EXPLORING HOW SIMULATION DESIGN AND PARTICIPANT CHARACTERISTICS IMPACT NOVICE NURSES' CLINICAL JUDGMENT IN SIMULATION-BASED LEARNING EXPERIENCES

by

Beth A. Rogers, MSN, RN

PhD in Health Sciences, 2021

A Dissertation

Submitted to the Faculty of

Harris College of Nursing and Health Sciences

Texas Christian University

in partial fulfillment of the requirements for the degree of

PhD in Health Sciences

May

2021

APPROVED:

Ashley E. Franklin, PhD, RN, CNE, CHSE-A
Associate Professor of Nursing
Dissertation Chair

Kathy Baker, PhD, APRN, ACNS-BC, FCNS, FAAN
Associate Professor of Nursing, Director of Nursing Research & Scholarship
Committee Member

Yan Zhang, PhD
Associate Professor of Professional Practice and Statistician
Harris College of Nursing & Health Sciences
Committee Member

Emily Lund, PhD, CCC-SLP
Associate Professor, Davies School of Communication Sciences & Disorders
Associate Dean for Research

Christopher R. Watts, PhD, SLP, ASHA, CCC-SLP
Professor, Davies School of Communication Sciences & Disorders
Dean of Harris College of Nursing & Health Sciences

FUNDING ACKNOWLEDGMENTS

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

ACKNOWLEDGMENTS

This work would not have been possible without the help and encouragement of so many people. First, to my family, whose sacrifice for the last three years, has made my success possible. To my husband, Kevin, you have provided for our family while I focused on school, listened when I needed to vent, and encouraged me to keep putting one foot in front of the other until we made it to the finish line. Your love and support kept me grounded when I doubted my ability. Our marriage has withstood wartime separation, graduate school, death of loved ones, job changes, moves, remodeling, and now doctoral school. Throughout these stresses you have remained loyal to me- which gives me confidence to dream higher and higher. I hope that our children have learned about love and loyalty by watching your example. I love you and thank you is simply not enough.

To my children, Katherine and Trent, thank you for your patience while your mom studied. I hope you will always know that everything I do is partially for you. Katherine, I hope that you will always know the sky is the limit- you are so smart. I love that you are not afraid to think differently than others and stand up for what you believe in. This leadership will take you a long way. Trent, your kind heart, and passion for things you love have allowed you to learn how to work hard to achieve goals. I am so proud of your work ethic and hope you achieve all your dreams. I am looking forward to a slower pace of life from now on, so your mom can be there every step of the way to cheer you both on!

I am also very thankful for the guidance and support that Dr. Ashley Franklin has given me since starting the PhD program. Dr. Franklin has spent countless unpaid hours working with me and perfecting my skills and sacrificed time with her own family to help me grow. Dr. Franklin has expanded my thinking, challenged me to move past my comfort zone, and guided my approach to new challenges. I hope that the relationship we have built over my time at TCU will continue in the future. I am genuinely excited about discovering answers to some of the questions our work has created. You have fostered in me an interest to keep learning. I could not have had a more perfect mentor.

To Dr. Baker, I am so thankful for your mentoring throughout my master’s and doctoral programs. Your mentorship is one of the reasons I chose to pursue a PhD at TCU. Your friendship was

also helpful when I doubted my abilities. I will always appreciate you helping me take a deep breath and regain my confidence to design a path forward. Your philosophy class and scoping review were my top favorites because I love "wallowing" in thoughts and the literature. Your classes were the first to change my thinking and gave me so many ideas for future research. Thank you for your guidance and leadership.

To Dr. Zhang, your knowledge and help with statistics has been so helpful during my time at TCU. You took me from not really knowing anything about performing statistical analysis, to performing structural equation modeling in two semesters. The learning curve was steep, but you helped push me to keep going. Thank you for helping me gain a solid foundation in statistics. I look forward to learning more about statistics in the future.

There are so many other people I need to thank, including faculty and staff members who fostered my growth throughout this work- Dr. Debbie Rhea, Dr. Suzy Lockwood, Dr. Emily Lund, Dr. Christopher Watts, Dr. Karen Breitkreuz, Dr. Diane Hawley, Dr. Gabriel Huddleston, and Alysha Sapp. To the HPLC staff who helped me learn so much about high-quality simulation- Laura Thielke and Kimberly Graham. To Dr. Jodi Patterson for filming the expert modeling videos- your help made this study possible. To my friends, Ramona and Laura, whose friendship carried me and empowered me to keep going. To my parents, grandparents, and Aunt Joyce who taught me from a young age to keep learning and dream big. To my fellow classmates whose diverse educational backgrounds helped me learn how to think differently. You all helped me learn and have been an outstanding village of support.

I am privileged to be in the first graduating class of PhD students in the Harris College of Health Sciences. I am so thankful to the donors who graciously funded this PhD program, you made returning to school possible. My studies have encouraged me to *Lead On* to improve nursing education. My blood will forever bleed purple.

ABSTRACT

EXPLORING HOW SIMULATION DESIGN AND PARTICIPANT CHARACTERISTICS IMPACT NOVICE NURSES' CLINICAL JUDGMENT IN SIMULATION-BASED LEARNING EXPERIENCES

Beth A. Rogers

Background: Novice nurses are graduating without adequate clinical judgment to care for patients' increasingly complex health needs. Nursing programs frequently use simulation-based learning experiences (SBLE) to develop clinical judgment. However, the increased demand for SBLE has led nurse educators to modify simulation designs and assign novice nurses to either active or observer roles, thereby increasing simulation capacity. There is conflicting evidence related to the impact of role assignments on simulation outcomes. Cognitive load may explain differences in simulation outcomes of active versus observer participants. The purpose of this body of research was to examine how simulation design and participant characteristics impact novice nurses' clinical judgment.

Methods: Four analyses were performed. First, a scoping review described evidence presented in 28 articles related to simulation observers' learning outcomes. Next, an integrative review synthesized evidence presented 20 studies related to measurement and cognitive load experienced in nursing simulation. Third, a descriptive, longitudinal study described the clinical judgment trajectory of novice nurses who observed eight expert modeling video simulations and responded to clinical judgment prompts. Finally, a descriptive study explained reliability, feasibility, and usability of scoring written reflections with the Lasater Clinical Judgment Rubric after asynchronous simulation. Participants were simulation naïve, junior, undergraduate students in their first medical-surgical course at a nursing school in the southwestern region of the United States.

Results: The scoping review identified eight major learning outcomes of the observer role. The integrative review synthesized the literature about cognitive load as a possible mediator of simulation outcomes. Regardless of clinical judgment ability, we found observers develop clinical judgment after viewing expert modeling videos asynchronously, and we identified writing characteristics differentiating novice nurses' knowledge, thinking, and approach according to clinical judgment ability categories. Finally, the Lasater Clinical Judgment Rubric was reliable, feasible, and usable to score novice nurses' written reflection after asynchronous simulation.

Conclusion: Our body of work highlights how simulation design and participant characteristics impact learning outcomes. This work highlights the importance of using reliable measures to evaluate participant outcomes. Together, this body of research informs nurse educators' simulation design decisions which optimize learning and increase simulation program capacity.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter I — INTRODUCTION

Background

Novice nurses are graduating without the necessary skills for safe, independent practice (Al-Dossary et al., 2014; Bashford et al., 2012; Fisher & King, 2013; Kavanagh & Szweda, 2017; Lasater et al., 2015). Novice nurses become eligible for licensure in the United States through three different pathways by graduating from either a diploma, associate’s, or bachelor’s degree nursing program. The preparation and curriculum focus for each pathway to licensure is diverse. Therefore, accrediting bodies regulate minimum standards for knowledge and content of nursing curricula. For example, the American Association of Colleges of Nursing (AACN) provides the *Essentials of Baccalaureate Education for Professional Nursing Practice*, which defines core competencies for nurses graduating from bachelor’s programs (AACN, 2020). Clinical judgment (CJ) is an essential skill for baccalaureate-prepared nurses (AACN, 2020). However, each nursing school prioritizes their own list of essential skills, student outcomes, and learning activities. As a result, there is variation in the quality of CJ and experiences underpinning CJ among more than 100,000 graduates of nursing schools in the United States each year (NLN, 2020b).

Historically, novice nurses learned skills necessary for independent practice in traditional clinical experiences (Ironside et al., 2014; Jayasekara et al., 2018). Some of the known shortcomings with traditional clinical experiences are random access to learning opportunities, excessive downtime, and clinical site shortages (Founds et al., 2011; Ironside et al., 2014; Jayasekara et al., 2018; Weaver, 2011). Moreover, novice nurses largely perform nursing skills without direct faculty supervision or feedback during precepted clinical experiences which can lead to learning unintended practice errors (Ironside et al., 2014). Nurse educators often use simulation-based learning experiences (SBLE) to overcome challenges with traditional clinical experiences (Bradley et al., 2019; Smiley, 2019) because replacing up to half of clinical hours with well-designed SBLE creates similar learning outcomes (Hayden et al., 2014). Furthermore, SBLE more efficiently prepares nursing students because novice nurses practice higher levels of thinking and more behaviors in shorter amounts of time in SBLE compared to traditional clinical experiences (Sullivan et al., 2019).

Significance

Historically, novice nurses experience an academic-practice gap (Benner et al., 2009). In this body of work, novice nurse refers both to individuals in prelicensure programs and to nurses in their first one to three years of independent practice (Benner et al., 2009; Lasater et al., 2015). The academic-practice gap was first defined by Berkow et al. (2008), who found that less than 25 percent of nurse leaders believe novice nurses have adequate skills to manage hospitalized patients. Despite placing increased attention on novice nurses' practice readiness, experienced nurses consistently report limitations with novice nurses making decisions, noticing salient cues, utilizing clinical judgment, thinking critically, anticipating patient needs, and responding to urgent and non-urgent situations (Al-Dossary et al., 2014; Bashford et al., 2012; Brudvig et al., 2013; Burbach & Thompson, 2014; Fisher & King, 2013; Kavanagh & Szweda, 2017; Lasater et al., 2015). Specifically, a recent study of newly graduated nurses found that only 23 percent were safe and met minimal CJ standards needed for practice (Kavanagh & Szweda, 2017), despite employers reporting that CJ is an essential skill (Al-Dossary et al., 2014).

CJ is a complex mental process that encompasses a series of steps to ascertain salient cues, interpret the cause, and then select the appropriate actions amongst other alternatives (Cappelletti et al., 2014; INACSL Standards Committee, 2016; Tanner, 2006). After graduation, novice nurses require between one (Bratt & Felzer, 2011) and three years (Lasater et al., 2015) to develop adequate CJ. During this time, gaps in judgment lead to medication errors, omissions in patient care, physical mistakes or commissions that result in patient harm, and failure to rescue patients with deteriorating conditions (Hickerson et al., 2016; Kenward & Zhong, 2006; Saintsing et al., 2011). This is significant because recent estimates indicate that medical errors are now the third leading cause of death among Americans (James, 2013; Makary & Daniel, 2016). Moreover, as many as 53 percent of novice nurses report making errors; errors occur more frequently when novice nurses feel less prepared to use CJ (Kenward & Zhong, 2006). Therefore, educational interventions which better prepare nurses for independent practice are needed to reduce the academic-practice gap (Beroz & Hallmark, 2017).

Simulation-Based Learning Experiences

Simulation-based learning experiences (SBLE) in this body of research refers to structured educational activities utilizing high, medium, or low fidelity manikins or standardized patients to create a realistic clinical situation. Through participation in these activities, nurses develop knowledge, skills, and attitudes necessary to respond to real clinical situations (Lioce et al., 2020). SBLE scenarios may represent both urgent and non-urgent patient experiences. Extant simulation literature does not provide a clear definition of urgency but often describes urgency based on characteristics of a simulation scenario (see Table 1.1). Urgent situations in this body of research refer to any scenario which requires immediate action from the simulation participant to prevent loss of life, limb, hemodynamic stability, or maintain safety of the client, healthcare providers, or individuals in the scenario. Conversely, non-urgent situations involve routine procedures, assessments, or skills without an unexpected change in patient condition.

Table 1.1

Characteristics of Urgent Versus Non-Urgent Situations

Concept of Interest	Urgent Situations	Non-Urgent Situations
Hemodynamic Instability	Cardiopulmonary decompensation Lack of circulation to a limb or the entire body Unexpected deterioration in client's condition Unexpected reaction to treatments or medications	Patient maintains hemodynamic stability and circulation Patient encounters involving stable patients
Safety	Immediate or implied threat to life Immediate threats to the safety of the patient, staff, or care environment	No threat to life
Priority Setting	Immediate interventions required to prevent patient harm	No immediate intervention required
Pain	Severe pain or discomfort which may be anticipated	Mild to moderate pain or discomfort which is expected
Cognition	Change in level of consciousness	Stable level of consciousness
Communication	Communicating with a provider to escalate level of care	Therapeutic communication or patient education
Exposure	Extreme temperatures Burns Highly contagious infections	Normothermic
Acuity	Emergent care	Standard care administered in routine situations

The proliferation of simulation as an education strategy is in large part related to its effectiveness in developing cognitive skills (Cantrell et al., 2017), specifically CJ (Lee & Oh, 2015). We know that repeated exposure and repetition in simulation leads to knowledge gains, competence, and confidence (Svellingen et al., 2020). Furthermore, SBLE is useful for developing CJ because it provides guided, repetitive practice and individualized feedback in a safe environment (Fisher & King, 2013). Too often, simulation research investigates CJ following one simulation experience. More studies investigating CJ in simulation over time are needed to fully understand the effect of repeated simulation exposure on CJ development.

Role Assignment

Nurse educators assign novice nurses to either active or observer roles, thereby increasing simulation capacity to accommodate large cohorts (Cant & Cooper, 2010; Johnson, 2019). Educators commonly use two types of roles in SBLE: active, or process-based, and observer, or response-based (Jeffries & Rizzolo, 2007). However, the methods (Alexander, 2020; Howard et al., 2017; Johnson, 2019; Zulkosky et al., 2016) and value (Harder et al., 2013) of assigning different roles vary and remain a gap in simulation literature (Adamson, 2015; Mariani et al., 2016).

Active simulation roles involve varying levels of engagement with the patient according to task assigned (Price et al., 2017; Weiler et al., 2018; Zulkosky et al., 2016). In theory, roles foster teamwork, though the mechanism is sometimes unclear when nurse educators provide no specific delineation of team members' duties (Abe et al., 2013; Baxter et al., 2012; Hallin et al., 2016). Frequently, active roles prioritize primary nurse responsibilities (Bates et al., 2019; Kaplan et al., 2012; Price et al., 2017; Zulkosky et al., 2016), encourage leadership (Fluharty et al., 2012; Johnson, 2019), or portray healthcare providers (Kaplan et al., 2012) and patient/family members (Fluharty et al., 2012; Jeffries & Rizzolo, 2007; Price et al., 2017; Zulkosky et al., 2016). Active participants often have decision-making responsibilities and provide direct patient care (Price et al., 2017; Zulkosky et al., 2016). The literature is unclear about the impact of multiple active participants in one SBLE on preparation for independent nursing practice.

Observer Roles

Simulation participants spend the majority of time in observer roles in many nursing simulation programs (Hayden et al., 2014; Howard et al., 2017). A clear definition of the observer role is not established in the literature. Observers most often assume response-based, non-direct caregiver roles (Jeffries & Rizzolo, 2007) without active involvement in SBLE (Johnson, 2019, 2020; O'Reagan et al., 2016; Zulkosky et al., 2016). This body of research refers to observers as passively watching a SBLE via either a live stream web feed or video recording. Time spent in the observer role may decrease opportunities for independent CJ practice because observers watch and critique CJ rather than think on their feet independently. Therefore, it follows that understanding how simulation observers develop CJ in SBLE is a key contribution to the nursing education literature.

Researchers often group active SBLE participants and observers and compare learning outcomes as a proxy measure of role assignment effectiveness. Through these comparisons, we know observers and active participants gain similar knowledge of holistic nursing care (Fluharty et al., 2012; Kaplan et al., 2012), comprehension of managing the deteriorating patient (Johnson, 2019; Nilsson et al., 2014; Scherer et al., 2016), and perceived problem solving ability (Bates et al., 2019). All previous studies comparing knowledge and comprehension of patient care between roles used small numbers of exam questions, often with poor (Johnson, 2019) or no (Fluharty et al., 2012; Kaplan et al., 2012; Scherer et al., 2016) evaluation of reliability. Further studies using reliable measures are needed to understand how role assignment affects CJ in urgent and non-urgent SBLE.

There is a gap in the literature related to comparing learning outcomes between observers and individual active roles (e.g., primary nurse, assessment nurse, medication nurse). Studies find differences within active roles and between observers' use of CJ (Jeffries & Rizzolo, 2007; Zulkosky et al., 2016), and intuition (Price et al., 2017) when more detailed comparisons are made. Zulkolsky et al. (2016) found active participants portraying family members make less accurate CJs in both urgent and non-urgent situations. Further, primary nurses make more accurate CJs in non-urgent situations, but less accurate judgments than simulation observers in urgent situations. While this level of detail allows nurse educators to evaluate the effectiveness of each role assignment, the limitation is that educators often assign more observer than active roles. Uneven group size comparing active participants to observers is a barrier to robust statistical analysis, even though it is a meaningful question in the simulation setting (Price et al., 2017; Zulkosky et al., 2016). Further, comparing CJ of grouped active participants to observers may bias the results because all active participants do not have similar simulation experiences. Thus, more research is needed to clarify the effect of simulation role assignment on CJ.

Serving as an observer in SBLE before participating in an active role may affect CJ. Observing first led to improved (Hallin et al., 2016; Scherer et al., 2016) or partially improved (Livsey & Lavender-Stott, 2015) CJ. Studies investigating order of role assignment either used repeated (Livsey & Lavender-Stott, 2015; Scherer et al., 2016) or different (Baxter et al., 2012; Hallin et al., 2016) scenario exposure. It is not surprising that observing other students respond to a patient with an asthma exacerbation followed by debriefing led to significantly improved simulation performance in the same scenario (Scherer et al., 2016). It is more interesting that observing first increased the ability to communicate and assess a home health patient but not CJ when slight details were changed in a repeated scenario (Livsey & Lavender-Stott, 2015).

Though study design may explain some disagreement related to the effectiveness of observing simulation first, other variables like student ability, clinical experience, and previous simulation exposure make it difficult to synthesize the literature about the effectiveness of observing simulation first on CJ. Further investigations including novice nurses with similar experience are needed to fully understand how serving in the observer role first affects CJ.

In this body of research, attention is given to how observer role assignment affects simulation outcomes in Chapters II and IV. We know that role assignments lead to varied CJ outcomes (Delisle et al., 2019; Jeffries & Rizzolo, 2007; Price et al., 2017; Zulkosky et al., 2016). Further, we have learned about observers‘ CJ by comparing them to active participants and alternating role exposure. However, few studies focus on describing differences within observers and relating differences in academic or demographic factors to CJ.

Cognitive Load

Instructional design impacts the brain’s ability to process information (Plass et al., 2010). Knowledge acquisition is an active process which is limited in capacity and depends upon an interaction of working memory with long-term memory (Josephsen, 2015; Plass et al., 2010). Learners use working memory most often during initial exposure to new material. Three elements of cognitive load (CL) impact working memory: germane, extraneous, and intrinsic (Plass et al., 2010). Less load on working memory supports learning in the most complex tasks (Fraser et al., 2015; Josephsen, 2015; Plass et al., 2010).

For learning to occur, individuals must have available working memory. Intrinsic, extraneous, and germane loads are additive. With greater CL, there is less working memory available for learning (Plass et al., 2010). Interestingly, medical students’ learning outcomes are negatively affected both when CL is too high (i.e., overloaded) or too low (Fraser et al., 2015).

SBLE design decisions can increase or decrease nurses’ CL in simulation (Fraser et al., 2015; Josephsen, 2015). Further, complexity of the SBLE environment, role assignment, and CJ can overload CL. The simulation literature related to medical students’ CL informs emerging evidence for novice nurses’ CL.

This body of research includes a focus on novice nurses’ CL in Chapter III. Research describing nurses’ CL is emerging related to the effect of increased CL on CJ. We know CL affects what nurses notice and how they interpret salient cues (Al-Moteri et al., 2019; Chen et al., 2015; Henneman et al., 2017; Schlairet et al., 2015; Shinnick, 2016). Further evidence is needed related to how CL affects CJ in SBLE.

Novice Nurses’ Clinical Judgment

Novice nurses’ backgrounds impact their CJ (Hallin et al., 2016; Lasater et al., 2019; Tanner, 2006). Novice nurses’ anxiety (Bates et al., 2019) and young age (Rode et al., 2016) are negatively correlated with CJ, whereas real-world experience with a similar situation (Baxter et al., 2012; Hallin et al., 2016; Zulkosky et al., 2016), increased time in traditional clinical experiences (Scherer et al., 2016) and in SBLE (Hallin et al., 2016), and work experience (Hallin et al., 2016) improve CJ. While previous experiences may confound CJ in SBLE, further evidence is needed.

There is a growing body of evidence explaining components of novice nurses’ CJ (Tanner, 2006). Noticing, or cue attainment, is an important first CJ step (Burbach & Thompson, 2014). Novice nurses are known to have difficulty determining relevance, distinguishing unexpected findings, and recognizing important cues when compared to experts (Burbach & Thompson, 2014; Fisher & King, 2013). Next, factors like experience, familiarity, context of the environment, reasoning patterns, complexity, and the educational environment impact how novice nurses interpret and respond to cues (Cappelletti et al., 2014; Rogers & Franklin, 2021). Further, simulation design elements like role assignment (Zulkosky et al., 2016) impact CL which in turn impacts CJ (Rogers & Franklin, 2021). Finally, novice nurses' rigidity in thinking and lack of previous exposure limit reflection, which is the last stage of CJ (Brown Tyo & McCurry, 2019; Klenke-Borgmann et al., 2020; Nielsen et al., 2007; Ruth-Sahd, 2003).

Expert Modeling

There are many definitions of expert modeling (EM) in the extant literature. EM can include novice nurses viewing expert academic or clinical faculty performing tasks or holistic nursing care (Baldwin et al., 2014). EM in simulation often involves an expert nurse caring for one or more patients. Through EM, experts may verbalize their thoughts (i.e., "think aloud") or solely model expert care (Johnson et al., 2012).

Based on this evidence, this body of research utilized EM videos which modeled expert nursing care without thinking aloud. Two full-time simulation instructors modeled expert nursing care in eight scenarios which represented urgent and non-urgent situations. Each EM video lasted approximately 20 minutes.

EM deepens learning vicariously according to Bandura's Social Learning Theory (Bandura, 1986; Franklin et al., 2020; Lasater et al., 2014; LeFlore et al., 2007; Roberts, 2010). Novice nurses who observe experts providing care may create mental schema which serves as a reference for subsequent simulations or traditional clinical experiences (Lasater et al., 2014). We know that using EM as a pre-briefing strategy translates into improved higher-order thinking (Aronson et al., 2013; Coram, 2016; Franklin et al., 2015; Johnson et al., 2012) and clinical skills (Jarvill et al., 2018). However, no studies to date have investigated cognitive learning outcomes stemming from observing EM prior to simulation. This body of research is novel because it measures novice nurses' CJ immediately following EM and before a subsequent simulation or debriefing. Investigating what nurses learn from observing EM could fill an important gap in the literature.

EM in both urgent and non-urgent situations may improve CJ. Novice nurses consistently show increased CJ in urgent situations when observing EM prior to simulation (Aronson et al., 2013; Johnson et al., 2012). However, there is mixed evidence supporting EM effectiveness in non-urgent situations. Junior-level nursing students demonstrate significant improvements in CJ after observing EM videos about providing routine care to medical surgical patients (Coram, 2016) and using sterile technique (Jarvill et al., 2018). However, senior-level students do not consistently demonstrate competence in caring for multiple patients after observing EM (Franklin et al., 2015, 2020). Providing care to multiple patients also requires other skills which have not been correlated to EM (e.g., multitasking) which could confound results. Further, the quality and content of EM also confound results. Finally, measurement limitations such as using dichotomous tools and not awarding credit for partial or incomplete work also limit conclusions. Therefore, further research is needed using robust measures to understand how novice nurses develop CJ after observing EM in non-urgent situations.

Recently, many nursing programs augmented traditional clinical and simulation experiences with asynchronous EM to accommodate social distancing guidelines and prevent the spread of the novel Coronavirus Disease 2019 (COVID-19; Hallmark, 2020; Harder, 2020; Leigh et al., 2020; Ng & Or, 2020). Nursing programs that were already faced with clinical site scarcity were not allowed in hospitals for traditional clinical experiences (Esposito & Sullivan, 2020; Fogg et al., 2020). Many state boards of nursing altered their state guidelines emergently to allow for increased SBLE to fill this gap (Fogg et al., 2020; Hallmark, 2020; Harder, 2020). Nursing programs utilized asynchronous EM and virtual SBLE with all participants in observer roles to augment student learning without fully understanding the effects on novice nurses' CJ (Fogg et al., 2020). Therefore, the study in Chapter IV provides support for nurse educators' curriculum decisions in response to the COVID-19 pandemic by describing the trajectory of novice nurses' CJ over the course of the semester.

Measuring Clinical Judgment

CJ is a complex cognitive skill that nurses must develop to respond, or not, to both urgent and non-urgent patient situations (Burbach & Thompson, 2014; Cappelletti et al., 2014; Fisher & King, 2013; Klenke-Borgmann et al., 2020; Tanner, 2006). CJ requires the nurse to ascertain salient clues, interpret the cause, and then select the appropriate interventions (Burbach & Thompson, 2014; Cappelletti et al., 2014; Fisher & King, 2013; Klenke-Borgmann et al., 2020; Tanner, 2006).

Researchers measure CJ in many ways (Macauley et al., 2017), but the most common methods include exam questions and self-report tools as proxy for CJ (Rogers, Baker, & Franklin, 2020). Often, researchers use small numbers of exam questions which limits reliability. Conversely, there are many self-report CJ tools available with strong psychometric support (INACSL, n.d.; Kardong-Edgren et al., 2010; NLN, 2020). However, self-report does not always translate into objective performance improvement (Franklin & Lee, 2014). There are several reliable behavioral CJ tools available (Lasater, 2007; Todd et al., 2008), but these tools require measuring active simulation participation. Consequently, it is challenging to compare CJ among active simulation participants and observers (Hallin et al., 2016; Livsey & Lavender-Stott, 2015; Scherer et al., 2016). It is also possible that giving active simulation participants different pre-briefing than observers (Baxter et al., 2012) confounds conclusions about CJ. Therefore, developing a method to reliably measure simulation observers' CJ is a significant contribution to simulation research.

The "think aloud" technique is also often used to measure CJ as participants verbalize thoughts that come from short term memory (Burbach et al., 2015; Clarke et al., 2015; Lasater et al., 2019). Researchers analyze "think aloud" transcripts through qualitative analysis and sometimes triangulate data with behavioral performance (Burbach et al., 2015; Clarke et al., 2015; Lasater et al., 2019). There are limitations to "think aloud;" namely that participants do not always verbalize every thought and think aloud can influence others in team simulation. Zulkosky et al. (2016) improved on the "think aloud" method by having students provide a written response to three CJ questions. The rating of responses reached high internal consistency and allowed for blinding of raters. However, the method was limited by using a researcher-developed dichotomous scoring tool. Zulkosky's "think aloud" method points to the importance of awarding partial credit to more precisely describe CJ.

Researchers often measure CJ after debriefing. It is most common for researchers to score comments made in debriefing as evidence of CJ. Debriefing is an important part of simulation because it promotes reflection and the expansion of CJ (Al Sabei & Lasater, 2016; Levett-Jones & Lapkin, 2014; Mariani et al., 2013). Researchers who measured CJ after debriefing found no significant difference between the knowledge (Fluharty et al., 2012; Jeffries & Rizzolo (2007); Kaplan et al., 2012; Rode et al., 2016; Scherer et al., 2016) and skills necessary for CJ (Bates et al., 2019; Baxter et al., 2012) between active and observer roles. However, measuring CJ after debriefing makes it difficult to parse out what CJ novice nurses have gained independently during a scenario versus what gains they make as a result of facilitated debriefing.

