blood glucose.
    - I managed time well, good prioritization, thorough assessment, followed orders in an organized way; patient education; safety measures
    - I washed my hands and identified the patient by comparing it to the medical record. I addressed how he was feeling and took VS including temperature and BP. I then immediately took a bedside blood glucose due to the patient's history of type I diabetes. I assessed that it was low and then called the doctor to report the signs and symptoms and the low blood glucose. After receiving orders I inserted an IV and administered dextrose 50mL to the patient and attached a pulse ox and 3 lead EKG. I provided comfort measures such as sitting the patient up,

rechecked blood glucose many times and provided proteins and carbs when the patient was hungry.

- This one seemed better than the first one (COPD). I was able to anticipate needs of patient and act accordingly. I had a better grasp of treatment interventions than for 1st one.
- I got vital signs and hooked the pt up to a cardiac monitor quickly. I assessed lung/heart/bowel sounds. I assessed neuro and did a blood glucose check. I called the doctor and did all orders that were given within a good amount of time. I pushed the dextrose slowly.
- I was able to complete all my assessment pieces and all of the doctor's orders in a timely manner. I handed off the patient and received a 100% on the simulation.

2. What did no go well in the last scenario?

- For me, the last scenario kept freezing up and seemed to not be working properly. Other than that, I missed a few steps that I did not pick up on (give carbs).
- I wasn't sure if I had done everything & wasn't sure to end the scenario yet. I wasn't sure when to call the doctor.
- I did not do a full neuro assessment. I could not figure out how to introduce myself.
- Not be able to type/do what I'd want to or say.
- I wanted to jump the gun and start bagging the pt. to get O2 flowing as opposed to a NC; however, I didn't turn the O2 up so he wasn't getting anything. After pt. was stable, I did not continue with my other assessment pieces but rather just finished the scenario to let the pt. rest.
- I could have called the physician sooner. I almost proceeded with antihypoglycemic medication because I thought in the ED, there may be standing orders. I chose to call first. Also, I didn't flush immediately after IV med admin. I clicked two other buttons first, but in real practice, I think those three actions could have been completed simultaneously.
- Didn't flush IV after giving D50 and after starting IV. Took too long to notice patient was in hypoglycemic crisis and to call MD.
- Tried to give food to a patient that wasn't fully conscious. Should have checked blood sugar quicker in my assessment. Blood sugar went down below 40 before I administered the IV dextrose.
- Realized I needed to call the Dr. to get orders took longer than I would've needed.
- I did not check a pulse as part [of] vitals, I left out breathing/RR. I forgot to flush right after drug administration.
- I was not sure how often to check finger-stick glucose
- I knew from report the patient was a type 1 diabetic and had not eaten/had been doing a lot of physical exercise so I knew that taking vitals and getting a blood glucose were very important. The simulation reported that I did not assess respirations so I should have included that in the initial vital signs and before

calling the provider. At the end, I felt I was doing the same things over and over again (checking blood sugar, asking how the patient felt, asking what they needed, and I gave him food a couple of times so I was not sure exactly when to handoff the patient.

- The biggest learning curve was making sure I knew where to find everything. I struggled with 1st one a lot more>>I felt rushed.
- I did not assess the respiratory rate and I gave the patient food without sitting them up in bed.
- I started off the scenario by completing my assessment, taking vitals and taking the patient's blood sugar. I didn't know what else to do at this point so I just asked the patient questions (because I didn't have any orders). I wasted a little bit of time trying to figure out what to do until I realized that needed to call the provider for orders.