Only a few studies investigated CJ in simulation roles prior to debriefing. Measuring CJ prior to debriefing allows researchers to capture higher levels of independent thinking. Price et al. (2017) and Zulkosky et al. (2016) measured CJ before debriefing and found differences based on role assignment. These findings suggest observers' CJ may vary prior to debriefing. However, both studies only analyzed decision making during a stopping point in the simulation scenario. When nurses must make an immediate judgment with limited time, they are motivated to consider fewer hypotheses (Yang et al., 2012). Therefore, the descriptive study found in Chapter IV which measures observers' CJ following EM, but without the pressure of rushed decision-making, is an important first step to understand how observers use clinical judgment in situations with low CL.

In this body of research, a focus on measuring CJ is in Chapters IV and V. To overcome limitations with variations in simulation experience, we used eight EM videos filmed with educators portraying the role of primary nurse in urgent and non-urgent situations. Participants viewed videos asynchronously via the learning management system and had access to simulation preparation materials including a patient summary sheet, selected articles, policies, and procedures to match simulation content. After each video, participants individually answered 11 short answer prompts using a Qualtrics survey. To overcome limitations with researcher-developed tools, we used the Lasater Clinical Judgment Rubric (LCJR) to score written responses (Lasater, 2011). The LCJR has 11 items (with questions that correspond to the short answer prompts) and 4 subscales related to the Tanner's Clinical Judgment Model (Tanner, 2006). Each item is scored on an holistic rubric, and ratings range from Beginner to Exemplary (Lasater, 2011). In previous research, the LCJR has acceptable reliability and validity for rating behaviors in simulation (Adamson et al., 2012; Kardong-Edgren et al., 2010; Victor-Chmil & Larew, 2013).

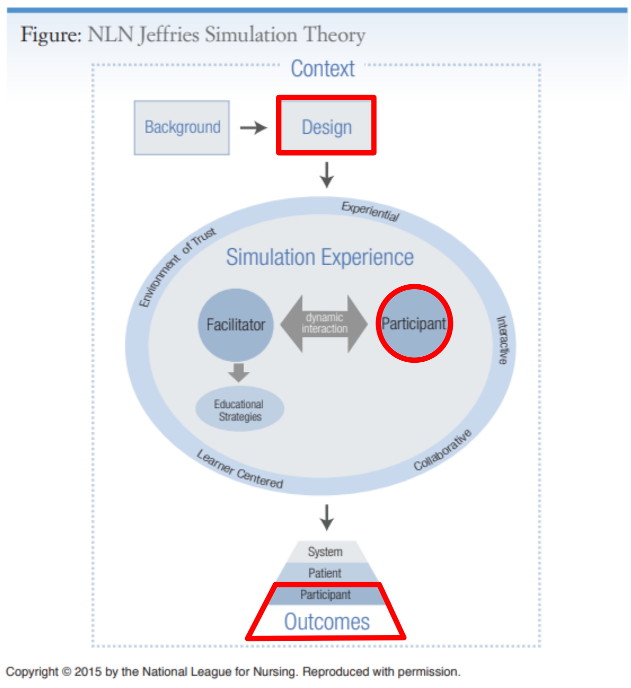
In Chapter IV, we describe the trajectory of CJ over the course of eight expert modeling videos used during a traditional academic semester. We anticipated participants' CJ would increase over the course of the semester. Currently, there are few studies investigating observers' CJ using reliable measures. In Chapter V, we describe the reliability and feasibility of using the LCJR to evaluate participants' CJ from written reflections. By establishing a more reliable method for measuring observers' CJ (see Chapter V), we extend what is known about CJ and describe the trajectory of CJ development for groups of low, middle, and high-performing novice nurses (see Chapter IV).

Conceptual Model

The National League for Nurses Jeffries Simulation Theory (NJST) posits simulation design impacts learning outcomes (Jeffries & NLN, 2016). Specifically, educators should first consider the context, or the setting and circumstances, when designing SBLE (Jeffries & NLN, 2016). Next, background factors, such as the learning goals, curriculum decisions, and available resources, should be considered (Jeffries & NLN, 2016). Based on the context and background, educators make design decisions such as role assignment, scenario content, simulation progression cues, fidelity, and debriefing strategies (Groom et al., 2014). Simulation activities should be "experiential, interactive, collaborative, learner centered, and built on trust" (Jeffries et al., 2015, p. 292). A facilitator's background and experience can influence SBLE (Jones et al., 2014). Facilitators should adapt the scenario, cues, and feedback to participant needs. Participant needs may be modifiable (e.g., emotion, CL, preparation) or non-modifiable (e.g., age, gender, experience; Durham et al., 2014). All NJST constructs work together to affect simulation outcomes (O’Donnell et al., 2014). Outcomes are hierarchical and most often relate to the participant reactions, knowledge, or behaviors (Jeffries & NLN, 2016; O’Donnell et al., 2014). This body of research will add to our understanding of how simulation design decisions and participant characteristics relate to participant outcomes (see Figure 1.1).

Figure 1.1

The Relationship Between Simulation Design and Participant Characteristics Which Affect Participant Outcomes, According to the NLN Jeffries Simulation Theory

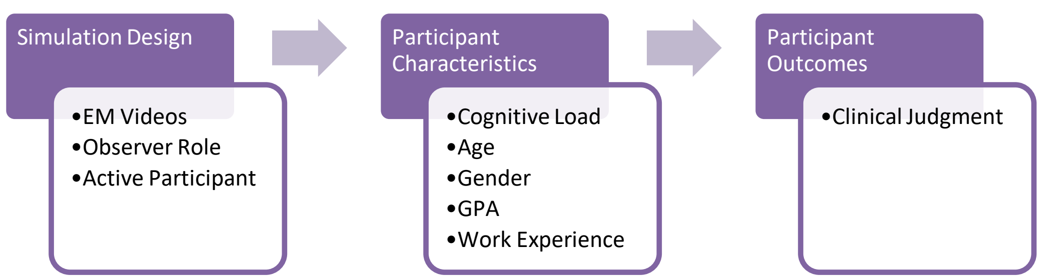


In Chapter II, we review how simulation design, operationalized as observer roles, impacts participant learning outcomes. Next, the authors review what is known about participant characteristics, operationalized as cognitive load, in Chapter III. Then, in Chapter IV, we operationalize simulation design using expert modeling videos and observer roles to determine how simulation design relates to the trajectory of clinical judgment. Finally, in Chapter V, we investigate the reliability, feasibility, and usability of scoring written reflections with the Lasater Clinical Judgment Rubric after asynchronous simulation with EM videos.

The NJST explains how simulation design decisions influence participants' learning outcomes (see Figure 1.2; Groom et al., 2014). Furthermore, the NJST suggests that participant characteristics also relate to participant outcomes (Durham et al., 2014). It is important for nurse educators to understand how participant characteristics relate to participant outcomes in order to optimize simulation design (Durham et al., 2014; Fisher & King, 2013; Fraser et al., 2015; Josephsen, 2015; Lasater, 2011). This body of research prioritizes CJ as a participant outcome.

Figure 1.2

Relationship Among Constructs of the NLN Jeffries Simulation Theory



Purpose and Specific Aims

The studies completed in this dissertation fill important knowledge gaps related to how simulation design and participant characteristics influence novice nurses' SBLE learning outcomes. There were four specific aims (see Table 1.2). First, the author aimed to describe what is known about learner outcomes in nurses assigned the observer role during simulation. To achieve this aim, the author used scoping review methodology to analyze 28 articles and synthesize what is known about simulation observers' learning outcomes. This scoping review demonstrated that simulation observers achieve similar learning outcomes to active participants and further highlighted important gaps in the extant literature (Rogers, Baker & Franklin, 2020).

Next, the author aimed to summarize measurement approaches and synthesize what is known about nurses' CL in simulation. This aim was accomplished with an integrative review of 20 studies measuring nurses' CL experienced in simulation. CL is emerging in nursing education literature as a possible explanation for variation among simulation learning outcomes. Chapter III provides further support for nursing educators to optimize CL with simulation design (Rogers & Franklin, 2021).

The third aim was to describe the trajectory of novice nurses' CJ after observing eight asynchronous expert modeling videos over a semester. The expected finding was that novice nurses' CJ would improve over the semester after developing habits of reflection as a result of the CJ framework provided in 11 short answer prompts (i.e., underpinned by the LCJR and Tanner's Clinical Judgment Model).

Finally, the last aim was to describe the reliability, feasibility, usability of the Lasater Clinical Judgment Rubric for scoring novice nurses written reflections after asynchronous simulation with EM videos. Chapter V reports interrater reliability of the LCJR used to evaluate written reflections from 63 participants who completed a total of 504 short answer surveys. Chapter V also reports time for participant completion and rater evaluation. This innovative use of the LCJR adds to a robust body of literature using the rubric to evaluate CJ after in-person simulation and in traditional clinical settings.

Table 1.2

How Each Specific Aim was Addressed and Related to the NJST Conceptual Model

Specific Aim	Title of Paper for How Aim was Addressed	Related Constructs of the NJST
1) Describe what is known about learner outcomes in nurses assigned the observer role during simulation	Chapter II: Learning Outcomes of the Observer Role in Nursing: A Scoping Review	Simulation Design Participant Outcomes
2) Summarize measurement approaches and synthesize what is known about nurses' cognitive load in simulation	Chapter III: Cognitive Load Experienced by Nurses in Simulation-based Learning Experiences: An Integrative Review	Participant Characteristics
3) Describe the trajectory of novice nurses' CJ after observing eight asynchronous expert modeling videos over a semester *Hypothesis: Novice nurses' CJ will improve over time.*	Chapter IV: Describing Novice Nurses' Clinical Judgment Trajectory After Observing Expert Modeling Videos: A Mixed Methods Study	Simulation Design Participant Outcomes
4) Describe the reliability, feasibility, and usability of the Lasater Clinical Judgment Rubric for scoring novice nurses' written reflections after asynchronous simulation with expert modeling videos *Hypothesis: It is reliable, feasible, and usable to measure novice nurses' CJ in written reflections after asynchronous simulation using the Lasater Clinical Judgment Rubric*	Chapter V: LCJR Reliability for Scoring Written Reflections After Asynchronous Simulation and Feasibility/Usability with Novice Nurses	Participant Outcomes

Summary

This body of research fills an important gap by synthesizing two bodies of literature that support NJST constructs. The first descriptive study demonstrates that simulation observers can improve their CJ over time as a result of participating in guided written reflections using short answer responses that elicit judgments about nursing care provided in expert modeling videos. The second descriptive study describing the reliability, feasibility, and usability of measuring observers' CJ using the LCJR offers a reliable and novel method for measuring simulation participant outcomes. Together, the body of work informs our understanding of how simulation design and participant characteristics impact participant outcomes.

The wider issue is that the proliferation of simulation is occurring without understanding how role assignment affects a novice nurse's ability to make decisions. This body of research will inform the way simulation educators design SBLE to optimize novice nurses' CJ. This body of research offers simulation educators support for assigning simulation observer roles, thus increasing the capacity of simulation programs.

References

AACN. (2020). *AACN essentials - baccalaureate, master's, DNP, and clinical resources*. https://www.aacnnursing.org/Education-Resources/AACN-Essentials

Abe, Y., Kawahara, C., Yamashina, A., & Tsuboi, R. (2013). Repeated scenario simulation to improve competency in critical care: A new approach for nursing education. *American Journal of Critical Care*, *22*(1), 33–40. https://doi.org/10.4037/ajcc2013229

Adamson, K. (2015). A systematic review of the literature related to the NLN/Jeffries simulation framework. *Nursing Education Perspectives*, *36*(5), 281–291. https://doi.org/10.5480/15-1655

Adamson, K. A., Gubrud, P., Sideras, S., & Lasater, K. (2012). Assessing the reliability, validity, and use of the Lasater Clinical Judgment Rubric: Three approaches. *Journal of Nursing Education*, *51*(2), 66–73. https://doi.org/10.3928/01484834-20111130-03

Al-Dossary, R., Kitsantas, P., & Maddox, P. J. (2014). The impact of residency programs on new nurse graduates' clinical decision-making and leadership skills: A systematic review. *Nurse Education Today*, *34*(6), 1024–1028. https://doi.org/10.1016/j.nedt.2013.10.006

Al-Moteri, M., Cooper, S., Symmons, M., & Plummer, V. (2019). Nurses' cognitive and perceptual bias in the identification of clinical deterioration cues. *Australian Critical Care: Official Journal Of The Confederation Of Australian Critical Care Nurses*. https://doi.org/10.1016/j.aucc.2019.08.006

Al Sabei, S. D., & Lasater, K. (2016). Simulation debriefing for clinical judgment development: A concept analysis. *Nurse Education Today*, *45*, 42–47. https://doi.org/10.1016/j.nedt.2016.06.008

Alexander, E. (2020). Purposeful simulation role assignment. *Clinical Simulation in Nursing*, *48,* 1–7. https://doi.org/10.1016/j.ecns.2020.07.008

Aronson, B., Glynn, B., & Squires, T. (2013). Effectiveness of a role-modeling intervention on student nurse simulation competency. *Clinical Simulation in Nursing*, *9*(4), e121–e126. https://doi.org/10.1016/j.ecns.2011.11.005

Baldwin, A., Mills, J., Birks, M., & Budden, L. (2014). Role modeling in undergraduate nursing education: An integrative literature review. *Nurse Education Today*, *34*(6), e18–e26. https://doi.org/10.1016/j.nedt.2013.12.007

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bashford, C. W., Shaffer, B. J., & Young, C. M. (2012). Assessment of clinical judgment in nursing orientation: Time well invested. *Journal for Nurses in Staff Development*, *28*(2), 62–65. https://doi.org/10.1097/NND.0b013e31824b4155

Bates, T. A., Moore, L. C., Greene, D., & Cranford, J. S. (2019). Comparing outcomes of active student and observer roles in nursing simulation. *Nurse Educator*, *44*(4), 216–221. https://doi.org/10.1097/NNE.0000000000000603

Baxter, P., Akhtar-Danesh, N., Landeen, J., & Norman, G. (2012). Teaching critical management skills to senior nursing students: Videotaped or interactive hands-on instruction? *Nursing Education Perspectives*, *33*(2), 106–110. https://doi.org/10.5480/1536-5026-33.2.106

Benner, P., Sutphen, M., Leonard, V., & Day, L. (2009). *Educating nurses : A call for radical transformation* (1st ed.). Josey-Bass.

Berkow, S., Virkstis, K., Stewart, J., & Conway, L. (2008). Assessing new graduate nurse performance. *Journal of Nursing Administration*, *38*(11), 468–474. https://doi.org/10.1097/01.NNA.0000339477.50219.06

Beroz, S., & Hallmark, B. (2017). *Academia to bedside: What we know now. Part 1 – NLN Nursing EDge*.

Bradley, C. S., Johnson, B. K., Dreifuerst, K. T., White, P., Conde, S. K., Meakim, C. H., Curry-Lourenco, K., & Childress, R. M. (2019). Regulation of simulation use in United States prelicensure nursing programs. *Clinical Simulation In Nursing*, *33*, 17–25. https://doi.org/10.1016/j.ecns.2019.04.004

Bratt, M. M., & Felzer, H. M. (2011). Perceptions of professional practice and work environment of new graduates in a nurse residency program. *Journal of Continuing Education in Nursing*, *42*(12), 559–568. https://doi.org/10.3928/00220124-20110516-03

Brown Tyo, M., & McCurry, M. K. (2019). An integrative review of clinical reasoning teaching strategies and outcome evaluation in nursing education. *Nursing Education Perspectives*, *40*(1), 11–17. https://doi.org/10.1097/01.NEP.0000000000000375

Brudvig, T. J., Dirkes, A., Dutta, P., & Rane, K. (2013). Critical thinking skills in health care professional students: A systematic review. *Journal of Physical Therapy Education*, *27*(3), 12–25. https://doi.org/10.1097/00001416-201307000-00004

Burbach, B., Barnason, S., & Thompson, S. A. (2015). Using “Think Aloud” to capture clinical reasoning during patient simulation. *International Journal of Nursing Education Scholarship*, *12*(1), 1–7. https://doi.org/10.1515/ijnes-2014-0044

Burbach, B. E., & Thompson, S. A. (2014). Cue recognition by undergraduate nursing students: an integrative review. *The Journal of Nursing Education*, *53*(9), S73–S81. https://doi.org/10.3928/01484834-20140806-07

Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: systematic review. *Journal of Advanced Nursing*, *66*(1), 3–15. https://doi.org/10.1111/j.1365-

2648.2009.05240.x

Cantrell, M. A., Franklin, A., Leighton, K., & Carlson, A. (2017). The evidence in simulation-based learning experiences in nursing education and practice: An umbrella review. *Clinical Simulation in Nursing*, *13*(12). https://doi.org/10.1016/j.ecns.2017.08.004

Cappelletti, A., Engel, J. K., & Prentice, D. (2014). Systematic review of clinical judgment and reasoning in nursing. *Journal of Nursing Education*, *53*(8), 453–458. https://doi.org/10.3928/01484834-20140724-01

Chen, R., Grierson, L. E., & Norman, G. R. (2015). Evaluating the impact of high- and low-fidelity instruction in the development of auscultation skills. *Medical Education*, *49*(3), 276–285. https://doi.org/10.1111/medu.12653

Clarke, D. E., Boyce-Gaudreau, K., Sanderson, A., & Baker, J. A. (2015). ED triage decision-making with mental health presentations: A “Think Aloud” study. *Journal of Emergency Nursing*, *41*(6), 496–502. https://doi.org/10.1016/j.jen.2015.04.016

Coram, C. (2016). Expert role modeling effect on novice nursing students’ clinical judgment. *Clinical Simulation in Nursing*, *12*(9), 385–391. https://doi.org/10.1016/j.ecns.2016.04.009

Delisle, M., Ward, M. A. R., Pradarelli, J. C., Panda, N., Howard, J. D., & Hannenberg, A. A. (2019). Comparing the learning effectiveness of healthcare simulation in the observer versus active role: Systematic review and meta-analysis. *Simulation in Healthcare*, *14*(5). https://doi.org/10.1097/SIH.0000000000000377

Durham, C. F., Cato, M. L., & Lasater, K. (2014). NLN/Jeffries Simulation Framework state of the science project: Participant construct. *Clinical Simulation in Nursing*, *10*(7), 363–372. https://doi.org/10.1016/j.ecns.2014.04.002

Esposito, C. P., & Sullivan, K. (2020). Maintaining clinical continuity through virtual simulation during the COVID-19 pandemic. *Journal of Nursing Education*, *59*(9), 522–525. https://doi.org/10.3928/01484834-20200817-09

Fisher, D., & King, L. (2013). An integrative literature review on preparing nursing students through simulation to recognize and respond to the deteriorating patient. *Journal of Advanced Nursing*, *69*(11), 2375–2388. https://doi.org/10.1111/jan.12174

Fluharty, L., Hayes, A. S., Milgrom, L., Malarney, K., Smith, D., Reklau, M. A., Jeffries, P., & McNelis, A. M. (2012). A multisite, multi-academic track evaluation of end-of-life simulation for nursing education. *Clinical Simulation in Nursing*, *8*(4). https://doi.org/10.1016/j.ecns.2010.08.003

Fogg, N., Wilson, C., Trinka, M., Campbell, R., Thomson, A., Merritt, L., Tietze, M., & Prior, M. (2020). Transitioning from direct care to virtual clinical experiences during the COVID-19 pandemic. *Journal of Professional Nursing*. https://doi.org/10.1016/j.profnurs.2020.09.012

Founds, S. A., Zewe, G., & Scheuer, L. A. (2011). Development of high-fidelity simulated clinical experiences for baccalaureate nursing students. *Journal of Professional Nursing*, *27*(1), 5–9. https://doi.org/10.1016/j.profnurs.2010.09.002

Franklin, A. E., Gubrud-Howe, P., Sideras, S., & Lee, C. S. (2015). Effectiveness of simulation preparation on novice nurses' competence and self-efficacy in a multiple-patient simulation. *Nursing Education Perspectives*, *36*(5), 324–325. https://doi.org/10.5480/14-1546

Franklin, A. E., & Lee, C. S. (2014). Effectiveness of simulation for improvement in self-efficacy among novice nurses: A meta-analysis. *Journal of Nursing Education*, *53*(11), 607–614. https://doi.org/10.3928/01484834-20141023-03

Franklin, A. E., Sideras, S., Dodd, C., & Hutson, J. (2020). A randomized trial of multiple-patient simulation preparation to improve novice nurses' competence and self-efficacy. *Nursing Education Perspectives*, *41*(3), 146–151. https://doi.org/10.1097/01.NEP.0000000000000593

Fraser, K. L., Ayres, P., & Sweller, J. (2015). Cognitive Load Theory for the design of medical simulations. *Simulation in Healthcare*, *10*(5). https://doi.org/10.1097/SIH.0000000000000097

Groom, J. A., Henderson, D., & Sittner, B. J. (2014). NLN/Jeffries Simulation Framework state of the science project: Simulation design characteristics. *Clinical Simulation in Nursing*, *10*(7), 337–344. https://doi.org/10.1016/j.ecns.2013.02.004

Hallin, K., Bäckström, B., Häggström, M., & Kristiansen, L. (2016). High-fidelity simulation: Assessment of student nurses' team achievements of clinical judgment. *Nurse Education in Practice*, *19*, 12–18. https://doi.org/10.1016/j.nepr.2016.03.010

Hallmark, B. F. (2020). Replacing clinical with simulation amid the COVID-19 crisis. *Tennessee Nurse*, *83*(2), 12.

Harder, N. (2020). Simulation amid the COVID-19 pandemic. *Clinical Simulation in Nursing*, *43*, 1–2. https://doi.org/10.1016/j.ecns.2020.03.010

Harder, N., Ross, C. J. M., & Paul, P. (2013). Student perspective of roles assignment in high-fidelity simulation: An ethnographic study. *Clinical Simulation in Nursing*, *9*(9), e329–e334. https://doi.org/10.1016/j.ecns.2012.09.003

Hayden, J., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Regulation Nursing*, *5*(2), S3–S40. https://doi.org/https://doi.org/10.1016/S2155-8256(15)30062-4

Henneman, E. A., Gawlinski, A., Nicholas, C., McAfee, K., Marquard, J. L., & Jr.Andrzejewski, C. (2017). Identification of transfusion-associated circulatory overload: An eye-tracking study. *Clinical Simulation in Nursing*, *13*(12), 675–679. https://doi.org/10.1016/j.ecns.2017.05.004

Hickerson, K. A., Taylor, L. A., & Terhaar, M. F. (2016). The preparation–practice gap: An integrative literature review. *Journal of Continuing Education in Nursing*, *47*(1), 17–23. https://doi.org/10.3928/00220124-20151230-06

Howard, S., Mahaffey, E., Alicia Lundstrom, C., Daly, A., & Roberts, J. (2017). *Comparison of satisfaction, self-confidence, and segagement of baccalaureate nursing students using defined observational roles and expectations versus traditional role assignments in high fidelity simulation and debriefing* (No. 10624882). ProQuest.

INACSL. (2016). INACSL Standards of best practice: SimulationSM simulation glossary. *Clinical Simulation in Nursing*, *12*, S39–S47. https://doi.org/10.1016/j.ecns.2016.09.012

International Nursing Association for Clinical Simulation and Learning. (n.d.). *Repository of instruments used in simulation research*. https://www.inacsl.org/resources/repository-of-instruments/

Ironside, P. M., McNelis, A. M., & Ebright, P. (2014). Clinical education in nursing: Rethinking learning in practice settings. *Nursing Outlook*, *62*(3), 185–191. https://doi.org/10.1016/j.outlook.2013.12.004

James, J. T. (2013). A new, evidence-based estimate of patient harms associated with hospital care. *Journal of Patient Safety*, *9*(3), 122–128. https://doi.org/10.1097/PTS.0b013e3182948a69

Jarvill, M., Kelly, S., & Krebs, H. (2018). Effect of expert role modeling on skill performance in simulation. *Clinical Simulation in Nursing*, *24*, 25–29. https://doi.org/10.1016/j.ecns.2018.08.005

Jayasekara, R., Smith, C., Hall, C., Rankin, E., Smith, M., Visvanathan, V., & Friebe, T. R. (2018). The effectiveness of clinical education models for undergraduate nursing programs: A systematic review. *Nurse Education in Practice*, *29*, 116–126. https://doi.org/10.1016/j.nepr.2017.12.006

Jeffries, P. R., & Rizzolo, M. A. (2007). *Designing and implementing models for innovative use of simulation to teach nursing care of ill adults and children: A national, multi-site, multi-method study*.

Jeffries, Pamela R., & National League for Nursing. (2016). *The NLN Jeffries simulation theory*. Wolters Kluwer.

Jeffries, Pamela R., Rodgers, B., & Adamson, K. (2015). NLN Jeffries Simulation Theory: Brief narrative description. *Nursing Education Perspectives*, *36*(5), 292–293. https://doi.org/10.5480/1536-5026-36.5.292

Johnson, B. K. (2019). Simulation observers learn the same as participants: The evidence. *Clinical Simulation In Nursing*, *33*, 26–34. https://doi.org/10.1016/j.ecns.2019.04.006

Johnson, B. K. (2020). Observational experiential learning: Theoretical support for observer roles in health care simulation. *The Journal of Nursing Education*, *59*(1), 7–14. https://doi.org/10.3928/01484834-20191223-03

Johnson, E. A., Lasater, K., Hodson-Carlton, K., Siktberg, L., Sideras, S., & Dillard, N. (2012). Geriatrics in simulation: Role modeling and clinical judgment effect. *Nursing Education Perspectives*, *33*(3), 176–180. https://doi.org/10.5480/1536-5026-33.3.176

Jones, A. L., Reese, C. E., & Shelton, D. P. (2014). NLN/Jeffries Simulation Framework state of the science project: The teacher construct. *Clinical Simulation in Nursing*, *10*(7), 353–362. https://doi.org/10.1016/j.ecns.2013.10.008

Josephsen, J. (2015). Cognitive load theory and nursing simulation: An integrative review. *Clinical Simulation in Nursing*, *11*(5), 259–267. https://doi.org/10.1016/j.ecns.2015.02.004

Kaplan, B. G., Abraham, C., & Gary, R. (2012). Effects of participation vs. observation of a simulation experience on testing outcomes: Implications for logistical planning for a school of nursing. *International Journal of Nursing Education Scholarship*, *9*(1). https://doi.org/10.1515/1548-923X.14

Kardong-Edgren, S., Adamson, K. A., & Fitzgerald, C. (2010). A review of currently published evaluation instruments for human patient simulation. *Clinical Simulation in Nursing*, *6*(1). https://doi.org/10.1016/j.ecns.2009.08.004

Kavanagh, J. M., & Szweda, C. (2017). A crisis in competency: The strategic and ethical imperative to assessing new graduate nurses' clinical reasoning. *Nursing Education Perspectives*, *38*(2), 57–62. https://doi.org/10.1097/01.NEP.0000000000000112

Kenward, K., & Zhong, E. H. (2006). *Report of findings from the practice and professional issues survey fall 2004 National Council of State Boards of Nursing (NCSBN)*.

Klenke-Borgmann, L., Cantrell, M. A., & Mariani, B. (2020). Nurse educators' guide to clinical judgment: A review of conceptualization, measurement, and development. *Nursing Education Perspectives*, *41*(4), 215–221. https://doi.org/10.1097/01.NEP.0000000000000669

Lasater, K. (2007). Clinical judgment development: Using simulation to create an assessment rubric. *Journal of Nursing Education*, *46*(11), 496–503. https://doi.org/10.3928/01484834-20071101-04

Lasater, K. (2011). Clinical judgment: The last frontier for evaluation. *Nurse Education in Practice*, *11*(2), 86–92. https://doi.org/10.1016/j.nepr.2010.11.013

Lasater, K., Holloway, K., Lapkin, S., Kelly, M., McGrath, B., Nielsen, A., Stoyles, S., Dieckmann, N. F., & Campbell, M. (2019). Do prelicensure nursing students' backgrounds impact what they notice and interpret about patients? *Nurse Education Today*, *78*, 37–43. https://doi.org/10.1016/j.nedt.2019.03.013

Lasater, K., Johnson, E. A., Ravert, P., & Rink, D. (2014). Role modeling clinical judgment for an unfolding older adult simulation. *Journal of Nursing Education*, *53*(5), 257–264. https://doi.org/10.3928/01484834-20140414-01

Lasater, K., Nielsen, A. E., Stock, M., & Ostrogorsky, T. L. (2015). Evaluating the clinical judgment of newly hired staff nurses. *Journal of Continuing Education in Nursing*, *46*(12), 563–571. https://doi.org/10.3928/00220124-20151112-09

Lee, J., & Oh, P. J. (2015). Effects of the use of high-fidelity human simulation in nursing education: A meta-analysis. *Journal of Nursing Education*, *54*(9), 501–507. https://doi.org/10.3928/01484834-20150814-04

LeFlore, J. L., Anderson, M., Michael, J. L., Engle, W. D., & Anderson, J. D. (2007). Comparison of self-directed learning versus instructor-modeled learning during a simulated clinical experience. *Simulation in Healthcare*, *2*(3), 170–177. https://doi.org/10.1097/SIH.0b013e31812dfb46

Leigh, J., Vasilica, C., Dron, R., Gawthorpe, D., Burns, E., Kennedy, S., Kennedy, R., Warburton, T., & Croughan, C. (2020). Redefining undergraduate nurse teaching during the coronavirus pandemic: Use of digital technologies. *British Journal of Nursing*, *29*(10), 566–569. https://doi.org/10.12968/bjon.2020.29.10.566

Levett-Jones, T., & Lapkin, S. (2014). A systematic review of the effectiveness of simulation debriefing in health professional education. *Nurse Education Today*, *34*(6). https://doi.org/10.1016/j.nedt.2013.09.020

Lioce, L. (ed. ., Downing, D., Chang, T. P., Robertson, J. M., Anderson, M., Diaz, D. A., Spain, A. E. (Assoc. E. ., & Terminology and Concepts Working Group. (2020). *Healthcare simulation dictionary- 2nd edition*. https://doi.org/10.23970/simulationv2

Livsey, K., & Lavender-Stott, E. (2015). Impact of vicarious learning through peer observation during simulation on student behavioural measures. *Focus on Health Professional Education: A Multi-Professional Journal*, *16*(4), 64. https://doi.org/10.11157/fohpe.v16i4.99

Macauley, K., Brudvig, T. J., Kadakia, M., & Bonneville, M. (2017). Systematic review of assessments that evaluate clinical decision making, clinical reasoning, and critical thinking changes after simulation participation. *Journal of Physical Therapy Education*, *31*(4), 64–75. https://doi.org/10.1097/jte.0000000000000011

Makary, M. A., & Daniel, M. (2016). Medical error-the third leading cause of death in the US. *BMJ (Online)*, *353*. https://doi.org/10.1136/bmj.i2139

Mariani, B., Cantrell, M. A., Meakim, C., Prieto, P., & Dreifuerst, K. T. (2013). Structured debriefing and students' clinical judgment abilities in simulation. *Clinical Simulation in Nursing*, *9*(5). https://doi.org/10.1016/j.ecns.2011.11.009

Mariani, B., Doolen, J., & Cne, A.-C. (2016). Nursing simulation research: What are the perceived gaps? *Clinical Simulation in Nursing*, *12*(1), 30–36. https://doi.org/10.1016/j.ecns.2015.11.004

Ng, Y. M., & Or, P. L. P. (2020). Coronavirus disease (COVID-19) prevention: Virtual classroom education for hand hygiene. *Nurse Education in Practice*, *45*, 102782. https://doi.org/10.1016/j.nepr.2020.102782

Nielsen, A. E., Stragnell, S., & Jester, P. (2007). Guide for reflection using the clinical judgment model. *The Journal of Nursing Education*, *46*(11), 513–516.

Nilsson, C., Sørensen, B. L., & Sørensen, J. L. (2014). Comparing hands-on and video training for postpartum hemorrhage management. *Acta Obstetricia et Gynecologica Scandinavica*, *93*(5), 517–520. https://doi.org/10.1111/aogs.12372

NLN. (2020a). *Descriptions of available instruments*. http://www.nln.org/professional-development-programs/research/tools-and-instruments/descriptions-of-available-instruments

NLN. (2020b). *Graduations from Basic RN Programs: 1987-88 to 1994-95 and 2002-03 to 2007-08*. http://www.nln.org/newsroom/nursing-education-statistics/graduations-from-rn-programs

O'Donnell, J. M., Decker, S., Howard, V., Levett-Jones, T., & Miller, C. W. (2014). NLN/Jeffries Simulation Framework state of the science project: Simulation learning outcomes. *Clinical Simulation in Nursing*, *10*(7), 373–382. https://doi.org/10.1016/j.ecns.2014.06.004

O'Regan, S., Molloy, E., Watterson, L., & Nestel, D. (2016). Observer roles that optimise learning in healthcare simulation education: a systematic review. *Advances in Simulation*, *1*(1), 1–10. https://doi.org/10.1186/s41077-015-0004-8

Plass, J. L., Moreno, R., & Brunken, R. (2010). *Cognitive load theory*. Cambridge University Press.

Price, A., Zulkosky, K., White, K., & Pretz, J. (2017). Accuracy of intuition in clinical decision-making among novice clinicians. *Journal of Advanced Nursing*, *73*(5), 1147–1157. https://doi.org/10.1111/jan.13202

Roberts, D. (2010). Vicarious learning: A review of the literature. *Nurse Education in Practice*, *10*(1), 13–16. https://doi.org/10.1016/j.nepr.2009.01.017

Rode, J. L., Callihan, M. L., & Barnes, B. L. (2016). Assessing the value of large-group simulation in the classroom. *Clinical Simulation in Nursing*, *12*(7), 251–259. https://doi.org/10.1016/j.ecns.2016.02.012

Rogers, B. A., & Franklin, A. E. (2021). Cognitive load experienced by nurses in simulation-based learning experiences: An integrative review. *Nurse Education Today*, *In press*. https://doi.org/10.1016/j.nedt.2021.104815

Rogers, B., Baker, K. A., & Franklin, A. E. (2020). Learning outcomes of the observer role in nursing simulation: A scoping review. *Clinical Simulation in Nursing*, *49*, 81–89. https://doi.org/10.1016/j.ecns.2020.06.003

Ruth-Sahd, L. A. (2003). Reflective practice: A critical analysis of data-based studies and implications for nursing education. *Journal of Nursing Education*, *42*(11), 488–497. https://doi.org/10.3928/0148-4834-20031101-07

Saintsing, D., Gibson, L. M., & Pennington, A. W. (2011). The novice nurse and clinical decision-making: How to avoid errors. *Journal of Nursing Management*, *19*(3), 354–359. https://doi.org/10.1111/j.1365-2834.2011.01248.x

Scherer, Y. K., Foltz-Ramos, K., Fabry, D., & Chao, Y. Y. (2016). Evaluating simulation methodologies to determine best strategies to maximize student learning. *Journal of Professional Nursing*, *32*(5), 349–357. https://doi.org/10.1016/j.profnurs.2016.01.003

Schlairet, M. C., Schlairet, T. J., Sauls, D. H., & Bellflowers, L. (2015). Cognitive load, emotion, and performance in high-fidelity simulation among beginning nursing students: A pilot study. *Journal of Nursing Education*, *54*(3), S5–S11. https://doi.org/10.3928/01484834-20150218-10

Shinnick, M. A. (2016). Validating eye tracking as an objective assessment tool in simulation. *Clinical Simulation in Nursing*, *12*(10), 438–446. https://doi.org/10.1016/j.ecns.2016.06.001

Smiley, R. A. (2019). Survey of simulation use in prelicensure nursing programs: changes and advancements, 2010- 2017. *Journal of Nursing Regulation*, *9*(4), 48–61. https://doi.org/10.1016/S2155-8256(19)30016-X

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (Suzie). (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: A study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing*, *30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Svellingen, A. H., Søvik, M. B., Røykenes, K., & Brattebø, G. (2020). The effect of multiple exposures in scenario-based simulation—A mixed study systematic review. *Nursing Open*, nop2.639. https://doi.org/10.1002/nop2.639

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, *45*(6), 204–211. https://doi.org/10.3928/01484834-20060601-04

Todd, M., Manz, J. A., Hawkins, K. S., Parsons, M. E., & Hercinger, M. (2008). The development of a quantitative evaluation tool for simulations in nursing education. *International Journal of Nursing Education Scholarship*, *5*(1). https://doi.org/10.2202/1548-923X.1705

Victor-Chmil, J., & Larew, C. (2013). Psychometric properties of the Lasater Clinical Judgment Rubric. *International Journal of Nursing Education Scholarship*, *10*(1), 30. https://doi.org/10.1515/ijnes-2012-0030

Weaver, A. (2011). High-fidelity patient simulation in nursing education: An integrative review. *Nursing Education Perspectives*, *32*(1), 37–40. https://doi.org/10.5480/1536-5026-32.1.37

Weiler, D. T., Gibson, A. L., & Saleem, J. J. (2018). The effect of role assignment in high fidelity patient simulation on nursing students: An experimental research study. *Nurse Education Today*, *63*, 29–34. https://doi.org/10.1016/j.nedt.2018.01.012

Yang, H., Thompson, C., & Bland, M. (2012). The effect of clinical experience, judgment task difficulty and time pressure on nurses' confidence calibration in a high fidelity clinical simulation. *BMC Medical Informatics & Decision Making*, *12*(1), 113. https://doi.org/10.1186/1472-6947-12-113

Zulkosky, K. D., White, K. A., Price, A. L., & Pretz, J. E. (2016). Effect of simulation role on clinical decision-making accuracy. *Clinical Simulation in Nursing*, *12*(3), 98–106. https://doi.org/10.1016/j.ecns.2016.01.007

Chapter II- LEARNING OUTCOMES OF THE OBSERVER ROLE IN NURSING SIMULATION: A SCOPING REVIEW

Authors: Beth Rogers, Kathy A. Baker, Ashley E. Franklin

Corresponding Author: Beth Rogers

This manuscript is significant because many programs are utilizing observer, or non-active, roles more frequently without fully knowing what learning outcomes are achieved. Eight categories of observer learning outcomes were identified: knowledge, clinical skills, clinical judgment, teamwork/ collaboration, confidence, critical thinking, insight, and conceptual thinking. This review is important because it highlights what is known about observer learning outcomes to date. Beth Rogers was the primary author and conducted the review under the direction of Dr. Baker. Dr. Franklin also significantly contributed to writing and editing the final manuscript. This paper is published in *Clinical Simulation in Nursing* (impact factor 1.713), a peer-reviewed journal with a readership interested in simulation.

This manuscript was exempt from institutional review because it does not include human subjects.

Cite this article:
Rogers, B., Baker, K. A., & Franklin, A. E. (2020, December). Learning outcomes of the observer role in nursing simulation: A scoping review. Clinical Simulation in Nursing, 49, 81-89. https://doi.org/10.1016/j.ecns.2020.06.003.

Abstract

Background: Simulation-based learning experiences are utilized more frequently to support nursing education. Some programs use observational, rather than active, role assignments to meet the growing demand for simulation-based learning experiences. Despite support for observer learning, educators disagree about whether observers' learning outcomes are similar to those who are active participants.

Methods: The scoping review strategy established by the Joanna Briggs Institute was followed to investigate what learning outcomes have been measured in nurses serving in observer roles in simulation.

Results: Twenty-eight studies matched the search strategy and inclusion criteria. Eight categories of observer learning outcomes were identified: knowledge, clinical skills, clinical judgment, teamwork/ collaboration, confidence, critical thinking, insight, and conceptual thinking.

Conclusion: The literature suggests that the observer role can lead to measurable learning outcomes.

Keywords: learning outcomes, observer, nursing education, role assignment, scoping review, simulation

Nurse educators are using many different strategies, including simulation-based learning experiences (SBLE), to address the demands of increasing student populations, clinical site scarcity, active classroom teaching strategies, and need for continual skill competency training in nursing education (Hayden et al., 2014). Lioce, (2020) defined SBLE as "activities that represent actual or potential situations in education and practice. These activities allow participants to develop or enhance their knowledge skills, and attitudes, or analyze and respond to realistic situations in a simulated environment."

Nursing education programs use SBLE to fill gaps in traditional clinical and classroom activities (NLN, 2015). Use of SBLE has also been driven by increased demands for graduates who are better prepared to care for complex patients upon graduation (Benner et al., 2010). Nursing programs across the globe are responding to this call by including more active teaching strategies that promote synthesis of knowledge. Decisions to utilize SBLE have been validated by evidence showing that participants achieve learning outcomes that prepare them for practice. Furthermore, the National Simulation Study found that replacing up to half of clinical hours with simulation resulted in similar learning outcomes (Hayden et al., 2014). More specifically, simulation research consistently shows nurses in SBLE achieve cognitive, psychomotor, and affective skills (Cantrell et al., 2017).

With increased demand placed on simulation programs, however, comes overcrowded space and shortages of facilitators (Cant & Cooper, 2010; Gaberson & Oermann, 2014). Hospital simulation programs experience similar stresses on program resources. More hospitals utilize SBLE for new graduate training, employee orientation, continuing education, certification courses, and staff development (Hallenbeck, 2012; Jansson et al., 2013; O'Leary et al., 2015;

Olejniczak et al., 2010; Weaver, 2011). Many simulation programs accommodate growing numbers by assigning participants active and observational roles.

While significant evidence supporting SBLE is available, there is a gap related to use of observer roles. Furthermore, there is much variation in how observer roles are utilized in simulation programs. Some describe observers as any participant in a response-based, non-direct caregiver role (Jeffries & Rizzolo, 2007), whereas others categorize observers as having no active involvement in the scenario (Johnson, 2018; O'Reagan et al., 2016). Educators have questioned whether observer roles are the best response to increased demand for SBLE. There is concern whether participants who are not actively involved in simulation scenarios will stay attentive and remain actively engaged in learning (Harder et al., 2013). Others believe that students prefer active roles in simulation, which allows hands-on practice (Guhde, 2010).

The challenges and concerns faced with the observer role in simulation have been somewhat satisfied by previous studies showing that observers achieve similar outcomes to active learners. Learning outcomes are defined as measurable knowledge, skills, or abilities that result from an educational activity (Lioce, 2020). Simulation participants in observer roles are described as "learning differently from, but equally to, traditional participants" (Bonnel & Hober, 2016). Few systematic reviews of effectiveness exist related to observational learning (Delisle et al., 2019; O'Reagan et al., 2016). Learning outcomes may increase when observers complete a worksheet or cognitive aid that focusses their attention (O'Reagan et al., 2016). Recently, Delisle et al. (2019) reported that simulation observers achieved similar reaction outcomes, but active participation resulted in improved learning outcomes. However, this effectiveness review restricted findings to randomized control trials and included only two nursing studies. No reviews evaluate what learning outcomes have been explicitly measured in nurses[1] participating in SBLE in the observer role. This is important because the National Simulation Study reported observer roles are used frequently (Hayden et al., 2014). Therefore, this scoping review was completed to investigate the question: What learning outcomes have been achieved by nurses assigned to the observer role in simulation?

Methods

This scoping review was conducted following the Joanna Briggs Institute methodology (Peters et al, 2017). An *a priori* protocol established the objectives, inclusion criteria, and methods and was agreed upon by all authors (Rogers et al., 2020). A scoping review methodology was utilized to map the evidence and synthesize the support of learning outcomes of nurses assigned to simulation observer roles. Scoping review research questions are more broadly focused and investigate topics which have a preponderance of evidence but have not been previously reviewed. This process involves a systematic search and synthesis of the literature, which can include published research, unpublished research studies, or non-experimental opinion pieces. The purpose of scoping reviews is to synthesize current findings, discover gaps in the research, and investigate if further research is needed (Khalil et al., 2015; Peters et al., 2017).

Search Strategy

The authors identified the keywords *nurse, observer, simulation*, and *learning outcome* for initial database searches through consultation with a research librarian. An initial limited

[1] The term nurse here refers to both pre-licensure students and practicing nurses, who may be in advanced education programs. In some publications, researchers have referred to students as nurses or novice nurses. We avoided the use of the word *participant* to refer to nurses, because *participant* (compared with observer) represents someone in an active simulation role. Using mixed terminology to address the same concept is problematic in simulation literature; simulation experts recommend using consistent terminology to enhance communication and clarity (Lioce, 2020)

search of MEDLINE was undertaken in September 2019 to identify articles on the topic and identify index terms. The text words contained in the titles and abstracts of relevant articles and the index terms were used to develop a full search strategy for CINAHL (see Table 2.1).

Table 2.1

Search Strategy for CINAHL Complete via EBSCO

Inclusion Criteria	Search Terms Used	Expanded Terms	Total Results
Population	MJ (Nurs* or	Nurse	2,046
	Nurs* education or	Nursing education	
	Bachelor or	Bachelor	
	Vocation* nurs* or	Vocational nurse	
	Graduat* educat* or	Graduate education	
	Advance* practice* or	Advanced practice	
	Register* nurs* or	Registered nurse	
	Licensed vocation* nurs*)	Licensed vocational nurse	
	combined with AND		
Context	SU (Simulat* or	Simulation	
	Virtual reality or	Virtual reality	
	Computer simulat* or	Computer simulation	
	Vignette or	Vignette	
	Manikin or	Manikin	
	Mannikin or	Mannikin	
	Mannequin or	Mannequin	
	Role Play or	Role Play	
	Standard* patient* or	Standardized patient	
	Augmented Reality or	Augmented Reality	
	Observ* or	Observer	
	Observ* role or	Observer role	
	Observational learn* or	Observational learning	
	Vicarious learn* or	Vicarious learning/er	
	Watch*)	Watch/ing	
	combined with AND		
Concept	SU (Learn* outcome* or	Learner outcome	
	measure* or	Measure/s/ment	
	Knowledge or	Knowledge	
	Skill or	Skill	
	Attitude* or	Attitude	
	Behav*)	Behave /ior	

Note: This search was conducted on September 10, 2019 using the Advanced Search feature. The search was filtered to the English language. All geographic subsets were included.

Next, the authors utilized the protocol's detailed strategy to perform a more thorough database search. The authors limited the search to articles written in English. The JBI Database of Systematic Reviews and Implementation Reports, Cochrane Central Register of Controlled Trials, ProQuest (Nursing & Allied Health), Embase, ERIC, CINAHL, and MEDLINE databases were searched on January 10, 2020, and downloaded into EndNote reference management software (see Table 2.2). After database searches, reference lists of all studies appraised in full-text were screened for additional sources.

Tables 2.2

Search Strategy for Included Databases

Database	Search Date	Search Terms	Results
CINAHL Complete	January 10, 2020	SU (Nurs* OR ‘Nurs* education’ OR Bachelor OR ‘Vocation* nurs*’ OR ‘Graduat* educat*’ OR ‘Advance* practice*’ OR ‘Register* nurs*’ OR ‘Licensed vocation* nurs*’) AND MJ (Simulat* OR ‘Virtual reality’ OR ‘Computer simulat*’ OR ‘Vignette’ OR Manikin OR Mannikin OR Mannequin OR ‘Role Play’ OR ‘Standard* patient*’ OR ‘Augmented Reality’) AND (Observ* OR ‘Observ* role’ OR role OR ‘Observational learn*’ OR ‘Vicarious learn*’ OR Watch*) AND (‘Learn* outcome*’ OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	1440
Medline Complete	January 10, 2020	SU (Nurs* OR ‘Nurs* education’ OR Bachelor OR ‘Vocation* nurs*’ OR ‘Graduat* educat*’ OR ‘Advance* practice*’ OR ‘Register* nurs*’ OR ‘Licensed vocation* nurs*’) AND SU (Simulat* OR ‘Virtual reality’ OR ‘Computer simulat*’ OR ‘Vignette’ OR Manikin OR Mannikin OR Mannequin OR ‘Role Play’ OR ‘Standard* patient*’ OR ‘Augmented Reality’) AND (Observ* OR ‘Observ* role’ OR ‘Observational learn*’ OR ‘Vicarious learn*’ OR Watch*) AND (‘Learn* outcome*’ OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	1393
ProQuest (Nursing and Allied Health)	January 10, 2020	su((Nurs* OR ‘Nurs* education’ OR Bachelor OR ‘Vocation* nurs*’ OR ‘Graduat* educat*’ OR ‘Advance* practice*’ OR ‘Register* nurs*’ OR ‘Licensed vocation* nurs*’)) AND mainsubject((Simulat* OR ‘Virtual reality’ OR ‘Computer simulat*’ OR ‘Vignette’ OR Manikin OR Mannikin OR Mannequin OR ‘Role Play’ OR ‘Standard* patient*’ OR ‘Augmented Reality’)) AND (Observ* OR ‘Observ* role’ OR ‘Observational learn*’ OR ‘Vicarious learn*’ OR Watch*) AND (‘Learn* outcome*’ OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	1090
Embase	January 10, 2020	(Nurs* OR ‘Nurs* education’ OR Bachelor OR ‘Vocation* nurs*’ OR ‘Graduat* educat*’ OR ‘Advance* practice*’ OR ‘Register* nurs*’ OR ‘Licensed vocation* nurs*’) AND (Simulat* OR ‘Virtual reality’ OR ‘Computer simulat*’ OR ‘Vignette’ OR Manikin OR Mannikin OR Mannequin OR ‘Role Play’ OR ‘Standard* patient*’ OR ‘Augmented Reality’) AND (Observ* OR ‘Observ* role’ OR ‘Observational learn*’ OR ‘Vicarious learn*’ OR Watch*) AND (‘Learn* outcome*’ OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	1301
Cochrane	January 10, 2020	Keyword (Nurs* OR ‘Nurs* education’ OR Bachelor OR ‘Vocation* nurs*’ OR ‘Graduat* educat*’ OR ‘Advance* practice*’ OR ‘Register* nurs*’ OR ‘Licensed vocation* nurs*’) AND (Simulat* OR ‘Virtual reality’ OR ‘Computer simulat*’ OR ‘Vignette’ OR Manikin OR Mannikin OR Mannequin OR ‘Role Play’ OR ‘Standard* patient*’ OR ‘Augmented Reality’) AND (Observ* OR ‘Observ* role’ OR ‘Observational learn*’ OR ‘Vicarious learn*’ OR Watch*) AND (‘Learn* outcome*’ OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	221
ERIC via EBSCO	January 10, 2020	(Nurs* OR ‘Nurs* education’ OR Bachelor OR ‘Vocation* nurs*’ OR ‘Graduat* educat*’ OR ‘Advance* practice*’ OR ‘Register* nurs*’ OR ‘Licensed vocation* nurs*’) AND (Simulat* OR ‘Virtual reality’ OR ‘Computer simulat*’ OR ‘Vignette’ OR Manikin OR Mannikin OR Mannequin OR ‘Role Play’ OR ‘Standard* patient*’ OR ‘Augmented Reality’) AND (Observ* OR ‘Observ* role’ OR role OR ‘Observational learn*’ OR	357

		'Vicarious learn*' OR Watch*) AND ('Learn* outcome*' OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	
ProQuest (Dissertation and Theses)	January 10, 2020	(Nurs* OR 'Nurs* education' OR Bachelor OR 'Vocation* nurs*' OR 'Graduat* educat*' OR 'Advance* practice*' OR 'Register* nurs*' OR 'Licensed vocation* nurs*') AND (Simulat* OR 'Virtual reality' OR 'Computer simulat*' OR 'Vignette' OR Manikin OR Mannikin OR Mannequin OR 'Role Play' OR 'Standard* patient*' OR 'Augmented Reality') AND (Observ* OR 'Observ* role' OR role OR 'Observational learn*' OR 'Vicarious learn*' OR Watch*) AND ('Learn* outcome*' OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	565
JBI	January 10, 2020	(Nurs* OR 'Nurs* education' OR Bachelor OR 'Vocation* nurs*' OR 'Graduat* educat*' OR 'Advance* practice*' OR 'Register* nurs*' OR 'Licensed vocation* nurs*') AND (Simulat* OR 'Virtual reality' OR 'Computer simulat*' OR 'Vignette' OR Manikin OR Mannikin OR Mannequin OR 'Role Play' OR 'Standard* patient*' OR 'Augmented Reality') AND (Observ* OR 'Observ* role' OR role OR 'Observational learn*' OR 'Vicarious learn*' OR Watch*) AND ('Learn* outcome*' OR measure* OR Knowledge OR Skill OR Attitude* OR Behav*)	5

Inclusion and Exclusion Criteria

This review considered literature that discussed learning outcomes of nurses assigned the observer role in SBLE. Learning outcomes included any knowledge, skill, or ability necessary to practice nursing. Articles investigating subjects in a licensed vocational nursing (LVN), associate degree nursing (ADN), baccalaureate (BSN), or graduate (Master's or doctoral) nursing program; licensed; or advanced practice nurses were included. SBLE could occur in a simulation lab, the classroom, community, healthcare facility, or online setting. Studies were included regardless of whether observers participated in debriefing or not. Articles had to analyze learning outcomes of nurses separate from active participants and other professions.

Exclusion criteria included literature that did not contain nurses/ student nurses in the population. Furthermore, interprofessional simulations where nurses participated as observers, but results were analyzed with other professions, were also excluded because the authors were investigating nursing outcomes. Studies that investigated observing a procedure in the hospital clinical setting, or outside of simulation experiences, were excluded. Additionally, records were excluded if research participants were considered observers but were involved in a response-based role or were otherwise actively involved in the scenario. Finally, any study which investigated the observer role, but examined only reactions to learning (e.g., satisfaction, stress, or anxiety) was excluded.

Article Selection

The authors screened titles and abstracts to determine eligibility. Full-text sources of any article that possibly met this review's criteria were located and examined. A search of reference list titles and abstracts of all records that were reviewed in full-text was performed to identify other possible studies. Two graduate-prepared nurse educators examined the remaining articles independently. They met to review the study selection decisions and agreed upon all records included in the final review.

Charting Data

The authors utilized the JBI methodology (Peters et al., 2017) to guide data extraction and map the learning outcomes (see Table 2.3). Further details about the population, intervention, concept, and outcome of interest are found in Tables 2.4-2.8. Measurement is a key term in the definition of learning outcomes. Therefore, data were also extracted about how the outcome was measured and reported in accordance with publishing guidelines (see Table 2.3).

Table 2.3

Data Extraction Table

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Abe, Kawahara, Yamashina, & Tsuboi (2013)	To examine the effectiveness of SBLE in improving competency of critical care nurses and teamwork	Quasi Experimental; Practicing nurses; Sample (n= 24)	- Mean rubric scores were higher in teams who observed the simulation before participating - No significant difference in confidence in job, morale for job, or relationship with colleagues in either group	- Participant Rubric - Teamwork Activity Inventory in Nursing Scale (TAINS)
Abelsson & Bisholt, (2017)	Describe how nursing students learn care of patients through SBLE, based on observation and debriefing	Qualitative; Three-year nursing students (n= 41)	- Identified a theme that observers experienced a different path to learning through reflection - Themes of knowledge awareness: showed observing allowed participants to confirm knowledge and identify gaps	- Field observation notes - Group interviews
Alexander (2019)	To explore the impact of purposeful simulation role assignment, using preferred learning styles, on prelicensure nursing students' clinical reasoning	Dissertation Randomized Control Trial; Both ADN (n= 25) and BSN students(n= 179); total (n= 214)	- statistically significant increase in clinical reasoning for both the direct care providers and the observer - No statistically significant difference in clinical reasoning between the two groups when comparing those assigned roles based on learning preference compared to random assignment - Students with a preference for reflective learning had a statistically significant increase in clinical reasoning when assigned an observer role, but not with random role assignment	- Nurses Clinical Reasoning Scale

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Bates, Moore, Greene, & Cranford (2019)	To determine if anxiety levels and student learning outcomes are comparable for students in active and observer roles.	Quasi Experimental; Undergraduate BSN nurses; Non-randomized Sample (n= 132)	no significant difference found in SLEI scores for observer or participant in: - clinical ability (p= .721), - problem solving (p= .726), - confidence in clinical practice (p= .710) - collaboration measurements (p= .623) -	- Simulation Learning Effectiveness Inventory (SLEI) - Student Satisfaction and Self-Confidence in Learning Scale (SCLS)
Bethards (2014)	describes how one community college utilizes the component processes of Bandura's observational learning to design simulation experiences around the observer role	Expert Opinion; Undergraduate ADN program; Sample not defined	- Authors felt that regardless of the role the student assumed, there were no differences among the students in knowledge gained, achievement of learning objectives, satisfaction with the experience, or self confidence - Observer experiences should be designed with concepts of Bandura's theory (attention, retention, motor reproduction, and motivation) to promote optimal learning	- Anectodical reports from students and faculty
Bong et al. (2017)	To explore the differences between stress levels and non-technical skill performance between active and observer groups in simulation	Prospective, quasi-experimental single-center study; Total participants (n= 37) divided into active (n= 18) and Observer (n=19) groups; graduate nurse anesthesia	- Mean difference in ANTS scores (In all 4 categories: task management, team-working, situation awareness and decision-making) between active and observer role did not differ significantly (p=0.733)	- Anesthetist's Non-Technical Skills (ANTS) score.