3. After the last scenario, what would you do differently next time?

- Keep a better eye on the time and write some notes throughout since I am a visual person and going back to the chart multiple times can be time consuming.
- Complete the orders in a more timely fashion. I would have reviewed the sections in the book before starting the vSim.
- I would be able to respond quicker and provide all the expected assessments and interventions.
- Follow steps with clicking interventions
- I would start the pt. on simple face mask w/ O2 @ 10L/min. If given more time, I would've provided more pt. education on how to prevent hypoglycemia. I also would have started the IV earlier to get the fluids running as opposed to wasting time trying to recall where the IV button was.
- I would assess orientation/LOC quicker. I would call the physician sooner. I would focus on just IV med admin when completing that task. I would wait to ask non-pertinent questions until after the patient's BG has come into normal range.
- Pay closer attention to patient to immediately [to] catch any assessment changes that indicate hypoglycemia
- Check blood sugar first in assessment; Administer IV dextrose quicker, then give pt a snack.
- Be prepared with the program; get orders quicker; get consents before procedures; give meds at correct times
- Next time I would get the FSBS immediately after getting vitals. I would do a neuro assessment since he had a change in LOC. Remember to include RR and pulse rate as part of vitals check
- I would give the patient a snack of fat and protein sooner instead of waiting for the blood glucose to go down.
- I would assess respirations in the initial vital signs assessment with temperature and BP. I would also end the simulation a little earlier instead of repeating taking

the blood glucose and giving him food over and over when they reported feeling fine. (I was trying to fill up the 30 minutes.)

- With time permitting, I could have studied disease process, manifestations, and treatment more prior to beginning.
- I would make sure to assess respirations and sit the pt up before giving him food.
- After the last scenario, I would have called the provider first to receive orders. Instead I took vitals and blood glucose first and did an assessment and didn't' know what else to do so I called the provider. I feel like I wasted a little bit of time trying to figure out what to do until I called the provider.

4. What would you like for us to know about vSim for Nursing and/or this computerized learning activity?

- Very educational. Software is slow/lags at times.
- I felt it was a good experience, it was hard for me to get the hand of things, but once acclimated, I believe it went well. Even though I don't love in person sims, I believe they are better for hands on experience, but having a few vSims mixed in would be good.
- I wish there was a way to type in questions. Some of the questions I wanted to ask were not available.
- Not helpful in actual sim but pre/post questions helpful.
- Overall, I thought it went really well. The only thing I didn't personally love is the fact that I got a 78% on scenario 2 because I didn't complete all the assessment pieces; however, I prioritized very well & did what I needed to do, so I don't believe the 78% reflects my work. But overall, very detailed feedback & doesn't kill my computer. I enjoyed it!!
- I think this is a great product with a very intuitive interface. The feedback is detailed and actually contributes to further learning. However, the pre/post tests marked questions correct or incorrect inconsistently. The rationale did not agree with the answer choice. I had to research the correct answer to verify.
- Feedback log was helpful to see what you did right and wrong. Hard to find some of the tasks to complete (for example oxygen supplies was under ventilation and not respiration).
- I really liked the vSim and like the pre & post questions about the disease to get your head thinking about your interventions. The only thing I would like there to be is a textbox to ask patient questions.
- I liked it better than our behavioral health virtual sims. I think the program was effective (and honestly kind of fun!) and allowed us to do things we would do in real life and focus on prioritization, not the skills themselves.
- In the first scenario, I was going by the order in which orders were written and first thing I did was order chest tube & provider came before I had time to administer morphine, get CXR and obtain consent.

- For some reason the diabetes scenario was way easier than the COPD scenario. Because I did that one first, I kept wondering if I was missing something in the second one.
- The first simulation was very specific on the procedure but the second simulation (the one reported on above) was much easier to follow. I was a little confused about the appropriate time to do the patient handoff so I used the whole time but it felt repetitive. Overall, it was good practice for safety measures and practicing prioritizing orders/nursing actions.
- I think it was helpful to reinforce concepts learned in class. Also like that you can repeat scenarios.
- It gave great feedback and I was able to see the mistakes I made and fix them the next time I did the sim. The detailed feedback made it much easier to understand my errors.
- I enjoyed this vSim experience. It was frustrating at times because I wasn't sure what to do for the patient. I also became frustrated at times because it took a long time to complete some activities (wash hands, identify patient) and then I wasn't able to get informed consent before the provider inserted the chest tube, for example. I also had trouble determining when to hand the patient off.