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Bonnel & Hober (2016)	secondary analysis of qualitative data was to gain insights into the role and opportunities of the reflective observer in high-fidelity patient simulation (HFPS)	Qualitative; Convenience sample (n=23) of senior BSN students	Observer learn three main themes: 1.Self-assessment: Reacting in own head; Thinking about own thinking; Comparing thoughts to others' actions 2.Peer-review: Learning from others' mistakes; Gaining confidence in providing feedback; Taking strong debriefing roles 3.Team Focus: Helping team out; being part of the team; Looking beyond nurse role	- Written survey and face-to-face interview
Brown (2008)	To determine if the use of HFS in conjunction with role modeling had a measurable impact on critical thinking skills and self-efficacy	Dissertation, quasi-experimental; Convenience sample (n=67) of senior level BSN students	- No difference between groups (sim only vs role model then sim) in SCL scores - No significant difference bw groups in SDS scores - No significant difference bw groups in PJR scores	- Self-Confidence in Learning (SCL) - Simulation design scale (SDS) - Professional Judgement Rating (PJR)
Collins, Lambert, Helms, & Minichiello, (2017)	To increase mindfulness in the observer role, students were allowed in the control room to run the manikin and focus attention on the patient	Expert Opinion; population in ADN program; size not specified	- The use of a mindful observer during simulations resulted in an effective learning strategy. - Students remained focused on the patient during simulation - Observers focused on Safety, communication and organization concepts - Were able to notice more in the observer role	- Anectodical reports from students and faculty

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Fluharty et al. (2012)	To determine when incorporating an end-of-life simulation: Is there an increase in knowledge and communication skills related to end of life care?	Quasi-experimental design; Convenience sample (n=370) from 4 college of ADN and BSN students	- No significant difference in knowledge-change scores among the participant roles in simulation - Participants in observer role had non-significantly higher change scores than did participants - End-of life Communication assessment tool with a 5-point Likert scale had a mean of 4.33 (SD= 0.56)	- Knowledge Related to End-of-Life Care Instrument - End-of-Life Communication Assessment Tool
Grierson, Barry, Kapralos, Carnahan, & Dubrowski, (2012)	explores how manipulating the level of feedback delivered to trainees impacts the learning benefits they garner from observing video-based simulation laboratory performances via a collaborative Internet-mediated educational environment	Quasi-experimental; Convenience sample (n= 26); BSN students	- Group with the most feedback (ESPO) were the only group to have significant differences in skill ratings pre and post intervention - ESPO was also the only group to show a significant difference in transfer of learning - The ESPO group who were allowed to watch expert video, watch own performance, and get expert feedback on performance had a positive effect on learning and allows learners to apply knowledge	- Global rating scale - Exam

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	- Reported Outcomes	- Measurement Tools Used
Guhde (2010)	To make the student aware of the importance of an initial thorough assessment of a client. A program was developed where students were required to watch an assessment where important details were missed and the patient experienced complications	Expert Opinion; Sample size not listed, but entire semester of BSN students participated	- Strong positive (4.43/5) rating for assignment increased awareness of importance of doing a thorough assessment - Responded with awareness that client outcomes are linked to nursing assessments - Watching videos changed approach to client care - Clinical instructors noticed a change in student eagerness to perform assessments and ability to find mistakes	- Online survey and instructor feedback
Hallin, Backstrom, Haggstrom, & Kristiansen, (2016)	to identify nursing students' ability to make clinical judgments in terms of how they perceive, interpret and act in complex care situations measured in team achievements.	Quasi-experimental; Convenience sample (n= 174) of BSN students in last semester from 2 campuses	- students who had been observers and had been engaged in subsequent debriefing before they were in action achieved significantly higher team-points in clinical judgment than those who had not	- Lasater Clinical Judgement Rubric

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	- Measurement Tools Used
Hober & Bonnel (2014)	examined baccalaureate nursing student perceptions of roles played in high-fidelity patient simulation, focusing on the observer role	Qualitative; Convenience sample (n=23) of senior level BSN students from 2 campuses	Three themes emerged from observer data related to learning outcomes: 1. Conceptualizing the learning experience a) minimizing the stress for applied learning, b) collecting data and thoughts c) contemplating and/or calculating 2. Capturing the big picture a) gaining a different point of view b) increasing confidence in thinking c) concluding and/or confirming 3. Connecting with the team a) Communicating b) Consulting - Described using clinical judgment	- Written survey and face-to-face interview
Howard (2017)	examined baccalaureate nursing student perceptions of roles played in high-fidelity patient simulation, focusing on the observer role	Dissertation; Quasi-experimental mixed method design Convenience sample (n= 132) of BSN students	- Student’s perceptions of self-confidence were increased with the use of defined observational roles and expectation - Themes in students having defined observational roles were (a) knowledge acquisition, (b) gaining insight into the nurse's role, and (c) contemplating/ calculating actions(d) ownership of the simulation and connecting with the team, (e) feeling a responsibility for their role and (f) valuing feedback.	- Student Self-confidence in Learning Scale (SSCLS) - Qualitative Interviews

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Jeffries & Rizzolo, (2007)	Investigate if differences regarding learning outcomes exist (knowledge, self-confidence, judgment performance, and learner satisfaction) based on the role assigned to a student in the simulation	Multi-site randomized control trial; Sample (n= 403) consisting of both ADN and BSN students	- Regardless of the role they assumed, there were no significant differences in knowledge gain among students - Regardless of the role they assumed, there were no significant differences in self-confidence regarding caring for a patient among students - Students who assumed the observer role rated themselves significantly lower on their judgment when caring for a patient when compared to those who assumed the Nurse 2 role	- 12-item multiple choice pretest
Johnson (2019)	to describe the knowledge demonstration, knowledge retention, and knowledge application of participants and observers after a simulation debriefing	Quasi-experimental; Convenience sample of nursing students (n=119) in BSN programs from 2 campuses	- No statistically significant difference (p=.773) between participants in active and observer roles after a simulation about the at baseline, before debriefing, after debriefing, and after four weeks of time - No significant difference (p=.446) between students in active participant and observer roles when knowledge is applied to a similar case study	- Multiple choice test questions developed by investigator covering opioid induced acute respiratory distress (questions =10) - Multiple choice test questions developed by investigator covering distress from anaphylaxis (questions=10)

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Kaplan, Abraham, & Gary, (2012)	To evaluate students' test scores on questions related to content from a simulation experience, and whether being a participant or observer had any significant influence on the test scores.	Descriptive quasi experimental mixed methods; BSN students, (n= 92)	- no significant differences (p=.97) between the simulation and observational groups on scoring of the test items related to this content using ANOVA level of significance p<0.05 Active participant score (Mean= 9.5) lower than observer (mean 9.7)	- 10 Questions on an Exam Post-simulation student evaluation
LeFlore, Anderson, Michael, Engle, & Anderson, (2007)	To test the hypothesis that instructor-modeled learning is more effective compared with self-directed learning during a simulated clinical experience	Pilot Study; Convenience sample (n=16) of graduate Nurse Practitioner students	- No statistically significant difference in learner knowledge over time for students who observed expert video - Students who observed expert video had highest knowledge assessment test score at end - Overall BAT score higher in students who observed model video (not statistically significant) - BAT scores highest in all categories of observer group: - Observers gained higher ratings in the following TET categories (HPI, Social history, focused assessment, time to start oxygen) and lower in (recognize distress, PMH, family history and time to give albuterol) - SET scores higher in observers	- 10 item knowledge assessment test pre intervention, post lecture, and post simulation - Self-efficacy tool(SET) - Technical Evaluation tool (TET) - Behavioral Assessment Tool (BAT)

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Leigh, Miller, & Ardoin. (2017)	To discuss using the observer to lead debriefing to capture and hold the attention of those staff members assigned to the role of observer in patient simulation	Expert Opinion piece in hospital setting, with unknown sample size	- Increases staff engagement and shifts the responsibility for knowledge acquisition and developing clinical expertise to the staff member. - Skills such as self-assessment, professional peer review, communication, and teamwork are all enhanced by OLD. - Professional role development is facilitated	Expert Opinion
Livsey & Lavender-Stott (2015)	to explore whether serving as a peer observer supports vicarious learning to promote skill development in areas of assessment, communication, critical thinking and technical skills.	Quasi-experimental; Sample of 48 dyads of first semester BSN students (n= 92)	- No significant differences were found between the groups on overall scores on the total CSEI, technical skills (p= .527) or critical thinking subscales - Groups of students who witnessed the scenario as peer evaluator prior to engaging in the simulation experience scored significantly higher mean scores on communication (M=3.73, SD=1.07, p=.000) and assessment measures (M=3.05, SD=.92, p=.000) than those participating in the scenario first. - No significant difference on technical skills or critical thinking	- Creighton Simulation Evaluation Instrument (CSEI)

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Newberry (2014)	Determine whether participants and observers in low or high-fidelity simulation training obtained equal levels of self-confidence in learning	Dissertation (quantitative, quasi-experimental, 2x2 factorial design study); Convenience sample (n= 123) from undergraduate BSN students	- No significant differences between student self-confidence were noted between student participants and observers following simulation training. - In addition, no post-simulation differences in self-confidence were noted for students in the low versus the high-fidelity simulation training	- Student Satisfaction and Self-Confidence in Learning Scale (SSSCL)
Norman (2018)	to determine if there differences exist in learning outcomes, including knowledge, self-confidence, satisfaction, and collaboration between students using and not using an observation guide when in the role of observer during a SBL experience	Quasi-experimental; Convenience sample (n= 121) from 4 universities of BSN students	- no difference in knowledge increase between student with an Observation Guide and those without an Observation Guide. - post-test scores were lower than pre-test scores in both groups and across all research sites. - These findings were unexpected, contradicting findings of previous studies of the positive effect of simulation on knowledge acquisition - Mean post-test exam scores higher in students with guide, but not statistically significant - Mean collaboration scores on SSSLS higher in students with guide, but not statistically significant - No difference in self-confidence between observer groups; both trusted knowledge gained	- Pre-test: HESI 30 question exam - Post-test: different HESI 30 question exam - National educational practices in sim scale - Student Satisfaction and Self-Confidence in Learning Scale (SSSCL)

Table 2.3 (Continued)

Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Rode, Callihan, & Barnes (2016)	evaluate the effectiveness of high fidelity SBLE as an integrated classroom teaching strategy, whereby large-group simulation activities replaced lectures within a didactic medical surgical nursing course	Quasi-experimental; convenience sample (n=60) of BSN students	- differences in participants' and observers' knowledge retention levels were not statistically significant. - "more beneficial than lecture" - "discussion and recognizing mistakes/ highlighting important interventions is beneficial."	- Exams- pre-test, 4 course exams, and final exam - Helping Everyone Remember Our Skills Learner Simulation Scores (exam scores for observers) - Narrative comments
Schaar, Ostendorf, & Kinner, (2013)	To share experience of using QSEN categories in simulation observer tool	Expert Opinion piece; convenience class of 74 BSN students	- Student observers were focused on QSEN objectives when participating in simulation - Instructors felt that they could enhance the students' ability to provide safe, high-quality healthcare	- Expert Opinion
Scherer, Foltz-Ramos, Fabry, & Chao (2016)	To examine if participants in a HFS score higher on knowledge, satisfaction and confidence, performance than their students who observed	Quasi- experimental; Convenience sample (n=80) of BSN students	- observation first resulted in comparable or better outcomes - Observed first had significantly higher scores on the first knowledge quiz - Students who observed first had significantly higher total scores on METI and SSSCL - A significant improvement in scores on the performance measures occurred regardless of order	- Knowledge Test - Student Satisfaction and Self-Confidence in Learning Scale (SSCL) - Medical Education Technologies Incorporated (METI) - Simulation Effectiveness Tool- - performance measure evaluation form

Table 2.3 (Continued)

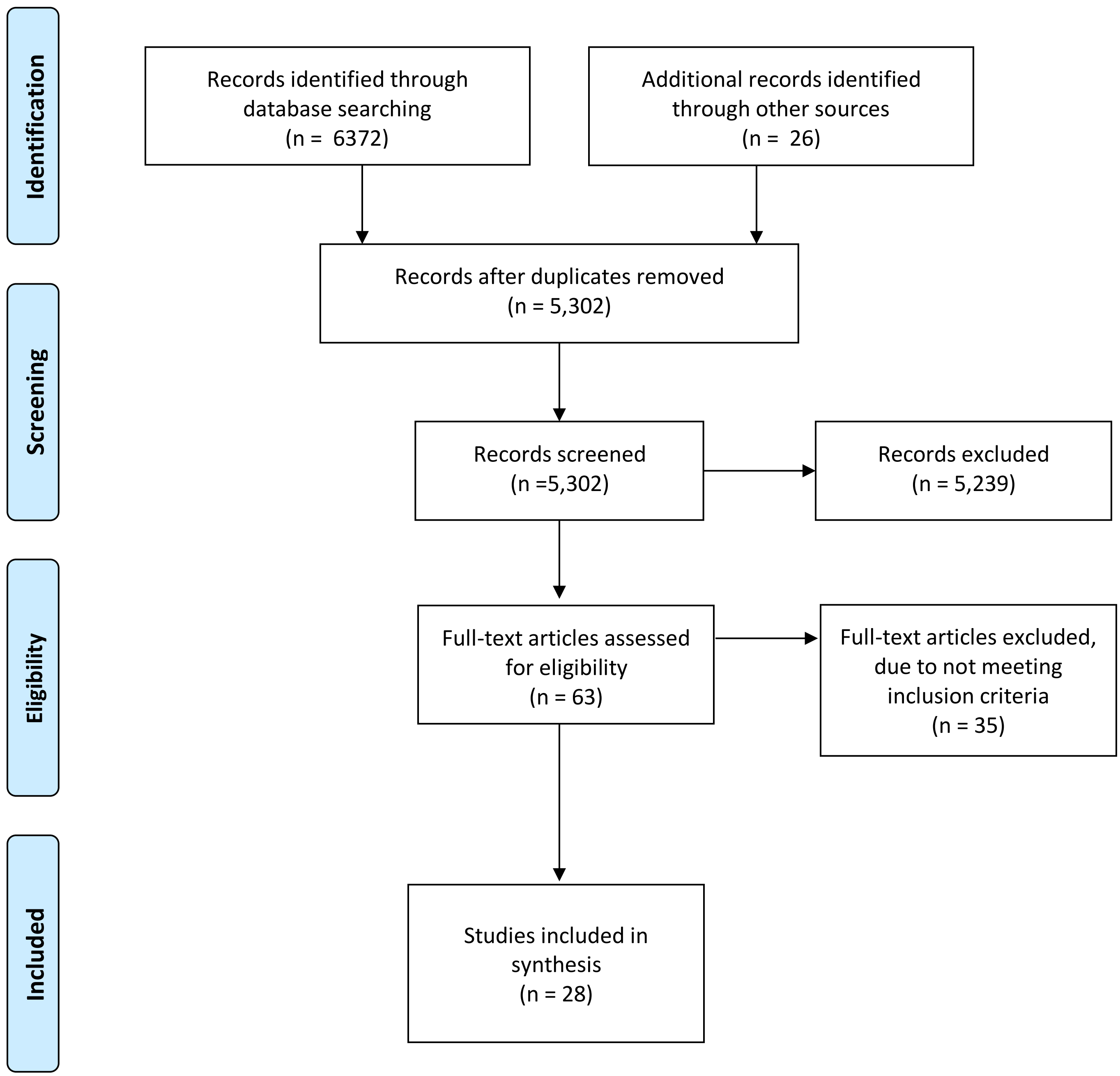
Author(s), Year	Aim or Purpose	Methodology, Population, Sample	Reported Outcomes	Measurement Tools Used
Thidermann & Saderhamn (2013)	Evaluate the HFS scenario experiences among nursing students serving different roles. three simulation outcomes were measured; knowledge, satisfaction and self-confidence in learning.	Quasi-experimental; Convenience sample (n=142); BSN students	- In both years of the study, observers had the lowest scores in problem solving, collaboration, and diverse ways of learning - Self-confidence mean scores lower in observer role - SDS mean scores lower in observers for objectives met and problem solving - Observer EPSS mean scores lowest in collaboration	- Instructor exam - Student satisfaction and self-confidence in learning (SSSCL) - Simulation Design Scale (SDS) - Educational Practices in Simulation Scale (EPSS)
Zulkolsky, White, Price, & Pretz (2016)	To determine if there are differences in clinical decision-making accuracy among different roles in an acute-care simulation scenario	quantitative, mixed factorial design study; Convenience sample (n=120); ADN students	- Role did not impact clinical decision-making accuracy on the familiar situation. On the unfamiliar situation, observers outperformed other roles, whereas family members were markedly less accurate - There was no difference between scores on diagnosis and action between groups (p =.177). - overall CDM accuracy tended to be higher for the primary nurse and observers - Observers were more accurate than family members on cues, p = .046. - Observers, as compared with other roles, were most accurate with CDM skills during the unfamiliar situation.	- Three question questionnaires

Results

The database searches identified a total of 6,372 records. An additional 26 titles were found through searching reference lists. After duplicate record identification, 5,302 remained. The authors screened the remaining titles and abstracts to evaluate whether the articles met inclusion criteria. From the initial screening, 63 records were identified as possible matches for this study. The authors reviewed the complete full-text version of the potential matches and excluded 35 records that did not meet inclusion criteria. All authors agreed to include 28 studies for synthesis and data extraction (See Figure 2.1).

Figure 2.1

Paper Selection and Inclusion Process Flow Diagram



Note: Adapted from Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. The PRISMA Group. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med, 6(7), e1000097. doi:10.1371/journal.pmed1000097

Most of the research studies were performed in the United States (n= 22). However, other countries included Japan (n= 1), Singapore (n= 1), Canada (n= 1), Sweden (n= 2), and Norway (n= 1). Many records investigated observers in BSN programs (n= 18). Others included ADN (n= 3), ADN combined with BSN (n= 3), and master's students (n= 2). Only two studies included practicing nurses (see Table 2.4). Studies included in this article were published or written between the years of 2007 and 2019.

Table 2.4

Population(s), Topic(s), and Context Discussed

	Population				Context
Title	Practicing Nurses	BSN Students	ADN Students	Graduate Students	Geographical Location
Abe et al. (2013)	✓				Japan
Abelsson et al. (2017)		✓			Sweden
Alexander (2019)		✓	✓		United States
Bates et al. (2019)		✓			United States
Bethards (2014)			✓		United States
Bong et al. (2017)				✓	Singapore
Bonnel et al. (2016)		✓			United States
Brown (2008)		✓			United States
Collins et al. (2017)			✓		United States
Fluharty et al. (2012)		✓	✓		United States
Grierson et al. (2012)		✓			Canada
Guhde (2010)		✓			United States
Hallin et al. (2016)		✓			Sweden
Hober et al. (2014)		✓			United States
Howard (2017)		✓			United States

Table 2.4 (Continued)

	Population				Context
Title	Practicing Nurses	BSN Students	ADN Students	Graduate Students	Geographical Location
Jeffries et al. (2007)		✓	✓		United States
Johnson (2019)		✓			United States
Kaplan et al. (2012)		✓			United States
LeFlore et al. (2007)				✓	United States
Leigh et al. (2017)	✓				United States
Livsey et al. (2015)		✓			United States
Newberry (2014)		✓			United States
Norman (2018)		✓			United States
Rode et al. (2016)		✓			United States
Schaar et al. (2013)		✓			United States
Scherer et al. (2016)		✓			United States
Thidermann et al. (2013)		✓			Norway
Zulkosky et al. (2016)			✓		United States

Many different methodological approaches and theoretical frameworks were utilized to investigate observer learning outcomes (see Table 2.5). Most of the studies utilized quasi-experimental methodology (n= 14). However, qualitative (n= 3), pilot studies (n= 2), qualitative mixed factorial (n= 1), expert opinion (n= 4), and mixed methods methodologies (n= 2) were also used. Only two randomized control trials met this review criteria, one of which was a dissertation (see Table 2.5). Bandura's Social Learning Theory was cited most frequently, although 15 studies did not specify a theoretical framework (see Table 2.6). Fifteen of the 28 studies were disseminated within the past five years in 16 different journals (see Table 2.6).

Table 2.5

Methodological Approaches Utilized

Author	Mixed Methods	Randomized Control Trial	Quasi Experimental	Quantitative, mixed-factorial	Qualitative	Dissertation	Pilot Study	Expert Opinion
Abe et al. (2013)			✓					
Abelsson et al. (2017)					✓			
Alexander (2019)		✓				✓		
Bates et al.(2019)			✓					
Bethards (2014)								✓
Bong et al. (2017)			✓					
Bonnel et al. (2016)					✓			
Brown (2008)			✓			✓		
Collins et al. (2017)								✓
Fluharty et al. (2012)			✓					
Grierson et al. (2012)			✓					
Guhde (2010)								✓
Hallin et al. (2016)			✓					

Note: ✓ indicates methodological approach utilized

Table 2.5 (Continued)

Author	Mixed Methods	Randomized Control Trial	Quasi Experimental	Quantitative, mixed-factorial	Qualitative	Dissertation	Pilot Study	Expert Opinion
Hober et al. (2014)					✓			
Howard (2017)	✓					✓		
Jeffries et al. (2007)		✓						
Johnson (2019)			✓					
Kaplan et al. (2012)	✓							
LeFlore et al. (2007)							✓	
Leigh et al. (2017)								✓
Livsey et al. (2015)			✓					
Newberry (2014)			✓			✓		
Norman (2018)			✓					
Rode et al. (2016)			✓					
Schaar (2013)								✓
Scherer et al. (2016)			✓					
Thidermann et al. (2013)			✓					
Zulkosky et al. (2016)				✓				

Note: ✓ indicates methodological approach utilized

Table 2.6

Research Context

Author	Bandura	Clinical Reasoning Model	Dewey	Experiential Learning-Kolb	NLN Jeffries	Nursing Education Sim	Transform-ative Learning	None	Journal
Abe et al. (2013)								✓	Am. Journal of Critical Care
Abelsson et al. (2017)								✓	Nurse Ed in Practice
Alexander (2019)		✓							Dissertation
Bates et al. (2019)					✓				Nurse Educator
Bethards (2014)	✓								Clinical Sim in Nursing
Bong et al. (2017)								✓	Advances in Simulation
Bonnel et al. (2016)								✓	The Journal of Nsg Ed
Brown (2008)			✓						Dissertation
Collins et al. (2017)								✓	Nursing Ed Perspectives
Fluharty et al. (2012)								✓	Clinical Sim in Nursing
Grierson et al. (2012)								✓	Medical Education
Guhde (2010)								✓	Computers Informatics Nsg
Hallin et al. (2016)			✓						Nurse Ed in Practice

Note: ✓ indicates theoretical framework utilized

Table 2.6 (Continued)

Author	Bandura	Clinical Reasoning Model	Dewey	Experiential Learning-Kolb	NLN Jeffries'	Nursing Education Sim	Transform-ative Learning	None	Journal
Hober et al. (2014)								✓	Clinical Sim in Nursing
Howard (2017)					✓				Clinical Sim in Nursing
Jeffries et al. (2007)								✓	National League for Nsg
Johnson (2019)				✓					Clinical Sim in Nursing
Kaplan et al. (2012)								✓	Intl J of Nsg & Scholarship
LeFlore et al. (2007)								✓	Simulation in Healthcare
Leigh et al. (2017)								✓	Journal of Cont Ed in Nsg
Livsey et al. (2015)	✓								Focus on Health Prof Ed
Newberry (2014)							✓		Dissertation
Norman (2018)				✓					Nurse Ed in Practice
Rode et al. (2016)	✓								Clinical Sim in Nursing
Schaar (2013)								✓	Clinical Sim in Nursing
Scherer et al. (2016)								✓	Journal of Prof Nursing
Thidermann et al. (2013)								✓	Nurse Ed Today
Zulkosky et al. (2016)						✓			Clinical Sim in Nursing

Note: ✓ indicates theoretical framework utilized

Observers were most commonly used in small numbers (1-5 per simulation). A few had medium-sized (5 to 10) or large groups (greater than 10). Many (n= 10) did not define the size of the group. The location where participants viewed the simulation experience also varied. Some placed observers within the simulation room (n= 3), whereas others viewed from remote areas (n= 8) or control rooms (n= 1). One study placed some observers in the simulation room and others watching remotely. Observers in 4 studies watched recorded SBLE. Many studies (n= 10) did not mention where observers watched the simulation scenario. Observers also varied by the amount of previous simulation exposure. Based on published details, it was hard to discern whether observers had previous experience in the observation role (see Table 2.7).

Simulation design decisions also varied. Some observers were given a worksheet, or cognitive aid, to focus their attention. Simulation duration varied from 8 to 40 minutes, although many researchers did not specify length. Duration of time spent in debriefing also varied between studies and ranged between 0 and 50 minutes. Most of the simulation scenarios were related to caring for adults — few covered caring for pediatric or maternal health clients. Five studies did not define the scenario topic (see Table 2.8).

Table 2.7

Context of Observers

	Number of Observers			Location of Observation					Previous Sim Experience		
Author	Small (1-5)	Medium (5-10)	Large (>10)	In Room	Different Room	Control Room	Both in and Out	Recorded Video	Yes	No	Mixed
Abe et al. (2013)	✓			✓						✓	
Abelsson et al. (2017)		✓			✓					✓	
Alexander (2019)											✓
Bates et al. (2019)	✓				✓					✓	
Bethards (2014)											
Bong et al. (2017)	✓			✓							
Bonnel et al. (2016)	✓										
Brown (2008)								✓			
Collins et al. (2017)						✓					
Fluharty et al. (2012)	✓										✓
Grierson et al. (2012)								✓			
Guhde (2010)								✓			
Hallin et al. (2016)	✓								✓		

	Number of Observers			Location of Observation					Previous Sim Experience		
Author	Small (1-5)	Medium (5-10)	Large (>10)	In Room	Different Room	Control Room	Both in and Out	Recorded Video	Yes	No	Mixed
Hober et al. (2014)	✓										
Howard (2017)											
Jeffries et al. (2007)	✓										
Johnson (2019)	✓				✓				✓		
Kaplan et al. (2012)	✓				✓					✓	
LeFlore et al. (2007)		✓						✓			✓
Leigh et al. (2017)											
Livsey et al. (2015)	✓				✓						
Newberry (2014)											
Norman (2018)								✓			
Rode et al. (2016)			✓	✓							
Schaar (2013)			✓				✓				
Scherer et al. (2016)	✓				✓					✓	
Thidermann et al. (2013)		✓			✓						
Zulkosky et al. (2016)	✓				✓						

Note: ✓ indicates observer characteristics

Table 2.8

Simulation Context

	Observer Tool Utilized			Simulation Duration		Debrief Duration		Simulation Topic			
Author	Tool Used	Tool Not Used	Mixed	8-20 Minutes	21-40 Minutes	0-29 Minutes	30-50 Minutes	Adult	Pediatric	Maternity	Pedi & Maternity
Abe et al. (2013)		✓						✓			
Abelsson et al. (2017)		✓		✓			✓	✓			
Alexander (2019)	✓										
Bates et al. (2019)	✓			✓				✓			
Bethards (2014)	✓										
Bong et al. (2017)		✓			✓		✓		✓		
Bonnel et al. (2016)	✓			✓		✓		✓			
Brown (2008)		✓		✓		✓					
Collins et al. (2017)	✓										
Fluharty et al. (2012)	✓			✓		✓		✓			
Grierson et al. (2012)			✓					✓			
Guhde (2010)		✓		✓		✓		✓			
Hallin et al. (2016)				✓				✓			
Hober et al. (2014)	✓			✓		✓		✓			

Table 2.8 (Continued)

	Observer Tool Utilized			Simulation Duration		Debrief Duration		Simulation Topic			
Author	Tool Used	Tool Not Used	Mixed	8-20 Minutes	21-40 Minutes	0-29 Minutes	30-50 Minutes	Adult	Pediatric	Maternity	Pedi & Maternity
Howard (2017)			✓								
Jeffries et al. (2007)				✓		✓		✓			
Johnson (2019)		✓		✓			✓	✓			
Kaplan et al. (2012)	✓			✓				✓			
LeFlore et al. (2007)		✓							✓		
Leigh et al. (2017)	✓										
Livsey et al. (2015)					✓			✓			
Newberry (2014)					✓		✓				✓
Norman (2018)			✓	✓			✓	✓			
Rode et al. (2016)	✓				✓		✓	✓			
Schaar (2013)	✓									✓	
Scherer et al. (2016)								✓			
Thidermann et al. (2013)				✓			✓	✓			
Zulkosky et al. (2016)					✓		✓	✓			

Note: ✓ indicates simulation design utilized

Learning Outcomes

Eight learning outcome categories emerged: knowledge, clinical skills, clinical judgment, teamwork/collaboration, confidence, critical thinking, insight or awareness, and conceptual thinking. Results from each article were classified as showing positive, neutral, or negative learning outcomes (See Table 2.9). The following outlines a general description of what is known about each learning category. Studies are grouped by objective and subjective data.

Knowledge

Several research studies use objective measures of simulation learning outcomes after participation. Eight retained articles found that observers scored similarly on examinations when compared with active participants after simulation (Bethards 2014; Fluharty et al., 2012; Jeffries & Rizzolo, 2007; Johnson, 2019; Kaplan et al., 2012; LeFlore et al., 2007; Rode, Callihan, & Barnes, 2016; Scherer et al., 2016). Only one study (Norman, 2018) found observers had lower exam scores. Observers were able to transfer their learning to unfamiliar case studies or simulations (Grierson et al., 2012; Johnson, 2019; Zulkolsky et al., 2016). Observers retained knowledge over time (Johnson, 2019; LeFlore, et al., 2007; Rode et al., 2016). Smaller bodies of work supported subjective reports of knowledge. Observers reported that they perceived they were acquiring knowledge (Howard, 2017; Leigh, Miller, & Ardoin, 2017). Abelsson (2017) added that the knowledge was gained through reflection. There was general agreement that observers felt they met learning objectives (Bethards, 2014; Brown, 2008; Schaar, Ostendorf, & Kinner, 2013). However, one study found that observers reported lower mean scores for meeting objectives (Thidermann & Saderhamn, 2013). Only one expert opinion suggested that practicing nurses in the observer role develop clinical expertise (Leigh et al., 2017).

Table 2.9

Categorized Positive, Negative, and Mixed or Neutral Reported Learning Outcomes of Simulation Observation

Author	Knowledge	Clinical skills/ Performance	Clinical Judgement	Teamwork/ Collaboration	Confidence	Critical Thinking	Insight/ Awareness	Conceptual thinking
Abe et al. (2013)		✓		✓	✓			
Abelsson et al. (2017)	✓						✓	
Alexander (2019)			✓					
Bates et al. (2019)		✓		✓	✓	✓		
Bethards (2014)	✓				✓			
Bong et al. (2017)		✓	✓	✓			✓	
Bonnel et al. (2016)			✓	✓	✓		✓	
Brown (2008)	✓				✓	✓		
Collins et al. (2017)				✓			✓	✓
Fluharty et al. (2012)	✓	✓						
Grierson et al. (2012)	✓	✓						
Guhde (2010)		✓	✓					
Hallin et al. (2016)			✓					
Hober et al. (2014)			✓	✓	✓		✓	✓

Table 2.9 (Continued)

Author	Knowledge	Clinical skills/ Performance	Clinical Judgement	Teamwork/ Collaboration	Confidence	Critical Thinking	Insight/ Awareness	Conceptual thinking
Howard (2017)	✓		✓	✓	✓		✓	
Jeffries et al. (2007)	✓		✗		✓			
Johnson (2019)	✓							
Kaplan et al. (2012)	✓							
LeFlore et al. (2007)	~	~	~	✓			✓	
Leigh et al. (2017)	✓	✓		✓				
Livsey et al. (2015)		✓		✓		✓		
Newberry (2014)					✓			
Norman (2018)	✗			~	✓			
Rode et al. (2016)	✓							
Schaar (2013)	✓	✓						✓
Scherer et al. (2016)	✓	✓			✓	✓		
Thidermann et al. (2013)	✗			✗	✗	✗		
Zulkosky et al. (2016)	✓		~					

Note: ✓ indicates positive report; ✗ indicates negative report; ~ indicates mixed or neutral report

Clinical Skills

Some studies used objective rubrics to measure behavioral outcomes and showed that nurses who observed simulation before performing in an active role had better clinical skill performance (Abe et al., 2013; Grierson et al., 2012; Scherer et al., 2016). LeFlore et al. (2007) had mixed findings on whether participants performed better after observing expert demonstrations. Observers have shown they can perform skills such as task management (Bong et al., 2017), assessments (Livsey & Lavender-Stott, 2015), professional behavior role development, (LeFlore, et al., 2007) and communication (Fluharty et al., 2012). Smaller numbers of studies used subjective tools to gather information about learning clinical skills. One study reported that observers perceived they achieved similar assessment skills (Guhde, 2010) and clinical ability (Bates et al., 2019) as other roles. Two authors reported knowledge gained in simulation was applied to clinical practice and changed clinical behavior (Guhde, 2010; Schaar et al., 2013).

Clinical Judgment

There are mixed findings about observers' clinical judgment, and most studies focus on how observers respond to a clinical situation. Watching a scenario first helped observers achieve increased scores on the Lasater Clinical Judgment Rubric (Hallin et al., 2016). However, LeFlore, et al. (2007) found no difference between nurses who observed a simulation video before participating in the ability to notice and respond to deteriorating patients. Other studies agreed that there was no difference in clinical decision making (CDM) when observers were compared with active participants (Bong et al., 2017; Zulkolsky et al, 2016). However, primary nurses tended to have more accurate CDM scores during familiar scenarios, whereas observers were more accurate in unfamiliar situations (Zulkolsky et al, 2016). Qualitative investigations found that observers reported using clinical judgment to notice and reflect on their own and others' actions during SBLE (Bonnel & Hober, 2016, Hober & Bonnel, 2014, Howard, 2017).

Two randomized control trials utilized subjective rating tools to investigate the clinical judgment of observers. Alexander (2019) investigated the effect of matching learning styles when assigning roles and found no difference between active and observer participants' clinical reasoning subjective ratings when learning preference was considered. Conversely, observers were found to report lower decision-making scores in one multi-site national study (Jeffries & Rizzolo, 2007). Finally, experts feel that having students observe a video where the nurse doesn't notice important assessment data, which leads to patient complications, made nursing students feel that noticing cues was important. This observational experience also made students attempt to notice more in the clinical setting to prevent patient complications (Guhde, 2010).

Teamwork/collaboration

Raters scoring communication behaviors typically assign higher scores to nurses who observe simulation first and them participate actively (Livsey & Lavender-Stott, 2015). More specifically, observers demonstrate skills including calling for help (LeFlore, et al., 2007), acting professionally (LeFlore, et al., 2007), and working with teams (Abe et al., 2013, Bong et al., 2017, LeFlore, et al., 2007) more effectively than their peers who participate actively in simulation first and observe second (LeFlore, et al., 2007). There is also consistent agreement in qualitative studies that observers achieve teamwork and collaboration. Observers have reported learning to connect with the team (Hober & Bonnel, 2014, Howard, 2017), give feedback (Howard, 2017), and communicate and consult with team members (Hober & Bonnel, 2014). Observers also describe the importance of vicarious learning because they feel as if they are part of the team and help team members by giving feedback (Bonnel & Hober, 2016). \

Studies using subjective ratings have mixed findings on whether observers learn teamwork. Norman (2018) found that observers reported higher collaboration when using an observer tool. Observers also rate their confidence in their job, relationship with colleagues, and morale for their job no differently than active participants (Abe et al., 2013). Bates et al., (2019) found no difference in observer collaboration ratings when compared to active participants. Only one study (Thidermann & Saderhamn, 2013) found that observers had lower mean scores in collaboration when compared with active participants. Conversely, experts also opine that nurse's ability to provide peer review and communication are all enhanced by serving in observer roles (Leigh et al., 2017). Finally, Collins et al. (2017) believe that using observers can allow students to provide feedback from a patient's perspective by focusing on safety, communication, and organization while viewing the scenario.

Confidence

Most records included in this review found that observers achieved confidence through subjective ratings (Abe et al., 2013; Bates et al., 2019; Bethards, 2014; Brown, 2008; Howard, 2017; Jeffries & Rizzolo, 2007; Newberry, 2014; Norman, 2018; Scherer et al., 2016) and qualitative analysis (Bonnel & Hober, 2016; Hober & Bonnel, 2014). Confidence is a controversial learning outcome because it frequently does not relate to behavioral performance (Franklin & Lee, 2014). Only one study found that observers reported lower mean scores in confidence when compared to active participants (Thidermann & Saderhamn, 2013). The included studies in this review describe obtaining confidence in learning, clinical performance, job performance, and self-confidence.

Critical Thinking

Findings are consistent that observers were able to achieve similar critical thinking as those in active roles when rated objectively by independent reviewers (Brown, 2008; Livsey & Lavender-Stott, 2015) and when observers rated their perceived ability (Bates et al., 2019; Scherer et al., 2016). Three studies report observers' ability to solve problems. Brown (2008) showed no difference in observers' problem-solving scores, when compared with active roles. These findings agreed with the self-reported ratings by observers in Bates et al. (2019). However, observers showed perceived lower mean scores in a study by Thidermann & Saderhamn, 2013.

Insight or Awareness

There was complete agreement that observers gain new insight or awareness through vicarious learning, despite variable research methodologies. Observers had no difference in situational awareness scores (Bong et al. 2007). Qualitative reports were the most frequent source for insight as a learning outcome. Nurses in observer roles describe having increased awareness of the overlap between roles of a nurse (Howard 2017) and team member ((Bonnel & Hober, 2016; Howard, 2017). Included studies also reported that observers gain empathy for the patient and experience seeing care from a different point of view (Hober & Bonnel, 2014). Observer role assignment allowed nurses to also identify knowledge gaps (Abelsson et al., 2017). Finally, one expert opinion described that use of the observer role allowed students to see the patient perspective (Collins et al., 2017).

Conceptual Thinking

Finally, all three records included in this review found that observers achieved conceptual thinking through qualitative reports (Hober & Bonnel, 2014) or expert opinions (Collins et al.

2017; Schaar et al, 2013). Observers think from a broader perspective in this role and see the bigger picture (Collins et al., 2017; Hober & Bonnel, 2014). Nurses reported that the observer role allowed them to think beyond the patient during a simulation about chest pain and asthma (Hober & Bonnel, 2014). Furthermore, Collins et al. (2017) reported that nursing students were able to focus on the concept of mindfulness and view the scenario through the patient's perspective. Finally, simulation observers were noted by faculty to focus on the concept of quality, safety, and communication when the observer guide for a post-partum hemorrhage included Quality and Safety for Education Nurses (QSEN) competencies (Schaar et al. 2013).

Discussion

This review found simulation observers achieve a variety of learning outcomes related to knowledge, clinical skills, clinical judgment, teamwork/collaboration, confidence, critical thinking, insight, and conceptual thinking. With the guidance of JBI methodology for scoping reviews, 28 records of nurses in SBLE were included. This supports the National Simulation Study findings that nurses achieve similar outcomes despite spending much of their time in an observer role (Hayden et al., 2014).

Learning outcomes are often categorized into cognitive, psychomotor, and affective domains. Research investigating nurses participating in SBLE suggests that the greatest outcomes are achieved in the psychomotor and cognitive domains (Lee & Oh, 2015; Shin et al., 2015). Results from this scoping review also show that most learning outcomes achieved in observer roles were in the cognitive domain. Conclusions from this review are consistent with other simulation research and umbrella reviews of the literature (Cantrell et al., 2017; Hayden et al., 2014).

Knowledge was the most frequently measured cognitive learning outcome. Outcomes were mixed about whether observers achieved similar knowledge to other participant roles. It was difficult to ascertain whether observers achieved higher-order thinking skills in clinical judgment. However, observers consistently demonstrated critical and conceptual thinking. Like other types of simulation research, there is a need for rigorous evidence supporting higher-order thinking (Cantrell, et al., 2017).

A number of studies addressed how observers learn psychomotor skills. Those included in this review consistently showed that watching first, and then doing, results in similar or better simulation performance, history taking, physical assessments, medication administration, SBAR reports, task management, professional behaviors, and communication. The included studies did not specify whether observers viewed flawed or flawless performance. However, there was general agreement that observers performed skills more accurately when watching before doing.

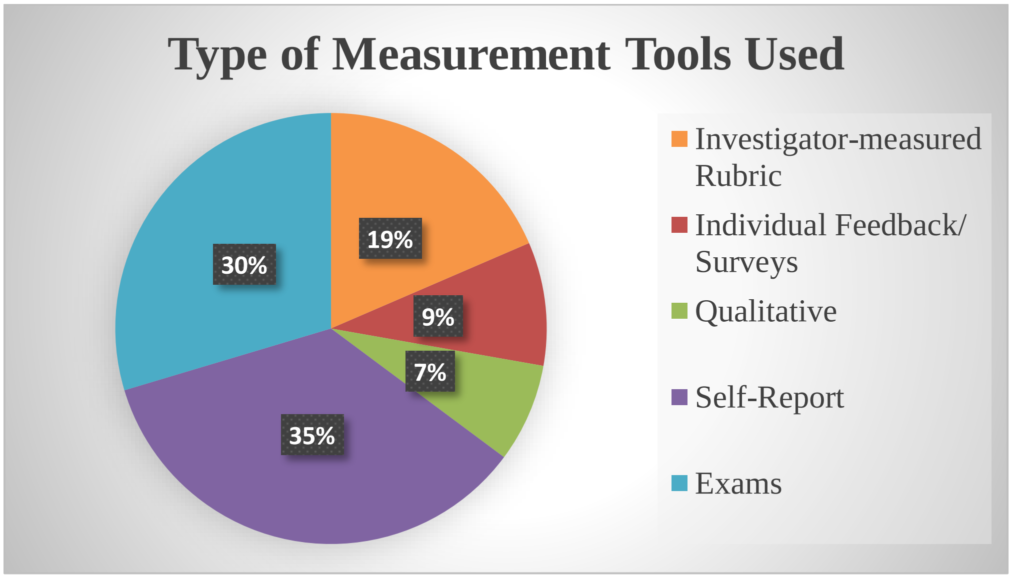
Confidence was the most widely reported affective learning outcome measured. This finding is consistent with other studies where participants become more confident in their abilities, knowledge, and clinical performance (Franklin & Lee, 2014). Although there were not many studies that investigated affective learning, there was agreement that observers were able to view simulations from a different perspective. This finding suggests that using the observer role could support nurses' affective learning. There are many gaps identified in nursing education research in affective domains such as cultural humility, cultural sensitivity, spiritual sensitivity, compassion, and emotional intelligence (Fang et al., 2016; Foronda et al., 2018; Sinclair et al., 2016). Observing in simulation may help nurses learn affective skills.

Most studies utilized quasi-experimental and qualitative methods. The literature investigating observer learning outcomes utilized few control groups, similar role assignments, posttest only design and included convenience samples from a single university. The field of observer simulation research needs studies with high methodological rigor, as described by Cantrell et al. (2017). The reviewers found one multi-site randomized control trial from 2007, which is typically considered a more rigorous design, but this trial measured learning outcomes from self-reported data focusing on learner satisfaction and examination performance (Jeffries et al., 2007). The other randomized control trial was a dissertation using subjective ratings to investigate the impact of learning style on the observer's reported clinical reasoning (Alexander, 2019).

Researchers frequently relied on self-report instruments and exam questions to measure learning outcomes (see Table 2.10). Although these findings help measure knowledge, more research is needed using objective data gathered by trained reviewers (Adamson, 2013; Kardong-Edgren, 2010). If only subjective reports are used to measure outcomes without triangulation to objectively measured data, we may not fully understand the learning outcomes of the observer role. A few studies utilized unique data collection techniques to quantify the learning outcomes. For example, Hallin et al. (2016) and Livsey and Lavendar (2015) both measured simulation performance using behavioral ratings following a simulation observation. Zulkolsky et al. (2016) had active and observer participants pause at a decision point in a familiar and unfamiliar scenario to answer questions that reveal clinical judgments. All three then compared the results with active participants to determine if there were differences between assigned roles, which is the level of detail that will strengthen the evidence of assigning nurses to observation roles.

Table 2.10

Type of Measurement Tool Utilized



Nursing research is also often criticized for inconsistent use of theoretical frameworks (Barrett, 2002; Cheng et al., 2016; Fawcett, 2000). Over half of the retained articles in this review lacked theoretical frameworks. While the evaluation of evidence quality is not included within scoping review strategy, the lack of theoretical framework reveals a need for improving compliance with simulation research guidelines (Cheng et al., 2016). The NLN Jeffries Simulation Theory frequently fits with measurement of simulation learning outcomes of both active and observer roles, and measuring observer learning outcomes adds depth to our understanding of the participant construct. This framework could be considered when measuring observers' learning outcomes during and after simulation.

This review also highlighted what others have discussed regarding the inconsistent definition and use of the observer role (Johnson, 2018). Consistent terminology and role utilization are necessary to enhance the science of simulation (Cantrell et al., 2017). Although simulation terminology has been standardized, the observer role was not included in the defined terms (INACSL, 2016; Lioce, 2020). Because more programs are utilizing observers in SBLE, adopting a universal definition will promote consistency and standardization of practice.

We found that simulation observers achieve measurable learning outcomes. Assigning observational roles can increase the number of nurses involved in simulation at one time and reduce the demand on simulation program resources. The scoping review methodology was chosen as the first step to define and describe the learning outcomes which have been achieved in nurses observing simulation. The next logical step in this line of inquiry is a systematic review of the literature to determine the effectiveness of learning in the observer role with evaluation of the quality of the evidence.

Limitations

Although the discoveries in this study have implications for research and current practice, there are limitations to the findings of this scoping review. First, results could be different if additional databases were searched and articles in other languages included. Second, scoping review methodology does not include reviewing quality of the evidence supporting a research question. The review process is more exploratory to evaluate what literature exists on a phenomenon of interest.

Research Gaps

This scoping review identified gaps in the current literature on learning outcomes of simulation observers. First, many of the studies included in this review involved scenarios caring for adult patients. Further support is needed for other scenario topics. In addition, evidence is needed in LVN, ADN, graduate, practicing nurses, and advanced practice nursing populations.

There are many conceptual gaps in extant literature. Studies included here required nurses to care for one patient and did not investigate multiple patient scenarios. None of the studies examined cultural awareness, cultural sensitivity, spiritual, or safety topics. Only two studies examined learning decay over a few week's duration. Longitudinal studies are needed to determine whether learning outcomes are retained or transferred to bedside care. Finally, no interprofessional simulation observer studies met inclusion criteria. Further research is needed that analyzes nurses' learning outcomes separate from other professions to determine whether observers can learn from viewing other professions.

Only two studies included a large group of observers in a classroom. Most studies that investigate classroom simulations do not separate the results of students who observed from those who participated in the simulation. Further research is needed to define how many observers can be used at one time with similar outcomes.

There were also gaps identified in the research methodology and design of studies. Many of the studies utilized examination scores and self-report tools to measure learning (see Table 2.10). More evidence using objective measurement tools is needed to support observer learning outcomes. Finally, this review located only two randomized control trials investigating observer outcomes. Studies utilizing more rigorous design methodology are necessary to investigate learning in the observer role.

Conclusion

Findings from this review provide preliminary evidence supporting the use of an assigned observer role in simulation. A systematic review and/or meta-analysis would be needed to determine the effectiveness of the observer role. Most researchers measure learning outcomes through self-report surveys and examination performance. Like other simulation research, there is a dearth of evidence using objective measurements. While the evidence for the use of observer roles is still developing, there is evidence for learning outcomes in nursing simulation from the participant's seat.

Acknowledgements

The authors would also like to thank Alysha Sapp, librarian with Mary Couts Library, Texas Christian University, for reviewing and offering guidance on the literature search strategy.

References

Abe, Y., Kawahara, C., Yamashina, A., & Tsuboi, R. (2013). Repeated scenario simulation to improve competency in critical care: A new approach for nursing education. *American Journal of Critical Care*, *22*(1), 33-40. https://doi.org/10.4037/ajcc2013229.

Abelsson, A., & Bisholt, B. (2017). Nurse students learning acute care by simulation- focus on observation and debriefing. *Nurse Education in Practice*, *24*, 6-13. https://doi.org/10.1016/j.nepr.2017.03.001.

Adamson, K. A., Kardong-Edgren, S., & Willhaus, J. (2013). An updated review of published simulation evaluation instruments. *Clinical Simulation in Nursing*, *9*(9), e393-e405. https://doi.org/10.1016/j.ecns.2012.09.004.

Alexander, E. F. (2019). Purposeful Simulation Role Assignment (Order No. 13882417). Available from ProQuest Dissertations & Theses Global. (2240067235). Retrieved from http://library.tcu.edu.ezproxy.tcu.edu/PURL/EZproxy_link.asp/docview/2240067235?accountid=7090.

Barrett, E. A. (2002). What is nursing science? *Nursing Science Quarterly*, *15*(1), 51-60. https://doi.org/10.1177/089431840201500109.

Bates, T. A., Moore, L. C., Greene, D., & Cranford, J. (2019). Comparing outcomes of active student and observer roles in nursing simulation. *Nurse Educator*, *44*(4), 216-221. https://doi.org/10.1097/NNE.0000000000000603.

Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for radical transformation*. San Francisco, CA: Josey-Bass.

Bethards, M. L. (2014). Applying social learning theory to the observer role in simulation. *Clinical Simulation in Nursing*, *10*(2), e65-e69. https://doi.org/10.1016/j.ecns.2013.08.002.

Bong, C. L., Lee, S., Ng, A. S., Allen, J. C., Lim, E. H., & Vidyarthi, A. (2017). The effects of active (hot-seat) versus observer roles during simulation-based training on stress levels and non-technical performance: A randomized trial. *Advances in Simulation*, *2*(7), 1-13. https://doi.org/10.1186/s41077-017-0040-7.

Bonnel, W., & Hober, C. (2016). Optimizing the reflective observer role in high-fidelity patient simulation. *The Journal of Nursing Education*, *55*(6), 353-356. https://doi.org/10.3928/01484834-20160516-10.

Brown, S. C. (2008). The impact of high-fidelity simulation and role modeling in the acquisition of critical thinking skills and self-efficacy: An experimental study (Order No. 3348784). Available from ProQuest Dissertation & Theses Global. (304541009). Retrieved from http://library.tcu.edu.ezproxy.tcu.edu/PURL/EZproxy_link.asp?http://search.proquest.com.ezproxy.tcu.edu/docview/304541009?accountid¼7090.

Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: Systematic review. *Journal of Advanced Nursing*, *66*(1), 3-15. https://doi.org/10.1111/j.1365-2648.2009.05240.x.

Cantrell, M. A., Franklin, A., Leighton, K., & Carlson, A. (2017). The evidence in simulation-based learning experiences in nursing education and practice: An umbrella review. *Clinical Simulation in Nursing*, *13*(12), 634-667. https://doi.org/10.1016/j.ecns.2017.08.004.

Cheng, A., Kessler, D., MacKinnon, R., Chang, T. P., Nadkarni, V. M., Hunt, E. A., & Auerbach, M. (2016). Reporting guidelines for health care simulation research: Extensions to the CONSORT and STROBE statements. *Simulation in Healthcare, 11*(4), 238-248. https://doi.org/10.1097/SIH.0000000000000150.

Collins, T., Lambert, L., Helms, C. D., & Minichiello, V. M. (2017). Use of mindful observer to extend simulation learning experience. *Nursing Education Perspectives*, *38*), 98-99. https://doi.org/10.1097/01.NEP.0000000000000087.

Delisle, M., Ward, M. A., Pradarelli, J. C., Panda, N., Howard, J. D., & Hannenberg, A. A. (2019). Comparing the learning effectiveness of healthcare simulation in the observer verses active role: A systematic review and metanalysis. *Simulation in Healthcare: Journal of the society for simulation in healthcare*, *14*(5), 318-331. https://doi.org/10.1097/SIH.0000000000000377.

Fang, M., Sixsmith, J., Sinclair, S., & Horst, G. (2016). A knowledge synthesis of culturally- and spiritually-sensitive end-of-life care: Findings from a scoping review. *BMC Geriatrics*, *16*(1), 107. https://doi.org/10. 1186/s12877-016-0282-6.

Fawcett, J. (2000). The state of nursing science: Where is the nursing in our science? *Theoria: Journal of Nursing Theory*, *9*(3), 3-10.

Fluharty, L., Hayes, A. S., Milgrom, L., Malarney, K., Smith, D., Reklau, M. A., & McNelis, A. M. (2012). A multi-site, multi-academic track evaluation of end-of-life simulation for nursing education. *Clinical Simulation in Nursing*, *8*(4), e135-e143. https://doi.org/10.1016/j.ecns.2010.08.003.

Foronda, C. L., Baptiste, D.-L., Pfaff, T., Velez, R., Reinholdt, M., Sanchez, M., & Hudson, K. W. (2018). Cultural competency and cultural humility in simulation-based education: An integrative review. *Clinical Simulation in Nursing*, *15*, 42-60. https://doi.org/10.1016/j. ecns.2017.09.006.

Franklin, A. E., & Lee, C. S. (2014). Effectiveness of simulation for improvement in self-efficacy among novice nurses: A meta-analysis. *Journal of Nursing Education*, *53*(11), 607-614. https://doi.org/10. 3928/01484834-20141023-03.

Gaberson, K., & Oermann, M. (2014). *Clinical teaching strategies in nursing* (4th ed.). New York: Springer.

Grierson, L. E., Barry, M., Kapralos, B., Carnahan, H., & Dubrowski, A. (2012). The role of collaborative interactivity in the observational practice of clinical skills. *Medical Education*, *46*(4), 409-416. https://doi.org/10.1111/j.1365-2923.2011.04196.x.

Guhde, J. (2010). Combining simulation, instructor-produced videos, and online discussions to stimulate critical thinking in nursing students. *Computers Informatics Nursing*, *28*(5), 274-279. https://doi.org/10.1097/NCN.0b013e3181ec2540.

Hallenbeck, V. J. (2012). Use of high-fidelity simulation for staff education/development: A systematic review of the literature. *Journal for Nurses in Staff Development*, *28*(6), 260-269. https://doi.org/10.1097/NND.0b013e31827259c7.

Hallin, K., Backstrom, B., Haggstrom, M., & Kristiansen, L. (2016). High- fidelity simulation: Assessment of student nurses' team achievements of clinical judgment. *Nurse Education in Practice*, *19*, 12-18. https://doi. org/10.1016/j.nepr.2016.03.010.

Harder, N., Ross, C. J. M., & Paul, P. (2013). Student perspective of roles assignment in high-fidelity simulation: An ethnographic study. *Clinical Simulation in Nursing*, *9*(9), e329-e334. https://doi.org/10.1016/j.ecns.2012.09.003.

Hayden, J. K., Alexander, M., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study re- placing hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation, 5*(2), S3-S64.

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high-fidelity simulation. *Clinical Simulation in Nursing*, *10*(10), 507- 514. https://doi.org/10.1016/j.ecns.2014.07.008.

Howard, S. (2017). Comparison of satisfaction, self-confidence, and engagement of baccalaureate nursing students using defined observational roles and expectations verses traditional role assignments in high fidelity simulation and debriefing (Order No. 10624882). Available from ProQuest Dissertation & Theses Global. (1961237950). Retrieved from http://library.tcu.edu.ezproxy.tcu.edu/PURL/EZproxy_link.asp?http://search.proquest.com.ezproxy.tcu.edu/docview/1961237950?accountid¼7090.

INACSL Standards Committee. (2016). INACSL standards of best practice: Simulation Glossary. *Clinical Simulation in Nursing*, *12*(S), S39- S47. https://doi.org/10.1016/j.ecns.2016.09.012.

Jansson, M., Kaariainen, M., & Kyngas, H. (2013). Effectiveness of simulation-based education in critical care nurses' continuing education: A systematic review. *Clinical Simulation in Nursing*, *9*(9), e355-e360. https://doi.org/10.1016/j.ecns.2012.07.003.

Jeffries, P., & Rizzolo, M. A. (2007). Designing and implementing models for the innovative use of simulation to teach nursing care of critically ill adults and children: A national, multi-site, multi-method study. In Jeffries, P. R. (Ed.), *Simulation in Nursing Education*. New York, NY: National League for Nursing. (pp. 147-159).

Johnson, B. K. (2019). Simulation observers learn the same as participants: The evidence. *Clinical Simulation in Nursing*, *33*, 26-34. https://doi.org/ 10.1016/j.ecns.2019.04.006.

Johnson, B. K. (2018). *Observational Experiential Learning Facilitated by Debriefing for Meaningful Learning: Exploring Student Roles in Simulation (Doctoral Dissertation)*. Available from ProQuest Dissertation & Theses Global. (2128022193)

Kaplan, B. G., Abraham, C., & Gary, R. (2012). Effects of participation vs. observation of a simulation experience on testing outcomes: Implications for logistical planning for a school of nursing. *International Journal of Nursing Education Scholarship*, *9*(1), 14. https://doi.org/10.1515/ 1548-923X.2398.

Kardong-Edgren, S., Adamson, K. A., & Fitzgerald, C. (2010). A review of currently published evaluation instruments for human patient simulation. *Clinical Simulation in Nursing*, *6*(1), e25-e35. https://doi.org/10.1016/j.ecns.2009.08.004.

Khalil, H., Peters, M., Godfrey, C. M., McInerney, P., Soares, C. B., & Parker, D. (2015). An evidence-based approach to scoping reviews. *Worldviews on Evidence Based Nursing*, *13*(2), 118-123. https://doi.org/10.1111/wvn.12144.

LeFlore, J. L., Anderson, M., Michael, J. L., Engle, W. D., & Anderson, J. (2007). Comparison of self-directed learning versus instructor-modeled learning during a simulated clinical experience. *Simulation in Health- care: Journal of the Society for Simulation in Healthcare*, *2*(3), 170- 177. https://doi.org/10.1097/SIH.0b013e31812dfb46.

Lee, J., & Oh, P. (2015). Effects of the use of high-fidelity human simulation in nursing education: A meta-analysis. *Journal of Nursing Education*, *54*(9), 501. https://doi.org/10.3928/01484834-20150814-044.

Leigh, G., Miller, L. B., & Ardoin, K. B. (2017). Enhancing observers' learning during simulations. *Journal of Continuing Education in Nursing*, *48*(10), 454-457. https://doi.org/10.3928/00220124-20170918-06.

Lioce, L., Ed, Lopreiato, J., Founding Ed, Downing, D., Chang, T. P., Robertson, J. M., ., & Associate Eds, & Terminology and Concepts Working Group.. (2020). In *Healthcare Simulation Dictionary Second Edition*. Rockville, MD: Agency for Healthcare Research and Quality. https://doi.org/10.23970/simulationv2. AHRQ Publication No. 20-0019

Livsey, K., & Lavender-Stott, E. (2015). Impact of vicarious learning through peer observation during simulation on student behavioral measures. *Focus on Health Professional Education*, *16*(4), 64-73. https://doi.org/10.11157/fohpe.v16i4.99.

National League for Nursing. (2015). Preparing the next generation of nurses to practice in a technology-rich environment: An informatics agenda. Retrieved from http://www.nln.org/docs/default-source/professional-development-programs/preparing-the-next-generation-of-nurses.pdf?sfvrsn¼6.

Newberry, B. M. (2014). Satisfaction and Self-confidence differences between undergraduate nursing students participating in and observing simulation training (Order No. 3665800) Available from ProQuest Dissertation & Theses Global. (1640764553). Retrieved from http://library.tcu.edu.ezproxy.tcu.edu/PURL/EZproxy_link.asp?http://search. proquest.com.ezproxy.tcu.edu/docview/1640764553?accountid¼7090.

Norman, J. (2018). Differences in learning outcomes in simulation: The observer role. *Nurse Education in Practice*, *28*, 242-247. https://doi. org/10.1016/j.nepr.2017.10.025.

O'Reagan, S., Molloy, E., Watterson, L., & Nestel, D. (2016). Observer roles that optimise learning in healthcare simulation education: A systematic review. *Advances in Simulation*, *1*(4), 1-10. https://doi.org/10. 1186/s41077-015-0004-8.

Olejniczak, E. A., Schmidt, N. A., & Brown, J. M. (2010). Simulation as an orientation strategy for new nurse graduates: An integrative review of the evidence. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, *5*(1), 52-57. https://doi.org/10.1097/SIH. 0b013e3181ba1f6.1.

O'Leary, J. A., Nash, R., & Lewis, P. A. (2015). High fidelity patient simulation as an education as an educational too in paediatric intensive care: A systematic review. *Nurse Education Today*, *35*(10), c8-c12. https://doi. org/10.1016/j.nedt.2015.07.025.

Peters, M. D., Godfrey, C., McInerney, P., Baldini Soares, C., Khalil, H., & Parker, D. (2017). Chapter 11: Scoping reviews. In Aromataris, E., & Munn, Z. (Eds.), *Joanna Briggs Institute Reviewer's Manual*. The Joanna Briggs Institute. Retrieved from https://reviewersmanual.joannabriggs.org/.

Rode, J. L., Callihan, M. L., & Barnes, B. L. (2016). Assessing the value of large-group simulation in the classroom. *Clinical Simulation in Nursing*, *12*(7), 251-259. https://doi.org/10.1016/j.ecns.2016.02.012.

Rogers, B. A., Baker, K. A., & Sapp, A. (2020). Learning outcomes of the observer role in nursing simulation: a scoping review protocol. *JBI Evidence Synthesis*, *18*(5), 1051-1056. https://doi.org/10.11124/JBISRIR- D-19-00172.

Schaar, G. L., Ostendorf, M. J., & Kinner, T. J. (2013). Simulation: Linking quality and safety education for nurses competencies to the observer role. *Clinical Simulation in Nursing*, *9*(9), e407-e410. https://doi.org/10. 1016/j.ecns.2012.07.209.

Scherer, Y. K., Foltz-Ramos, K., Fabry, D., & Chao, Y. (2016). Evaluating simulation methodologies to determine best strategies to maximize student learning. *Journal of Professional Nursing: Official Journal of the American Association of Colleges of Nursing*, *32*(5), 349-357. https:// doi.org/10.1016/j.profnurs.2016.01.003.

Sinclair, S., Norris, J., McConnell, S., Chochinov, H., Hack, T., Hagen, N., & Bouchal, S. (2016). Compassion: A scoping review of the health- care literature. *BMC Palliative Care*, *15*(1), 6. https://doi.org/10.1186/ s12904-016-0080-0.

Shin, S., Park, J., & Kim, J. (2015). Effectiveness of patient simulation in nursing education: Meta-analysis. *Nurse Education Today*, *35*(35), 176- 182. https://doi.org/10.1016/j.nedt.2014.09.009.

Thidermann, I., & Saderhamn, O. (2013). High-fidelity simulation among bachelor students in simulation groups and use of different roles. *Nurse Education Today*, *33*(12), 1599-1604. https://doi.org/10.1016/j.nedt.2012.12.004.

Weaver, A. (2011). High-fidelity patient simulation in nursing education: An integrative review. *Nursing Education Perspectives*, *32*(1), 37-40. https://doi.org/10.5480/1536-5026-32.1.37.

Zulkolsky, K. D., White, K. A., Price, A. L., & Pretz, J. E. (2016). Effect of simulation role on clinical decision-making accuracy. *Clinical Simulation in Nursing*, *12*(3), 98-106. https://doi.org/10.1016/j.ecns.2016.01.007.

Chapter III- COGNITIVE LOAD EXPERIENCED BY NURSES IN SIMULATION-BASED LEARNING EXPERIENCES: AN INTEGRATIVE REVIEW

Authors: Beth A. Rogers and Ashley E. Franklin

Corresponding Author: Beth A. Rogers

This manuscript reviews an emerging participant characteristic which may affect learning outcomes in simulation-based learning experiences. Past experiences, pre-briefing, repeated scenarios, and worked out modeling optimize cognitive load. High fidelity, time pressure, dual-tasking, interruptions, task complexity distractions, and a mismatch of simulation objectives to learner ability increases cognitive load. Cognitive load is measured using subjective tools, objective tools, eye tracking glasses alongside other dependent variables. This review is important because it synthesizes what is known about how cognitive load impacts simulation learning outcomes to date. Further, it offers suggestions and practice implications for how best to optimize the cognitive load nurses experience in simulation. Beth Rogers was the primary author and conducted the review under the direction of Dr. Franklin. Dr. Franklin also significantly contributed to writing and editing the final manuscript. This paper is published in press with *Nurse Education Today* (impact factor 2.49), a peer-reviewed journal with a readership interested in nursing education and simulation.

This manuscript was exempt from institutional review because it does not include human subjects.

Cite this article:
Rogers, B., & Franklin, A. E. (2021). Cognitive load experienced by nurses in simulation-based learning experiences: An integrative review. *Nurse Education Today, In Press*. https://doi.org/10.1016/j.nedt.2021.104815
.

Abstract

Background: Simulation based learning experiences help nurses gain skills necessary for independent practice. However, increased cognitive load placed on learners in simulation may affect learning outcomes.

Objectives: The purpose of this integrative review was to synthesize what is known about nurses' cognitive load in simulation and summarize measurement approaches.

Data Sources: A search of CINAHL, Medline, ProQuest Nursing and Allied Health, and ERIC databases was limited to peer-reviewed studies published after 2006 in the English language, using the key words nurse, simulation, and cognitive load.

Review Methods: Whittemore and Knafl's (2005) integrative review method was used. Studies investigating advanced practice nurses or interprofessional teams were excluded.

Results: Database and reference list searches identified a total of 3,077 records, and 20 met inclusion criteria. Simulation fidelity, time pressure, dual-tasking, interruptions, task complexity, distractions, and mismatched simulation objectives to learner ability increase nurses' cognitive load. However, past experience, pre-briefing, repeated scenarios, and worked-out modeling optimize cognitive load. Subjective and objective cognitive load measures help researchers understand cognitive load and define its relationship with other variables.

Conclusions: Simulation impacts nurses' cognitive load. Varying simulation designs to optimize cognitive load will improve learning outcomes. Future nursing simulation research should utilize well-validated cognitive load measures and measure cognitive load alongside other variables to further understand how cognitive load affects simulation outcomes.

Keywords: cognitive load, eye tracking, nurse, learning outcome, simulation

Cognitive Load Experienced by Nurses in Simulation-Based Learning Experiences: An Integrative Review

Novice nurses have several known risks for errors during their transition to practice including making appropriate clinical judgments (Al-Dossary et al., 2014; Fisher & King, 2013; Kavanagh & Szweda, 2017), identifying risks, prioritizing interventions, communicating salient information, and anticipating orders (Kavanagh & Szweda, 2017). Simulation-based learning experiences provide targeted skill practice (Bradley et al., 2019; Smiley, 2019). Nurses may achieve similar learning outcomes when high-quality simulation-based learning experiences replace half of traditional clinical learning hours (Hayden et al., 2014). Simulation-based learning experiences may be more efficient than clinical because participants intentionally practice skills and higher order thinking (Sullivan et al., 2019). However, we do not fully understand how simulation design decisions affect learning outcomes (Chen et al., 2015; Halpern et al., 2019; Johnson, 2019; Romero-Hall et al., 2016). Specifically, simulation design may increase nurses' cognitive load, which decreases learning (Fraser et al., 2015; Josephsen, 2015). This integrative review will summarize what is known about nurses' cognitive load in simulation-based learning experiences abstracted from the breadth of simulation research with experimental and non-experimental designs.

Cognitive Load Theory posits instructional design impacts information processing (Plass et al., 2010; Sweller et al., 2011) because knowledge acquisition depends upon limited working memory used during exposure to new material. Three different types of cognitive load impact working memory. First, germane load involves the effort of handling and incorporating a learning task into long-term memory. Next, the learning environment and presentation of information creates extraneous workload. Finally, task complexity increases intrinsic workload making less working memory available (Josephsen, 2015) . When cognitive load is not balanced with ability, learners become overwhelmed (Fraser et al., 2015; Plass et al., 2010).

Simulation participants' learning outcomes have a parabolic relationship to cognitive load (Fraser et al., 2015). Content sequencing, inefficient delivery, inappropriate fidelity, split attention, distractions, emotion, and stress overwhelm cognitive load (Fraser et al., 2015). Conversely, pre-briefing, consistent simulation preparation, psychological safety (Fraser et al., 2015), and having similar previous experiences reduce cognitive load (Pawar et al., 2018). Optimizing cognitive load through simulation design allows educators to maximize learning (Fraser et al., 2015).

An integrative review provides a broad synthesis of information related to a phenomenon of concern (Whittemore & Knafl, 2005). Integrative reviews critically analyze and synthesize a segment of published literature while comparing findings to prior research, literature reviews, and theoretical articles (Whittemore & Knafl, 2005). Whittemore and Knafl's method provides a systematic and rigorous approach to data analysis while leaning on qualitative techniques to decrease bias and error. The overarching goal of this integrative review is to synthesize what is known about nurses' cognitive load in simulation-based learning experiences and summarize measurement approaches. While others have reviewed cognitive load and simulation design (Fraser et al., 2015) and provided a theoretical overview of cognitive load in simulation (Josephsen, 2015), reviewing nurses' cognitive load related to learning outcomes may help educators better understand simulation design implications. Therefore, this integrative review will answer the research questions: 1) What is known about the cognitive load nurses experience in simulation? 2) How is cognitive load measured in nurses?

Review Methods

Whittemore and Knafl's (2005) integrative review method was used, and data analysis included a constant comparison approach that converted extracted data into systematic categories thereby allowing authors to distinguish patterns, themes, variations, and relationships.

Literature Search

A search of CINAHL, Medline, ProQuest Nursing and Allied Health, and ERIC databases was completed on March 1, 2020, using the key words “nurse,” “simulation,” and “cognitive load” (See Table 1) was limited to peer reviewed articles written in English after 2006. Manuscripts written in the English language after 2006 were included in this review to reflect recent growth in empirical research around simulation since publication of the Nursing Education Simulation Framework (Jeffries, 2005), which evolved into the National League for Nurses/Jeffries Simulation Theory (Jeffries & NLN, 2016).

Table 3.1

CINAHL Search Strategy Terms

Nurse	Simulation	Cognitive load
1. Nurs*	15. Simulat*	27. Cognitive load
2. Nurs* education	16. 'Virtual reality'	28. Cognitive workload
3. Bachelor*	17. Computer simulat*	29. Cognitive effort
4. Associate*	18. Vignette	30. Cognitive demand
5. Vocation* nurs*	19. Manikin	31. mental load
6. practical nurs*	20. Mannikin	32. mental workload
7. Nurs* student*	21. mannequin	33. mental effort
8. BSN	22. Role Play	34. mental demand
9. LVN	23. Standard* patient*	35. Cognitive load theory
10. ADN	24. Patient simulat*	36. Germane load
11. LPN	25. 'Augmented reality'	37. Extraneous load
12. Pre-licensure	26. or/15-25	38. Intrinsic load
13. Novice		39. Overload
14. or/1-13		40. Over-load
		41. Working memory
		42. Short-term memory
		43. Short term memory
		44. Long-term memory
		45. Long term memory
		46. Visual attention
		47. Time pressure
		48. Dual task
		49. Eye tracking
		50. or/27-49
51. 14 and 26 and 50		
52. limit 51 to year= 2006-2020		
53. limit 52 to peer reviewed		
54. limit 53 to English language		

Inclusion and exclusion criteria

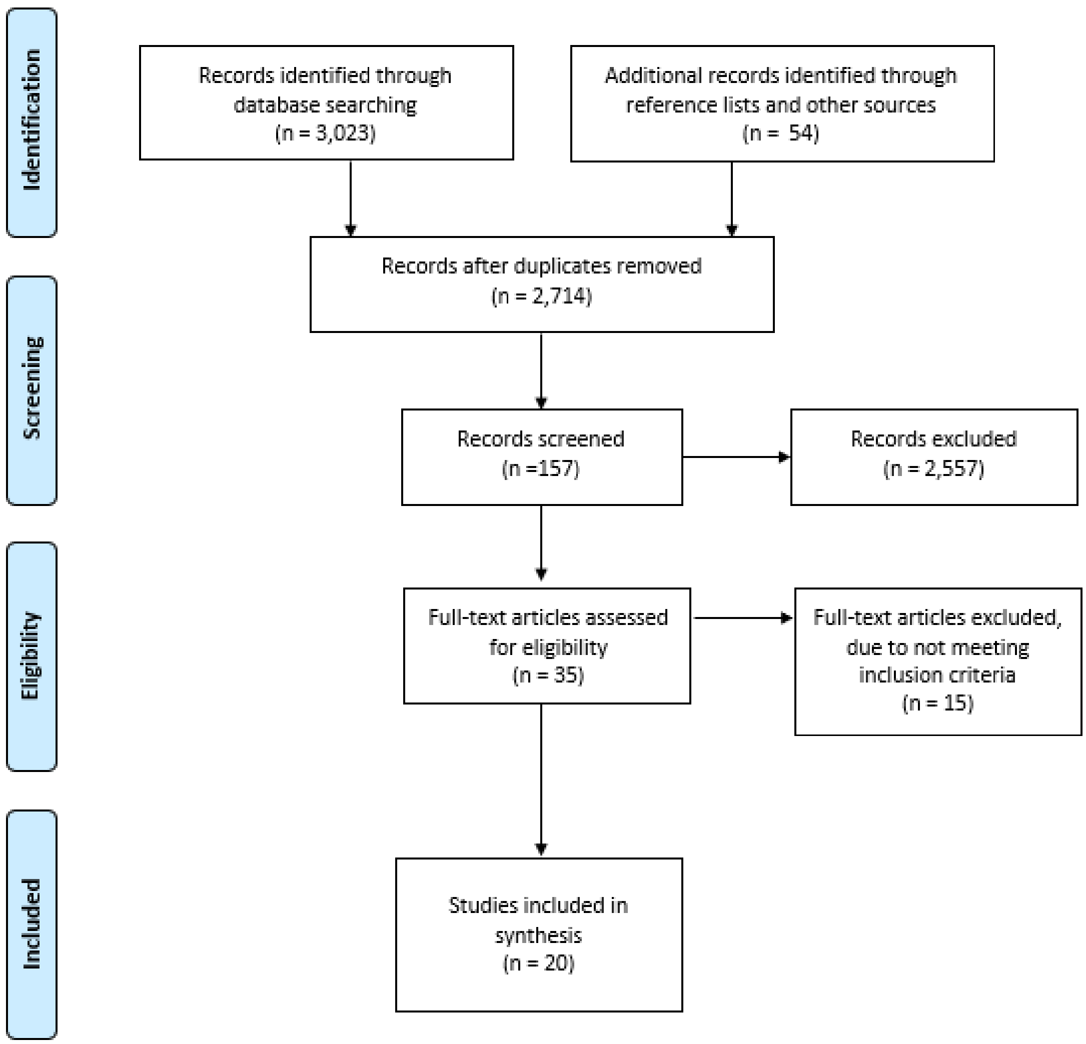
Two authors screened all records for inclusion. Articles were included if they were published in peer-reviewed journals and discussed nurses' cognitive load during simulation. Researchers used related terms like attention, time pressure, mental workload, dual-tasking, or memory to describe cognitive load. In this paper, novice nurse refers to pre-licensure students, and expert nurse refers to nurses with over three years' experience. Elements excluded from the scope of this review included delineation of cognitive load and stress or anxiety, simulation used to prepare advanced practice nurses or interprofessional teams, and discussion of debriefing best practices.

Search outcome

Database searches and reference lists identified 3,077 records. Authors identified 157 records as possible matches and reviewed 35 full-text articles for eligibility. Next, authors evaluated the reference lists of all studies screened in full-text for other potential sources. Authors agreed on 20 empirical studies for synthesis (See Figure 1).

Figure 3.1

Paper Selection and Inclusion Process Flow Diagram



Adapted from Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. The PRISMA Group. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med, 6(7), e1000097. doi:10.1371/journal.pmed1000097

Data evaluation

The final sample for this integrative review included empirical and theoretical reports. Authors did not evaluate the quality of the data due to diverse representation of primary sources and few studies meeting inclusion criteria. We coded articles based on whether they: measured cognitive load directly, used eye tracking glasses as a proxy, discussed cognitive load but did not measure it, or used concepts measured in cognitive load (See Table 3). Reports of low rigor and relevance contributed less to analysis.

Table 3.2

Article Coding Strategy

	Category assigned			
Author	Measured CL	Eye tracking	Discussed CL	Used related CL concepts
Al-Monteri et al. (2019)		✓		
Amster et al. (2015)		✓		
Ausburn et al. (2010)			✓	
Blondon et al. (2017)			✓	
Browning et al. (2016)		✓		
Cabrera-Mino et al. (2019)	✓			
Campoe & Giuliano, (2017)	✓			
Chen et al. (2015)			✓	
Halpern et al. (2019)				✓
Henneman et al. (2017)		✓		
Hsu et al. (2019)	✓			
Josephsen (2018)	✓			
Kataoka et al. (2008)		✓		
Kataoka et al. (2011)	✓			
Romero-Hall et al. (2016		✓		
Saleem et al. (2007)	✓			
Say et al. (2019)			✓	
Schlairet et al. (2015)	✓			
Shinnick (2016)		✓		✓
Yang et al. (2012)				✓

Data extraction

After all records were identified, data pertaining to sample characteristics and method were extracted and charted (See Table 2).

Data analysis

We used constant comparison to reduce, categorize, and code articles. Categories extracted included cognitive load definition, related terms and variables, study design, measures, facilitators of optimal cognitive load, and contributors to high cognitive load. Data display matrices helped authors iteratively compare categories. As abstraction evolved, authors reviewed primary sources to verify congruence with developing conclusions.

Table 3.3

Data Extraction Table

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Al-Moteri et al., (2019)	To better understand lapses in cue processing when nurses fail to manage patient deterioration optimally	None	Quasi-experimental; (n=40) 19 inexperienced and 21 experienced nurses BSN, masters, and doctorate students	- Comparison of group who demonstrated non-fixation and bias compared to those who did not	- Eye tracking- non-fixation Tobii glasses - Task analysis for cognitive bias	- Attention deviations caused nurses to exhibit cognitive bias. Shortcut thinking happens when under time pressure so students can miss clues	- Unable to know if previous clinical experience influenced decisions - Sample size - Time commitment to study
Amster et al. (2015)	To understand whether nursing students failed to identify the allergy error because they did not locate the information or because they were unable to apply their knowledge	None	Quasi-experimental, (n=10); senior level nursing students	- Assigned after completion of the study based on performance outcome (Identification of error vs. those who did not identify the error)	- Eye tracking- fixation - Belt visualization - Errors	- Participants who identified the error and those who did not completed the medication administration process similarly. This suggests that students can follow rules to perform a task, but may not have the knowledge necessary to complete accurately	- Small sample- n=10 - Single nursing program - No randomization- post-hoc group assignment based on whether made error or not .

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Ausburn et al. (2010)	To compare the differential effects of VR and traditional still image presentations of surgical operating room environments to students with high- and low-visual perceptual styles	- Cognitive Load Theory (CLT) - Supplantation Theory - Dale's Cone of Experience - Communication theory and channel noise - Theory of visual/haptic perceptual type	Mixed methods; (n=18); Licensed practical nurse students Used extreme group design	- VR vs still imagery - Visual/haptic learner type	- Accuracy of scenic orientation - Recall of scenic details (Accuracy) - Perceived confidence - Perceived difficulty - Time on learning task - Time on test	- Low visuals learners were susceptible to increased cognitive load during virtual reality, but this led to no significant differences between two groups on timed recall of scenic details	- Participants limited to 10 minutes - Small sample (n=18) - Significance set to 0.1
Blondon et al. (2017)	Aims at exploring resident-nurse collaborative reasoning in a simulation setting	None	Mixed methods; (n=28) volunteer nurses and residents	- Team scores vs mean of resident/nurse pair scores	- Simulation performance: 5 categories graded on a 1-5 Likert - Qualitative	- Cognitive load affected team's simulation performance. Situational awareness reduced task overload. Task overload could occur if the residents gave too many orders at once.	- generalizability d/t single center study - use of manikin could have changed the interaction with the patient - participants only had minimal knowledge about the patient
Browning et al. (2016)	To identify undergraduate healthcare students' area of visual interest and its relationship to performance ratings	None	Pilot study; (n=39); 20 BSN vs 19 paramedic students	- Nurses vs Paramedics	- Eye tracking glasses-fixation - Objectively rated performance	- Repeating simulations and using eye tracking videos to debrief learners led to significantly improved simulation performance. Nurses were distracted by the personal assistant in the scenario	- Participants limited to 8 minutes in 3 scenarios - small sample -

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Cabrera-Mino et al. (2019)	To identify differences in stress and cognitive load as detected by pupil dilations associated with specific tasks	CLT	Prospective, correlational-comparative design with two groups: (n=28) Senior prelicensure nursing students (n = 13); and adult ICU or ED nurses with >5 years of experience (n = 15)	- novice vs expert	- Eye tracking glasses - Pupil diameter change from baseline	- Novices experienced higher stress in simulation tasks when compared to novices, especially when the tasks required clinical judgment	- No control for effect of other substances that could affect stress response, such as caffeine use, anti-anxiety medications, or diagnosis of anxiety disorders - novice nursing students did not have a lot of sim experience
Campoe & Giuliano, (2017)	To measure the impact of interruption on nurses' cognitive workload, completion times, frustration, and error while programming a PCA pump	None	Quasi experimental; (n=9) experienced adult medical-surgical registered nurses (RN)	- Number of interruptions (2, 4, 6)	- NASA- TLX - Completion time - Error rate - Number of interruptions (2, 4, 6) - Frustration-subscale of TLX	- Interruptions during task performance led to increased cognitive load, increased completion times, and errors. Errors occurred following interruption	- Small sample size - Repeated measures- hard to control for learning from repetition - Unclear how previous experience affected the study - Observation from the PI and videotaping may have influenced performance
Chen et al. (2015)	To explore the effectiveness of high and low-fidelity simulation for learning cardiac and respiratory auscultation and physical assessment skills	CLT	Quasi experimental with random assignment (n=60) senior nursing undergraduate students	- LF instruction (n= 21) vs - HF instruction (n= 23) vs - Control- no instruction (n=16)	- assessment performance on infant and child simulation - LF Auscultation sound test - Auscultation test on simulators	- High fidelity learning environments may lead to ineffective learning by significantly increasing extraneous CL in novice learners. Nurses who learned in low fidelity simulations demonstrated better performance than students who learned in high fidelity and the control group	- Given 5 minutes to complete the auscultation test on simulators - sound recordings provided to groups were not exactly the same because LF group listened to recordings of HF simulator - fair to moderate reliability on measurement scale used

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Halpern et al. (2019)	To test whether nurses are capable of appropriately manually ventilating patients for 6 hours	None	Descriptive study (n=10) Experienced nurses	- None- looked at change over time	- Physiological (BP, HR, RR, O2 sat) - Ventilation Quality (Tidal volume and minute volume) - Borg Rating of perceived Effort -	- The subjects' physiologic states, including blood pressure, heart rate, respiratory rate, and oxygen saturation, showed no significant changes over time which correlated with the cognitive load ratings. The quality of delivered ventilation was stable on the average	- All participants were fairly young and fit
Henneman et al. (2017)	To describe the VSPs of nurses who successfully identify TACO	None	Observational descriptive; (n=6) practicing nurses	- Described the fixation of the six nurses who identified TACO	- Eye tracking - Fixation - Think aloud - Accuracy in identifying TACO	- Nurses who identified the reaction gave the longest attention to the shift report, bedside monitor, infusion pump, and flow sheet, but did not frequently focus on the patient or blood label. However, no nurses stopped the blood transfusion -	- small sample - convenience sampling - High attrition
Hsu et al. (2019)	To examine student's perceived effectiveness of an educational intervention for understanding oncology nursing	CLT	Randomized control trial; pre/post-test; (n=210) Sophomore nursing students from a vocational university in northern Taiwan	- Simulation vs lecture	- Adapted Paas scale - Knowledge test - Competency Inventory - Learning satisfaction and self-confidence scale	- Nurses reported lower cognitive load in simulation training which led to a significant increase in nursing competency, satisfaction, and oncology nursing knowledge.	- Single university - Long-term affects unknown

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Josephsen (2018)	To evaluate the application of worked-out modeling, based on the CLT worked-out example in simulation	CLT	Pilot study: Quasi-experimental; (n=61) senior nursing students with previous simulation experience	- Treatment group with Worked out modeling (WOM) (n=27) vs no WOM (n=34)	- Adapted Leppink tool to simulation - Knowledge pre/post	- Nurses who viewed worked out modeling prior to sim had greater knowledge related to falls and SBAR; which made intrinsic and germane load higher, but decreased extraneous load	- Limited generalizability because of pilot - Poor internal consistency so caution should be used interpreting extraneous load; moderate ICC for intrinsic load, good ICC for germane; overall good ICC for overall CL scores
Kataoka et al. (2008)	To describe the occurrence of long fixation during infusion pump operation and to examine if there are any differences between students and nurses with distractions	None	Quai-experimental; (n=9) students and practicing nurses	- Novice (n=6) - Expert (n=3)	- Eye tracking Fixation - Eye tracking Saccade -	- Clinical experience affected visual behaviors. The number of long fixations was significantly higher for the students than the nurses during pump operation. Students were easily distracted and did not have a consistent procedure for pump operation.	- alarm started at beginning of scenario instead of in the middle, so it was difficult to know how it impacted visual behavior - small sample size
Kataoka et al. (2011)	To examine changes in experienced and inexperienced nurses' visual behavior during infusion pump operation under the mental workloads of TP and DT	None	Descriptive experimental; (n=32) Students, inexperienced (<1 year); experienced (>1 year)	- Mental workload conditions: without, under time pressure, and dual tasking - Students (n= 10), Inexperienced (n=13) vs. Experienced (n=9)	- Eye tracker fixation & saccade - Heart rate variability adjusted by breathing frequency - NASA TLX - Completion time	- Nurses' mental workload and capacity during a procedure differ with experience. Nurses not familiar with pump operation do not standardize task reduction; but expert nurses do. Dual-tasking caused dispersed attention but did not lead to errors.	- Mental workload conditions in this study were artificial conditions

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Romero-Hall et al. (2016	To assess how emotive animated agents in a simulation-based training affect the performance outcomes and perceptions of the individuals	None	Quasi-experimental' (n=56)	- 29 experiences nurses (> 3 years experience) and 27 students (3rd & 4th year students)	- Eye tracking: gaze time, fixation - Emotion intensity (pain intensity) - Sim performance - Emotional response (facial expression)	- Animation of the virtual patients caused nurses to focus attention on the body. Novice participants achieved higher performance scores on pain assessments than experienced participants and conveyed more neutral facial expressions during the interaction with the animated agents than experience participants.	- participant compensation - eye tracking distraction - unable to blind
Saleem et al. (2007)	To determine how the re-design of a computer charting system affected learnability, efficiency, usability, and workload	None	Descriptive within subjects comparison; (n=16) Experienced nurses who had never used the VHA charting system and one nurse practitioner	- Comparison of old computer system with redesign to optimize workability	- NASA TLX - Completion time - Usability questionnaire	- Clinical reminders reduced the workload of nurses learning a new computer software. Nurses were more efficient and completed tasks quicker when workloads were reduced.	- First time users - Outlier- just deleted - computer experience not assessed - small sample size - Repeated measurement, but analyzed data with t-test, ANOVA, Wilcoxon
Say et al. (2019)	To evaluate the effectiveness of low-fidelity simulation utilizing CLT principles in the assessment and management of the deteriorating patient	CLT	Pilot study; (n=13); undergraduate nurses, mean age 41	- Pre/post perceptions of confidence in ability to AMDP	- confidence in skill survey	- Low fidelity simulations may be effective for undergraduate nursing students learning to care for deteriorating patients.	- Self-reported survey does not necessarily translate to practice - CL not directly measured in this study - Single arm pre/post test design - Small sample size

Author(s), Year	Aim or Purpose	Theoretical framework	Methodology, Population, Sample	Group Assignment	Measurement Tools Used	Significant Findings	Limitations
Schlairet et al. (2015)	To explore the impact of simulation on emotion and cognitive load among beginning nursing students	CLT NLN Jeffries Pleasure Activation	Descriptive Pilot study; (n=40) 1st-semester (junior) BSN students	- Role assignment (active vs observer)	- Cognitive load rating scale (Paas) - 8-Item emotional scale - TEAS - Kaplan Critical thinking test	- Nursing students' cognitive load was influenced by emotions. Cognitive load negatively affected identifying lung sounds especially in learners with lower ability.	- measured after debriefing - small sample size - multiple simulations prior to accuracy measurement
Shinnick (2016)	To validate ETG technology's ability to differentiate clinical performance between known groups in a heart failure simulation Also, to explore the utility of the ETG data for skill assessment and response times	None	pilot study- prospective, validation study with a two-group, convenience sample (n= 35) Novices (n=16); experts (n=19) While there was a significant difference in age between the groups (novice 25.1 ± 5.6; expert 39.7± 10.2)	- Novice (n= 16) vs. expert (n=19)	- Eye tracking (fixation) - Time to task - Task completion - Heart failure knowledge test	- Novices spent a significant amount of time looking at non-salient data, but experts identified what was important in a faster time. This led to novice nurses taking longer times to complete expected tasks.	- Participants have different, unequal previous experience - Average simulation experience was minimal or non-existent - Awareness of eye tracking glasses could have changed their eye movement - Participants who wore eyeglasses were unable to calibrate - CL not explicitly discussed - High attrition
Yang et al. (2012)	To investigate the effect of clinical experience, task difficulty and time pressure on nurses' confidence and decision-making accuracy	None	Descriptive two group; (n=97); Experienced critical care nurses and 2nd and 3rd year undergraduate nursing students	- Time pressure vs without time pressure - High (n= 8) vs low (n= 17) difficult decisions - Novices (n= 63) vs expert (n= 34)	- Accuracy - Confidence	- Task difficulty affected nurses' confidence and accuracy in their risk assessment judgments. However, time pressure did not. Expert nurses were not significantly more accurate in their risk assessment judgment than students but were more confident.	- non-random sampling

Results

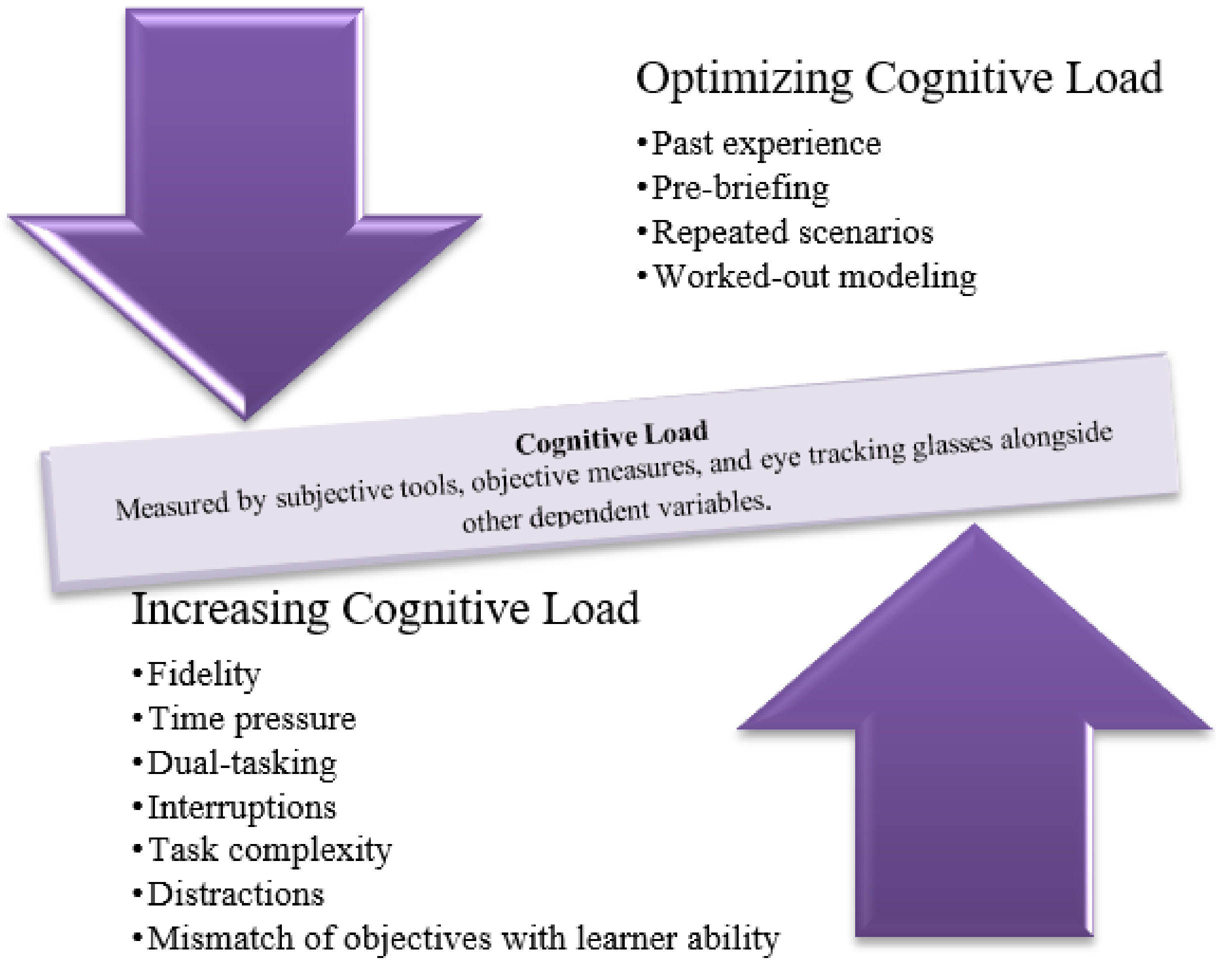
The 20 studies included in this integrative review originated from 8 countries: the USA (n=10), Australia (n=3), Japan (n=2), Switzerland (n=1), Canada (n=1), Israel (n=1), Taiwan (n=1), United Kingdom (n=1) and were published between 2007 and 2019. Studies included LVN (n=1), sophomore BSN (n=3), and senior BSN (n=5) students, while others included practicing nurses (n=5) or both students and practicing nurses (n=6). Most sample sizes ranged from 6-61, but two included 97 and 210 participants. Most studies did not report participants' previous simulation experience (n=13), but others had no (n=1), some (n=5), or mixed (n=1) previous simulation exposure. Only three studies investigated group simulation. Simulation topics included caring for deteriorating patients, performing skills, and responding to assessments. Most described offering an orientation to the simulation room before simulation (n=6), skill practice time (n=2) or training session (n=2).

Research methods included quasi-experimental (n=7), mixed methods (n=2), pilot (n=5), descriptive (n=5), and randomized control trials (n=1). Seven studies utilized subjective tools, and four used objective measures to measure cognitive load.

Authors identified several facilitators of optimal cognitive load: (1) past experience, (2) pre-briefing, (3) repeated simulation, and (4) worked-out models. Simulation design elements contributing to high cognitive load included (1) fidelity, (2) time pressure, (3) dual-tasking, (4) interruptions, (5) task complexity (6) distractions, and (7) mismatch of scenario objectives with learner ability. Researchers used subjective and objective tools as well as eye tracking glasses to measure cognitive load. Importantly, researchers measured cognitive load alongside other education dependent variables, which is an emerging theme in simulation literature (See Figure 2).

Figure 3.2

What is Known About Cognitive Load and how it is Measured



1. What is known about the cognitive load nurses experience in simulation?

Facilitators of Optimal Cognitive Load

Past Experience.

Thirteen studies reported how experience impacts cognitive load. Experience is defined in multiple ways. Al-Moteri et al. (2019), Blondon et al. (2017), Cabrera-Mino et al. (2019), Kataoka et al. (2011), Romero-Hall et al. (2016), Shinnick (2016) and Yang et al. (2012) defined expertise as clinical work experience, while others assert academic (Hsu et al., 2019; Josephsen,

2018) and skill experiences (Campoe & Giuliano, 2017; Saleem et al., 2007) are more influential. Only ten studies reported demographic information. Some utilized strict exclusion criteria to control for the effect of previous experience (Cabrera-Mino et al., 2019; Kataoka et al., 2011; Yang et al., 2012), while others intentionally sought participants with minimal previous exposure (Say et al., 2019; Schlairet et al., 2015). Work experience helps nurses respond to deteriorating patients in simulation-based learning experiences (Cabrera-Mino et al., 2019) and perform skills despite time pressure and distractions (Kataoka et al., 2008; Kataoka et al., 2011). Interestingly, Al-Moteri et al. (2019) and Yang et al. (2012) found no difference in simulation performance based on clinical experience, while Romero-Hall et al. (2016) found experts had worse performance in pain assessment than novices.

Pre-briefing.

Ten of 20 studies included pre-briefing to familiarize participants with the simulation environment before measuring cognitive load. Variety exists in pre-briefing methods. Most describe briefing as orientation to the environment (Al-Moteri et al., 2019; Cabrera-Mino et al., 2019; Henneman et al., 2017; Kataoka et al., 2008; Schlairet et al., 2015; Shinnick, 2016) or scenario (Josephsen, 2018), while some describe pre-briefing serving dual purposes to record each participant's baseline cognitive load (Campoe & Giuliano, 2017; Kataoka et al., 2011; Saleem et al., 2007). Pre-briefing durations vary from five to 30 minutes.

Repeated Simulation.

Eight studies investigated how repeated simulation impacts cognitive load. Generally, studies using repeated simulation-based learning experiences involved psychomotor tasks (Campoe & Giuliano, 2017; Kataoka et al., 2008; Kataoka et al., 2011; Saleem et al., 2007). Four studies incorporated holistic patient care requiring clinical judgment and task performance in repeated simulation-based learning experiences (Browning et al., 2016; Romero-Hall et al., 2016; Say et al., 2019; Schlairet et al., 2015). Novice nurses improved (Browning et al., 2016) and felt more confident (Say et al., 2019) in their ability to respond to a deteriorating patient but were influenced by emotion (Romero-Hall et al., 2016; Schlairet et al., 2015). Only one research team measured active participants' and observers' cognitive load and found no difference between roles in repeated scenarios (Schlairet et al., 2015). Conversely, use of a parallel case in repeated simulation-based learning experiences did not improve cognitive load (Saleem et al., 2007).

Worked-out Models.

Only one article investigated worked-out models. Interestingly, Josephsen (2018) found providing worked-out models did not significantly reduce cognitive load. However, watching worked-out models prior to simulation reduced extraneous loads but increased intrinsic and germane loads.

Simulation Design Elements Contributing to Increased Cognitive Load

Fidelity.

Two studies investigated how simulation fidelity relates to cognitive load. Research reveals providing too much fidelity overwhelms nurses' cognitive load and does not improve knowledge or behavior (Chen et al., 2015). Whereas Say et al. (2019) found that low fidelity simulations allowed students to learn how to manage a deteriorating patient.

Time Pressure.

Nine studies limited simulation time. Three studies induced time pressure and measured the impact on decision-making (Al-Moteri et al., 2019; Yang et al., 2012) and skill performance (Kataoka et al., 2011). Kataoka et al. (2011) investigated how time pressure affected novice and experienced nurses' performance operating an intravenous infusion pump. Experienced nurses shortened the number of steps to mitigate intrinsic load and deliver medication safely, while novices took shortcuts on safety checks and therefore increased risk for patient harm. Novices, who were unable to combine steps independently, reported more cognitive load with time pressure.

Dual-Tasking.

Only one study investigated how dual tasking, or performing two tasks at once, impacts cognitive load. Nurses operating under dual-tasking (Kataoka et al., 2011) had more cognitive load, but expert nurses reported less cognitive load than novices under the same conditions. Surprisingly dual-tasking did not lead nurses to commit errors.

Interruptions.

Two studies investigated how interruptions during simulations impact cognitive load. Nurses experienced increased cognitive loads when interrupted with questions while programming a patient-controlled analgesia pump. The total cognitive load and rate of errors increased with increasing numbers of interruptions (Campoe & Giuliano, 2017).

Task Complexity.

Nine of 20 studies found task complexity affected performance. All studies involved episodic nursing care (e.g. manage shortness of breath, program intravenous pump), and most involved senior pre-licensure novice nurses. Researchers often rate novice and expert task performance using objective tools (Cabrera-Mino et al., 2019; Shinnick, 2016; Yang et al., 2012) and under imposed workloads (Campoe & Giuliano, 2017; Kataoka et al., 2008; Kataoka et al., 2011). Some gather user experience related to task complexity in interviews (Blondon et al., 2017) or surveys (Ausburn et al., 2010; Halpern et al., 2019).

Distractions.

Some distractions are intentionally placed (Browning et al., 2016; Kataoka et al., 2008; Romero-Hall et al., 2016), while others are removed to investigate if cognitive load improves (Amster et al., 2015; Chen et al., 2015; Say et al., 2019). Simulation literature reveals unintended distractions contribute to cognitive load (Al-Moteri et al., 2019; Blondon et al., 2017; Schlairet et al., 2015). For example, cues from confederate participants (Browning et al., 2016), patients (Romero-Hall et al., 2016), and environmental sounds (Kataoka et al., 2008) distract nurses. Nurses are also distracted by their own thoughts. Amster et al., (2015) suggest novices' medication knowledge gaps distract decision-making. Cognitive load increases when novice nurses need to apply knowledge about which they are uncertain, while straight-forward skills like identifying abnormal breath sounds come with less cognitive load (Chen et al., 2015). Novice nurses' cognitive bias (Al-Moteri et al., 2019; Blondon et al., 2017) and emotions (Schlairet et al., 2015) also interfere with learning when unexpected events arise.

Mismatch of Objectives to Learner Ability.

Two articles compared cognitive load in nurses with varying ability. Findings suggest novice nurses, especially those with lower ability (Schlairet et al., 2015), experience higher cognitive load (Cabrera-Mino et al., 2019; Shinnick, 2016). This mismatch affects performance of expected behaviors (Cabrera-Mino et al., 2019; Shinnick, 2016) and judgment ability, such as correctly interpreting lung sounds (Schlairet et al., 2015).

How is Cognitive Load Measured in Nurses?

Subjective Tools

Eight articles used subjective rating tools. Nursing simulation studies most often use the NASA-TLX global score in analysis (Campoe & Giuliano, 2017; Kataoka et al., 2011; Saleem et al., 2007). The next most commonly used subjective instruments are the Cognitive Load Rating Scale (Schlairet et al., 2015) and Borg Scale of Perceived Physical Exertion (Halpern et al., 2019). Two authors adapted other cognitive load scales (Hsu et al., 2019; Josephsen, 2018) and one utilized a researcher-developed survey (Ausburn et al., 2010).

Regardless of the subjective measure used, most researchers ask participants to rate cognitive load immediately after simulation (Ausburn et al., 2010; Campoe & Giuliano, 2017; Hsu et al., 2019; Kataoka et al., 2011; Saleem et al., 2007). Two research teams measured cognitive load after debriefing (Josephsen, 2018; Schlairet et al., 2015), and another measured cognitive load both during and after simulation (Halpern et al., 2019).

Objective Measures

Two studies used both subjective cognitive load surveys and physiologic data including blood pressure, heart rate, and respiratory rate (Halpern et al., 2019; Kataoka et al., 2011). Halpern et al. (2019) found subjective and physiologic measures correlated with nurses performing bag-valve mask ventilation, and Kataoka et al. (2011) found correlation when novice nurses multitasked while programming an intravenous pump. Researchers also use pupillometry (Cabrera-Mino et al., 2019) and time to task (Shinnick, 2016) as a proxy for cognitive load.

Eye Tracking Glasses

Researchers have investigated what participants notice (Amster et al., 2015; Browning et al., 2016; Henneman et al., 2017; Romero-Hall et al., 2016), miss (Al-Moteri et al., 2019; Kataoka et al., 2008; Kataoka et al., 2011), and how participants respond alongside data about pupil size or field of gaze as a proxy of cognitive load (Cabrera-Mino et al., 2019; Shinnick, 2016). Some studies focus on what nurses notice about a patient (Amster et al., 2015; Henneman et al., 2017; Romero-Hall et al., 2016), while others use inanimate objects (e.g., intravenous pump, patient care monitor) to describe nurses' global view (Browning et al., 2016).

Eye tracking glasses have helped researchers understand the differences between how novices and experts notice salient cues. Expert nurses found salient cues and processed pertinent information faster (Kataoka et al., 2008; Kataoka et al., 2011; Shinnick, 2016). Novice nurses notice different, and often non-salient, things compared to experts. Amster et al. (2015) and Henneman et al. (2017) point out that even when nurses notice salient information, they may not make a correct decision. Several research teams agree novice nurses miss cues because they focus on non-salient information (Al-Moteri et al., 2019; Kataoka et al., 2008; Kataoka et al., 2011). Some researchers use nurses' verbalizations (Henneman et al., 2017) and behaviors (Cabrera-Mino et al., 2019; Kataoka et al., 2008; Shinnick, 2016) to represent what nurses see and then do.

Measuring Alongside Other Dependent Variables

Despite reporting high cognitive load, novice nurses describe increases in self-confidence (Ausburn et al., 2010; Hsu et al., 2019), confidence in decisions (Say et al., 2019; Yang et al., 2012), and satisfaction after simulation (Hsu et al., 2019). Survey findings reveal changes in emotion do not relate to cognitive load (Schlairet et al., 2015), and face recognition software shows novice nurses displayed more neutral emotions compared to expert nurses but that novice nurses had similar attentional focus in simulation-based learning experiences (Romero-Hall et al., 2016). Two studies measured cognitive load and knowledge using quasi-experimental designs (Hsu et al., 2019; Josephsen, 2018). Three studies investigated how cognitive load affects assessment (Chen et al., 2015; Romero-Hall et al., 2016) and skill performance (Halpern et al., 2019). Most researchers studied how noticing cues (Amster et al., 2015; Browning et al., 2016; Henneman et al., 2017; Shinnick, 2016), versus missing cues (Al-Moteri et al., 2019; Blondon et al., 2017), affected clinical decision making. Two studies investigated interpretation of auscultated sounds (Chen et al., 2015; Schlairet et al., 2015). Finally, three authors researched how cognitive load affects decision accuracy (Amster et al., 2015; Blondon et al., 2017; Henneman et al., 2017). Generally, extant literature agrees that cognitive load impacts simulation outcomes.

Discussion

This integrative review adds to the literature by separating out simulation design elements which optimize versus increase nurses' cognitive load in simulation-based learning experiences. Researchers measure cognitive load using objective measures and subjective tools. Extant literature reports that cognitive load may impact emotional responses, confidence, knowledge, simulation performance, and clinical judgment during simulation.

Most studies in this review involved senior-level BSN students in the United States. Because faculty use simulation across the curriculum, it is important to understand the trajectory of cognitive load over time to guide scaffolding in simulation design. Too often, studies used homogenous samples from one setting that limit generalizability. Additional descriptive work involving cognitive load and simulation-based learning experiences across the curriculum with diverse student samples is needed.

Simulation Design Considerations to Optimize Cognitive Load

Most educators believe previous work experience makes expert nurses proficient, however many expert nurses have less experience in simulation-based learning experiences. As such, it is possible that being simulation naïve increases nurses' cognitive load. Theoretically, expert nurses use long-term memory to recognize salient information and implement appropriate interventions with less mental effort in most situations (Fraser et al., 2015). Researchers do not routinely report cognitive load findings in the context of previous experience that may confound results. Most studies comparing novice and expert performance used dichotomous measures and blinded (Cabrera-Mino et al., 2019; Shinnick, 2016) or non-blinded raters (Al-Moteri et al., 2019; Romero-Hall et al., 2016; Yang et al., 2012). Additional studies awarding partial credit for task performance and using blinded raters could more precisely describe the relationship between cognitive load and experience.

Existing literature demonstrates pre-briefing increases familiarity with the simulation environment and scenario. Orientation before simulation-based learning experiences removes the risk an unknown environment adds to intrinsic load (Fraser et al., 2015) which positively affects simulation outcomes (Tyerman et al., 2019). However, no studies measured nurses' cognitive load during or following pre-briefing. Further studies investigating pre-briefing are needed to understand how pre-briefing influences cognitive load.

Using and integrating knowledge increases nurses' cognitive load (Fraser et al., 2015), so educators use repeated simulation-based learning experiences to decrease cognitive load. Several researchers manipulated levels of complexity in repeated simulation-based learning experiences with the goal of understanding how familiarity with scenario content impacts cognitive load. These results operationalize the hypothesized benefit that expert nurses' repeated exposure with skill performance and situational decision-making optimizes intrinsic load (Pawar et al., 2018). Future research should use longitudinal designs to investigate whether repeated simulation-based learning experiences similarly impacts novice nurses' intrinsic load.

Future studies should use repeated simulation-based learning experiences requiring holistic care to measure changes in cognitive load over time for active participants and observers.

Because extant literature supports increasing simulation since novice nurses practice decision-making independently (Cabrera-Mino et al., 2019), it seems prudent to measure their cognitive load alongside holistic behavioral performance and other outcomes over time. Using repeated simulation-based learning experiences should decrease stress (Schommer et al., 2003) by enhancing knowledge synthesis and improving clinical judgment (Lawrence et al., 2018). There is a gap in the literature, however, for evidence of cognitive load change over time.

Worked-out modeling involves demonstrating skills and procedures while verbalizing thoughts and standards of practice. Providing partial or completely worked-out examples reduce cognitive load (Fraser et al., 2015; Josephsen, 2015). Josephsen (2018) was the first to investigate worked-out modeling's effect on nurses' cognitive load, though medical educators recommend its use (Leppink & van den Heuvel, 2015). Surprisingly, Josephsen (2018) found providing worked-out models did not significantly reduce intrinsic or germane loads but did reduce extraneous loads. Though study findings were limited by research design (e.g., pilot study, small sample, convenience sample, poor internal consistency with a researcher-adapted tool). Worked-out modeling theoretically reduces cognitive load by developing cognitive schema, minimizing germane load, and decreasing intrinsic load (Jalani & Sern, 2015; Josephsen, 2018). Josephsen (2018) provides a start to investigating how worked-out modeling impacts novice nurses' cognitive load, and the body of literature could be strengthened if further research involved larger samples with reliable measures.

Simulation Design Characteristics Producing Increased Cognitive Loads

Simulation fidelity may increase cognitive load and influence simulation outcomes. Evidence-based standards recommend aligning fidelity to simulation objectives and learner experience (INACSL, 2016). Novice nurses experience increased cognitive load during high fidelity simulations. Studies using expert nurses with neutral or negative findings utilized either screen-based or low-fidelity simulation. The expert reversal effect posits that fidelity of a scenario negatively impacts expert nurse performance (Fraser et al., 2015). As such, simulation-based learning experiences must provide enough realism to stimulate experts while not overwhelming novices.

Simulationists strive to balance simulation design and learning outcomes, especially because some design elements do not enhance learning. Time pressure may increase cognitive load (Bong et al., 2016; Leppink & Duviver, 2016). Al-Moteri et al. (2019) found limiting screen simulation time to 8 minutes led participants to miss cues which led to cognitive bias and inaccurate decision-making. However, time pressure did not significantly alter decision-making in an individual live simulation allowing participants only 20 seconds to assess patient risk based on vital sign cues (Yang et al., 2012). Both studies used dichotomous scoring for decision-making accuracy which likely contributed to difficulty detecting correlations among time pressure and decision-making. Using categorical and partial credit scoring options in future studies will clarify the impact of time pressure. More studies investigating time pressure and cognitive load are needed.

Simulation can require nurses to attend to many cues simultaneously, often introducing interruptions, requiring dual-tasking, and thus increasing cognitive load. Increased cognitive load, in turn, affects behavior and distracts attention. In Kataoka et al., (2011), participants listened to the news while programming an infusion pump and recalled details after simulation-based learning experiences but did not commit errors. Conversely, when interruptions require participants to complete a physical task and return to programming a patient-controlled analgesia pump, errors were most likely at the resumption of patient-controlled analgesia pump programming (Campoe & Giuliano, 2017). Task complexity and dual-tasking may explain the paradox in results. Because researchers did not report accuracy of recall, it is unfair to assume participants gave equal attention to the secondary task. More investigations are needed using realistic task interruptions requiring nurses to shift attention and complete dual tasks. However, educators should carefully select complex simulation tasks in situations where other supportive design elements are in place to optimize cognitive load.

Complexity of the simulation-based learning experiences environment, assigned tasks, and clinical judgments can overwhelm cognitive load. More studies investigating task complexity and cognitive load are needed with novice nurses who have less clinical experience to understand the trajectories of task complexity, cognitive load, and performance and quantify which tasks are more difficult for novice nurses. Of note, some investigators define task complexity *a priori* (Kataoka et al., 2008; Kataoka et al., 2011; Yang et al., 2012), while others use task completion time (Shinnick, 2016), physiologic data (Cabrera-Mino et al., 2019), and self-report (Ausburn et al., 2010; Blondon et al., 2017; Campoe & Giuliano, 2017). Since little is known about task complexity, more descriptive studies are needed. Measuring nurses' cognitive load and relating it to task assignment in group simulation will add to the literature.

Distractions increase extraneous workload. Matching simulation fidelity to learner ability by removing distractions should reduce novice nurses' cognitive load (Fraser et al., 2015). Interestingly, 16 of 20 studies measured cognitive load in individual simulation experiences rather than team; we assume adding more nurses to team simulation-based learning experiences further increases distractions and exaggerates cognitive load. More studies are needed to demonstrate how distractions in team simulation influence cognitive load.

Even in low fidelity simulation-based learning experiences without the *noise* of extraneous information, lack of cognitive schema increases novice nurses’ cognitive load resulting in missed *signals* (Green & Swets, 1966). Cognitive aids and role clarity may decrease the *noise*. While simulation preparation and orientation control emotion and help novice nurses recognize the *signal*, it is important to recognize novice nurses can become distracted of their own regard. As such, simulationists should not plant unrealistic distractions. Researchers have uncovered unintended distractions via behavioral coding (Al-Moteri et al., 2019; Amster et al., 2015) and semi-structured interviews (Blondon et al., 2017). Further studies analyzing the sequence of novice nurses’ decisions using behavioral coding and mixed methods will provide greater detail about distractions and cognitive load.

Learning tasks must match learners’ abilities. Articles in this review agreed that learners with less ability experienced increased cognitive load, which impaired clinical judgment. These findings support the National League for Nurses/ Jeffries Simulation Theory postulation that participant characteristics affect simulation outcomes (Jeffries, 2005). However, further studies should investigate how learner ability and other participant characteristics affect cognitive load (e.g., age, program, level, learning style, etc.) so educators can design simulations which best support learning (Durham et al., 2014).

Measuring Cognitive Load With Subjective and Objective Tools Informs Research and Teaching

Subjective measures of cognitive load after simulation-based learning experiences are common. The NASA Task Load Index (NASA-TLX) has the most validity with samples of nurses in simulation-based learning experiences (Campoe & Giuliano, 2017; Kataoka et al., 2011; Saleem et al., 2007), and it includes six subscales related to mental demand, physical demand, temporal demand, performance, effort, and frustration (Hart, 2006). Participants rate each area on a visual analog scale of 1 to 20 where higher scores indicate more cognitive load. Subscale scores can be used individually or in combination.

Nursing simulation-based learning experience studies most often use global NASA-TLX scores in analysis, and reliability is reported as 0.77 (Hoonakker et al., 2011). Alternatively, simulation researchers use the Cognitive Load Rating Scale (Paas, 1992) to rate only mental workload (Pawar et al., 2018; Schlairet et al., 2015), and some adapt the scale to focus on specialty content (Hsu et al., 2019). The main limitation of the Cognitive Load Rating Scale is that it only has one item. Josephsen (2018) adapted a 10-item scale from Leppink et al. (2013) to measure simulation intrinsic, extrinsic, and germane load separately, but the tool has not been used widely. Some researchers develop cognitive load surveys (Ausburn et al., 2010), while others used the Borg Scale of Perceived Physical Exertion (Halpern et al., 2019). The majority of subjective measures have limited use in previous studies with diverse samples, and they have limited accuracy related to few items.

Most studies utilizing subjective tools measured cognitive load after simulation and found that cognitive load affected nurses' ability to perform tasks, obtain knowledge, and recall details in a predictable manner. However, researchers who measured cognitive load after debriefing unexpectedly found no major differences between nurses who viewed worked-out modeling (Josephsen, 2018) or between active participants and observers (Josephsen, 2018; Schlairet et al., 2015). Debriefing is a potential confounder of cognitive load ratings. Reflection in debriefing should help schema development and reduce cognitive load (Josephsen, 2015). However, anticipating feedback from others and providing feedback to classmates may increase cognitive load due to feeling vulnerable. Measuring cognitive load with subjective tools before and after debriefing could add depth to the literature about cognitive load, especially because higher order thinking in debriefing and the team environment could increase intrinsic load.

Triangulating subjective measures with objective data provides a clearer understanding of cognitive load. More studies are needed using both subjective and objective measures to help researchers understand which more effectively represents cognitive load. Objective measures are favored because they have more reliability. Researchers use pupillometry (Cabrera-Mino et al., 2019) and time to task completion (Shinnick, 2016) as a proxy for cognitive load with the assumption information-processing changes the autonomic system and response to stimuli. Shinnick, (2016) reported novices take significantly longer to complete expected behaviors Further, physiologic data indicates novice nurses have more cognitive load while performing everyday nursing tasks when multitasking compared to expert nurses. Further studies using a pre-post design to investigate how changes from baseline physiologic data are needed to strengthen the argument related to how cognitive load changes in simulation-based learning experiences.

Automated eye tracking glass analysis allows researchers to overcome bias from video coding and surveys. Head-mounted eye tracking glasses provide valuable real-time insight into visual behavior and demonstrate how individuals process cues without restricting the field of movement (Kataoka et al., 2011). They may include a field-of-view camera (Cabrera-Mino et al., 2019; Kataoka et al., 2011) offering a “bird’s eye view” of attention which is generally more accurate than recall (Shinnick, 2016). Most studies measure fixation as a proxy for attention because an individual cannot process the visual field during saccade. A scoping review describes robust eye tracking metrics including search patterns and pattern matching (Al-Moteri et al., 2017), but there is a gap in the nursing literature for analyzing these metrics. The strongest way nurse researchers use eye tracking data is to look for fixation patterns alongside other variables. Triangulating data allows researchers to determine processes underpinning errors (Al-Moteri et al., 2017; Amster et al., 2015). While eye tracking glasses provide researchers many advantages, they can be cost prohibitive in terms of dollars and time required for calibration and analysis. Furthermore, nursing eye tracking glass studies utilized small samples (e.g. under 60) and experienced high attrition due to calibration errors (Al-Moteri et al., 2019; Amster et al., 2015; Browning et al., 2016; Henneman et al., 2017), which limits validity and generalizability.

Relating Cognitive Load to Additional Learning Outcomes

It is helpful to measure cognitive load alongside other variables because cognitive load is a fairly new concept in nursing. However, the literature is replete with studies measuring reactionary outcomes after simulation-based learning experiences, and self-confidence usually does not correlate with improved behaviors (Franklin & Lee, 2014). Researchers have looked for relationships between cognitive load and emotion because emotion guides attention (Hunt et al., 2007) and expert nurses rely on emotional responses to intuitively recognize perceptual cues (Benner, 1984). Further investigations are needed to examine how cognitive load relates to emotions.

Although increases in cognitive load theoretically decrease knowledge, Hsu et al. (2019) found decreases in cognitive load and increases in knowledge comparing a simulation and lecture group. Josephsen (2018) found nurses had less cognitive load and improved knowledge after simulation-based learning experiences, while a pre-training intervention intended to help cognitive load surprisingly increased it. However, both utilized faculty-developed knowledge assessments. Further studies using validated knowledge assessments are needed to confirm how cognitive load relates to knowledge gains.

With increased cognitive load, novice nurses demonstrate better pain assessments compared to experts (Romero-Hall et al., 2016). Conversely, increased cognitive load did not affect the quality of nurses' ventilation (Halpern et al., 2019) or physical assessments (Chen et al., 2015). While Chen et al. (2015) and Romero-Hall et al. (2016) relied on faculty developed rubrics, Halpern et al. (2019) measured the quality of skill performance through objective ventilation metrics (e.g., tidal volume). Technology-calculated measures remove the risk of poor inter-rater reliability, which was not reported in either of the studies using faculty ratings. Further investigations providing sufficient reliability and quantifiable measurements will strengthen our understanding of how cognitive load affects performance.

Nurses must notice salient cues to make appropriate clinical judgments. Both Al-Moteri et al. (2019) and Blondon et al. (2017) found the sequence of noticing cues biases clinical judgments, but Blondon et al. (2017) added failure to notice vital signs is a frequent consequence of high cognitive load. Both used researcher-developed tools to examine clinical judgment. More investigations using valid tools could further explain how cognitive load affects noticing.

Increased cognitive load impacts cue processing necessary for clinical judgment. Researchers often measure accuracy of auscultation skills (Chen et al., 2015; Schlairet et al., 2015). Nurses interpret lung and heart sounds more accurately in screen-based simulation-based learning experiences with few distractions, but there were no differences on subsequent high-fidelity simulation-based learning experiences (Chen et al., 2015). Schlairet et al. (2015) had similar findings, meaning cognitive load did not relate to interpreting lung sounds. Measuring clinical judgments alongside cognitive load is important to demonstrate how cognitive load impacts application of knowledge.

Extant literature provides examples of increased cognitive load affecting clinical judgment accuracy (Amster et al., 2015; Blondon et al., 2017; Henneman et al., 2017). Vagabond diagnostics describes healthcare providers' fragmented thought processes and explains why nurses with increased cognitive load have less clinical judgment accuracy (Rudolph et al., 2007). Gaps in the literature exist related to factors that contribute to clinical judgment, so simulation provides an opportunity for study of cognitive load and clinical judgment in a safe environment.

Limitations

While the discussion provides implications for investigating nurses' cognitive load, there are limitations. First, reviewers used articles written in the English language. Articles not written in English or not included in the database search could change results. Additionally, primary studies informing this review had small sample sizes. Furthermore, generalizability is limited because most articles used descriptive, pilot, or quasi-experimental designs. Finally, most studies investigated individual simulation performance, which is not representative of the more frequently used team simulation practice.

Implications for Practice

Increasing time spent on pre-briefing may limit adoption, but the tradeoff is increased learning and knowledge transfer as a result of optimized cognitive load in simulation-based learning experiences. Repeating simulation scenarios may further reduce cognitive load in difficult scenarios. High fidelity simulations may overwhelm novice nurses; so, nurse educators should scaffold simulation fidelity. Limiting simulation time which is commonplace to manage logistics in a simulation center may increase cognitive load. Assigning multiple tasks to simulation participants may impact novice nurses' performance. Simulation designs should limit distractions and interruptions. Students with less knowledge or experience may learn better from worked-out examples (Paas & Van Merrienboer, 1994) or from completing partially-solved problems (Paas, 1992).

Conclusion

This review provides an evaluation of nurses' cognitive load outcomes during SBLE. Nurse educators should consider simulation design elements which optimize cognitive load when designing simulations. Research using subjective tools, objective measures, and eye tracking glasses quantifies cognitive load and defines the relationship between cognitive load and other variables. In order to design interventions to minimize nurses' cognitive load, we must first describe cognitive load in safe simulation settings. Further studies investigating cognitive load as a product of simulation design will help improve simulation learning outcomes.

References

Al-Dossary, R., Kitsantas, P., & Maddox, P. J. (2014). The impact of residency programs on new nurse graduates' clinical decision-making and leadership skills: A systematic review. *Nurse Education Today, 34*(6), 1024–1028. https://doi.org/10.1016/j.nedt.2013.10.006

Al-Moteri, M., Cooper, S., Symmons, M., & Plummer, V. (2019). Nurses' cognitive and perceptual bias in the identification of clinical deterioration cues. *Australian Critical Care: Official Journal Of The Confederation Of Australian Critical Care Nurses*. https://doi.org/10.1016/j.aucc.2019.08.006

Al-Moteri, M. O., Symmons, M., Plummer, V., & Cooper, S. (2017). Eye tracking to investigate cue processing in medical decision-making: A scoping review. *Computers in Human Behavior, 66*, 52–66. https://doi.org/10.1016/J.CHB.2016.09.022

Amster, B., Marquard, J., Henneman, E., & Fisher, D. (2015). Using an eye tracker during medication administration to identify gaps in nursing students' contextual knowledge. *Nurse Educator, 40*(2), 83–86. https://doi.org/10.1097/NNE.0000000000000097

Ausburn, L. J., Ausburn, F. B., & Kroutter, P. (2010). An exploration of desktop virtual reality and visual processing skills in a technical training environment. *Journal of Educational Technology*, *6*(4), 43–54. https://doi.org/10.26634/JET.6.4.1109

Benner, P., 1984. From novice to expert, excellence and power in clinical nursing practice. Addison-Wesley, Menlo Park, CA.

Blondon, K. S., Maître, F., Muller-Juge, V., Bochatay, N., Cullati, S., Hudelson, P., Vu, N. V, Savoldelli, G. L., & Nendaz, M. R. (2017). Interprofessional collaborative reasoning by residents and nurses in internal medicine: Evidence from a simulation study. *Medical Teacher*, *39*(4), 360–367. https://doi.org/10.1080/0142159X.2017.1286309

Bong, C. L., Fraser, K., & Oriot, D. (2016). Cognitive load and stress in simulation. In V. J. Grant & A. Cheng (Eds.), *Comprehensive Healthcare Simulation: Pediatrics* (pp. 1–17). Springer International Publishing. https://doi.org/10.1007/978-3-319-24187-6

Bradley, C. S., Johnson, B. K., Dreifuerst, K. T., White, P., Conde, S. K., Meakim, C. H., Curry-Lourenco, K., & Childress, R. M. (2019). Regulation of simulation use in United States prelicensure nursing programs. *Clinical Simulation In Nursing*, *33*, 17–25. https://doi.org/10.1016/j.ecns.2019.04.004

Browning, M., Cooper, S., Cant, R., Sparkes, L., Bogossian, F., Williams, B., O'Meara, P., Ross, L., Munro, G., & Black, B. (2016). The use and limits of eye-tracking in high-fidelity clinical scenarios: A pilot study. *International Emergency Nursing*, *25*, 43–47. https://doi.org/10.1016/j.ienj.2015.08.002

Cabrera-Mino, C., Shinnick, M. A., & Moye, S. (2019). Task-evoked pupillary responses in nursing simulation as an indicator of stress and cognitive load. *Clinical Simulation in Nursing*, *31*, 21–27. https://doi.org/10.1016/j.ecns.2019.03.009

Campoe, K. R., & Giuliano, K. K. (2017). Impact of frequent interruption on nurses' patient-controlled analgesia programming performance. *Human Factors*, *59*(8), 1204–1213. https://doi.org/10.1177/0018720817732605

Chen, R., Grierson, L. E., & Norman, G. R. (2015). Evaluating the impact of high- and low-fidelity instruction in the development of auscultation skills. *Medical Education*, *49*(3), 276–285. https://doi.org/10.1111/medu.12653

Durham, C. F., Cato, M. L., & Lasater, K. (2014). NLN/Jeffries Simulation Framework state of the science project: Participant construct. *Clinical Simulation in Nursing*, *10*(7), 363–372. https://doi.org/10.1016/j.ecns.2014.04.002

Fisher, D., & King, L. (2013). An integrative literature review on preparing nursing students through simulation to recognize and respond to the deteriorating patient. *Journal of Advanced Nursing*, *69*(11), 2375–2388. https://doi.org/10.1111/jan.12174

Franklin, A. E., & Lee, C. S. (2014). Effectiveness of simulation for improvement in self-efficacy among novice nurses: A meta-analysis. *Journal of Nursing Education*, *53*(11), 607–614. https://doi.org/10.3928/01484834-20141023-03

Fraser, K. L., Ayres, P., & Sweller, J. (2015). Cognitive Load Theory for the design of medical simulations. *Simulation in Healthcare*, *10*(5). https://doi.org/10.1097/SIH.0000000000000097

Green, D. M., & Swets, J. A. (1966). *Signal detection theory and psychophysics*. Wiley, New York.

Halpern, P., Dang, T., Epstein, Y., Van Stijn–Bringas Dimitriades, D., Koenig, K. L., Bringas Dimitriades, D. V. S.-, & Van Stijn-Bringas Dimitriades, D. (2019). Six hours of manual ventilation with a bag-valve-mask device is feasible and clinically consistent. *Critical Care Medicine*, *47*(3), e222–e226. https://doi.org/10.1097/CCM.0000000000003632

Hart, S. G. (2006). NASA-Task Load Index (NASA-TLX); 20 years later. *Proceedings of the Human Factors and Ergonomics Society*, 904–908. https://doi.org/10.1177/154193120605000909

Hayden, J., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Regulation Nursing*, *5*(2), S3–S40. https://doi.org/https://doi.org/10.1016/S2155-8256(15)30062-4

Henneman, E. A., Gawlinski, A., Nicholas, C., McAfee, K., Marquard, J. L., & Andrzejewski, C.

(2017). Identification of transfusion-associated circulatory overload: An eye-tracking study. *Clinical Simulation in Nursing*, *13*(12), 675–679. https://doi.org/10.1016/j.ecns.2017.05.004

Hoonakker, P., Carayon, P., Gurses, A., Brown, R., McGuire, K., Khunlertkit, A., & Walker, J. M. (2011). Measuring workload of ICU nurss with a questionnaire survey: The NASA Task Load Index (TLX). *IIE Transactions on Healthcare Systems Engineering*, *1*(2), 131–143. https://doi.org/10.1080/19488300.2011.609524

Hsu, L.L., Ueng, R.S., & Hsieh, S.I. (2019). An outcome-based educational intervention to improve nursing students' knowledge and competencies in oncology nursing: a randomized controlled Trial. *Contemporary Nurse: A Journal for the Australian Nursing Profession*, *55*(4/5), 391–407. https://doi.org/10.1080/10376178.2019.1682463

Hunt, A. R., Cooper, R. M., Hungr, C., & Kingstone, A. (2007). The effect of emotional faces on eye movements and attention. *Visual Cognition*, *15*(5), 513–531. https://doi.org/10.1080/13506280600843346

INACSL. (2016). Standards of best practice : simulation design. *Clinical Simulation in Nursing*, *12*, S5–S12. https://doi.org/http://dx.doi.org/10.1016/ j.ecns.2016.09.005.

Jalani, N. H., & Sern, L. C. (2015). The example-problem-based learning model: Applying cognitive load theory. *Procedia - Social and Behavioral Sciences*, *195*, 872–880. https://doi.org/10.1016/j.sbspro.2015.06.366

Jeffries, P. R. (2005). A framework for designing, implementing, and evaluating: simulations used as teaching strategies in nursing. *Nursing Education Perspectives*, *26*(2), 96–103.

Jeffries, P. R., & National League for Nursing. (2016). *The NLN Jeffries Simulation Theory*. Wolters Kluwer.

Johnson, B. K. (2019). Simulation observers learn the same as participants: The evidence.

Clinical Simulation In Nursing, *33*, 26–34. https://doi.org/10.1016/j.ecns.2019.04.006

Josephsen, J. (2015). Cognitive load theory and nursing simulation: An integrative review. *Clinical Simulation in Nursing*, *11*(5), 259–267. https://doi.org/10.1016/j.ecns.2015.02.004

Josephsen, J. (2018). Cognitive load measurement, worked-out modeling, and simulation. *Clinical Simulation in Nursing*, *23*, 10–15. https://doi.org/10.1016/j.ecns.2018.07.004

Kataoka, J., Sasaki, M., & Kanda, K. (2008). Visual behavior differences by clinical experience and alarming sound during infusion pump operation. *Japan Journal of Nursing Science*, *5*(2), 123–129. https:/doi.org/10.1111/j.1742-7924.2010.00158.x.

Kataoka, J., Sasaki, M., & Kanda, K. (2011). Effects of mental workload on nurses' visual behaviors during infusion pump operation. *Japan Journal of Nursing Science*, *8*(1), 47–56. https://doi.org/10.1111/j.1742-7924.2010.00158.x

Kavanagh, J. M., & Szweda, C. (2017). A crisis in competency: The strategic and ethical imperative to assessing new graduate nurses' clinical reasoning. *Nursing Education Perspectives*, *38*(2), 57–62. https://doi.org/10.1097/01.NEP.0000000000000112

Lawrence, K., Messias, D. K. H., & Cason, M. L. (2018). The influence of simulation experiences on new nurses' clinical judgment. *Clinical Simulation in Nursing*, *25*, 22–27. https://doi.org/10.1016/J.ECNS.2018.10.008

Leppink, J., & Duviver, R. (2016). Twelve tips for medical curriculum design from a cognitive load theory perspective. *Medical Teacher*, *38*, 669–674. https://doi.org/10.3109/0142159X.2015.1132829

Leppink, J., Paas, F., Van der Vleuten, C. P. M., Van Gog, T., & Van Merriënboer, J. J. G. (2013). Development of an instrument for measuring different types of cognitive load. *Behavior Research Methods*, *45*(4), 1058–1072. https://doi.org/10.3758/s13428-013-0334-1

Leppink, J., & van den Heuvel, A. (2015). The evolution of Cognitive Load Theory and its application to medical education. *Perspectives on Medical Education*, *4*(3), 119–127. https://doi.org/10.1007/s40037-015-0192-x

Paas, F. G. (1992). Training strategies for attaining transfer of problem-solving skill in statistics: A cognitive-load approach. *Journal of Educational Psychology*, *84*(4), 429–434. https://doi.org/10.1037/0022-0663.84.4.429

Paas, F., & Van Merrienboer, J. J. G. (1994). Variability of worked examples and transfer of geometrical problem-solving skills: A cognitive-load approach. *Journal of Educational Psychology*, *86*, 122–133. https://doi.org/10.1037/0022-0663.86.1.122

Pawar, S., Jacques, T., Deshpande, K., Pusapati, R., & Meguerdichian, M. J. (2018). Evaluation of cognitive load and emotional states during multidisciplinary critical care simulation sessions. *BMJ Simulation & Technology Enhanced Learning*, *4*(2), 87–91. https://doi.org/10.1136/bmjstel-2017-000225

Plass, J. L., Moreno, R., & Brunken, R. (2010). *Cognitive Load Theory*. Cambridge University Press, New York.

Romero-Hall, E., Watson, G. S., Adcock, A., Bliss, J., & Adams Tufts, K. (2016). Simulated environments with animated agents: Effects on visual attention, emotion, performance, and perception. *Journal of Computer Assisted Learning*, *32*(4), 360–373. https://doi.org/10.1111/jcal.12138

Rudolph, J. W., Morrison, J. B., & Carroll, John, S. (2007). Conficdence, error and ingenuity in diagnositc problem solving: Clarifying the role of exploration and expoitation. *Academy of Management Proceedings*, *2007*(1), 1–6. https://doi.org/10.5465/ambpp.2007.26508215

Saleem, J. J., Patterson, E. S., Militello, L., Anders, S., Falciglia, M., Wissman, J. A., Roth, E.

M., & Asch, S. M. (2007). Impact of clinical reminder redesign on learnability, efficiency, usability, and workload for ambulatory clinic nurses. *Journal of the American Medical Informatics Association*, *14*(5), 632–640. https://doi.org/10.1197/jamia.M2163

Say, R., Visentin, D., Betihavas, V., & Minutillo, S. (2019). A Cognitive Load Theory simulation design to assess and manage deteriorating patients. *International Journal of Nursing Education Scholarship*, *16*(1). https://doi.org/10.1515/ijnes-2019-0009

Schlairet, M. C., Schlairet, T. J., Sauls, D. H., & Bellflowers, L. (2015). Cognitive load, emotion, and performance in high-fidelity simulation among beginning nursing students: A pilot study. *Journal of Nursing Education*, *54*, S5–S11. https://doi.org/10.3928/01484834-20150218-10

Schommer, N. C., Hellhammer, D. H., & Kirschbaum, C. (2003). Dissociation between reactivity of the hypothalamus-pituitary-adrenal axis and the sympathetic-adrenal-medullary system to repeated psychosocial stress. *Psychosomatic Medicine*, *65*(3). https://doi.org/ 10.1097/01.PSY.0000035721.12441.17

Shinnick, M. A. (2016). Validating eye tracking as an objective assessment tool in simulation. *Clinical Simulation in Nursing*, *12*(10), 438–446. https://doi.org/10.1016/j.ecns.2016.06.001

Smiley, R. A. (2019). Survey of simulation use in prelicensure nursing programs: changes and advancements, 2010- 2017. *Journal of Nursing Regulation*, *9*(4), 48–61. https://doi.org/10.1016/S2155-8256(19)30016-X

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S.. (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: A study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing*, *30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive Load Theory*. Springer.

Tyerman, J., Luctkar-Flude, M., Graham, L., Coffey, S., & Olsen-Lynch, E. (2019). A systematic review of health care presimulation preparation and briefing effectiveness. *Clinical Simulation in Nursing*, *27*, 12–25. https://doi.org/10.1016/j.ecns.2018.11.002

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, *52*(5), 546–553. https://doi.org/10.1111/j.1365-2648.2005.03621.x

Yang, H., Thompson, C., & Bland, M. (2012). The effect of clinical experience, judgment task difficulty and time pressure on nurses' confidence calibration in a high fidelity clinical simulation. *BMC Medical Informatics & Decision Making*, *12*(1), 113. https://doi.org/10.1186/1472-6947-12-113

Describing Novice Nurses' Clinical Judgment Trajectory After Observing Expert Modeling Videos: A Mixed Methods Study

Authors: Beth Rogers, MSN, RN, Ashley E. Franklin, PhD, RN, CNE, CHSE-A

Corresponding Author: Beth Rogers

Beth Rogers conducted the data collection and analysis under the supervision of Dr. Ashley Franklin. Dr. Franklin also contributed to the conception and design of the study. This paper will be submitted after dissertation defense as a research report to *Clinical Simulation in Nursing* (impact factor 1.713). a peer-reviewed journal with a readership interested in simulation.

The Texas Christian University Institutional Review Board determined this study was exempt.

Acknowledgment: The authors would like to thank: Dr. Kathy Baker, PhD, APRN, ACNS-BC, FCNS, FAAN, for guidance with the qualitative analysis; Dr. Yan Zhang, PhD for consulting on statistical analysis; Dr. Jodi Patterson, PhD, RN and Kimberly Graham for their time recording the expert modeling videos.

Abstract

Background: Novice nurses have known deficiencies in clinical judgment (CJ). CJ is a cognitive process nurses use to notice salient cues, interpret their meaning, respond to situations, and reflect on the action to apply in future client encounters.

Methods: A mixed methods study was completed to describe novice nurses' CJ trajectory after observing eight expert modeling videos asynchronously over a semester. Novice nurses responded to clinical judgment prompts after viewing expert modeling videos, and responses were scored using the Lasater Clinical Judgment Rubric (LCJR). Novice nurses were assigned to low, medium, or high performance groups based on their cumulative LCJR score. Next, we analyzed whether any background variables related to LCJR scores. Finally, we used thematic analysis to describe characteristics of written responses for select participants in low, medium, and high performance groups.

Results: Sixty-three novice nurses completed the study. Observing eight expert modeling videos asynchronously resulted in statistically significant changes in CJ over time, $F(5.514, 341.858) = 24.18$, $p < .001$, $\eta_p^2 = 0.28$. Furthermore, all three performance groups demonstrated statistically significant increases in CJ over time. Longer time spent responding to prompts significantly predicted whether novice nurses were high versus low-performing students. Thematic analysis revealed writing samples from low, medium, and high performers differ in terms of nursing knowledge, thinking, and approach.

Conclusions: The combination of having novice nurses observe expert modeling videos and respond to CJ prompts positively influenced CJ development. Time spent responding to CJ prompts per week favorably influenced CJ scores.

Key words: clinical judgment, expert modeling, mixed methods, nurse, observer, simulation

Describing Novice Nurses' Clinical Judgment Trajectory After Observing Expert Modeling Videos: A Mixed Methods Study

Introduction

Novice nurses may take between one to three years following entry to practice to develop cognitive skills necessary to "think like a nurse" (Bratt & Felzer, 2011; Bussard, 2015). Novice nurses often lack clinical judgment (CJ) required for safe, independent practice (Al-Dossary et al., 2014; Bashford et al., 2012; Fisher & King, 2013; Kavanagh & Szweda, 2017). Despite employers citing CJ as a necessary skill (Al-Dossary et al., 2014), only 23 percent of graduate nurses in a recent study met minimal CJ entry-to-practice standards (Kavanagh & Szweda, 2017). Lack of adequate CJ leads to errors, unsafe conditions, patient harm, or death (Hickerson et al., 2016; Kenward & Zhong, 2006; Saintsing et al., 2011). Medical errors are the third highest cause of death (James, 2013; Makary & Daniel, 2016) and are a growing concern because recent studies indicate as many as 53 percent of novice nurses report making errors in their first year of practice (Kenward & Zhong, 2006). Therefore, CJ development is an essential outcome for nursing schools (AACN, 2020). The National Council of State Boards of Nursing evaluates CJ on licensing exams which novice nurses must pass before beginning a career of independent practice (Dickison et al., 2019).

Nurse educators use simulation-based learning experiences (SBLE) frequently to increase novice nurses' CJ (Bradley et al., 2019; Smiley, 2019), because SBLE develops cognitive skills (Cantrell et al., 2017) and overcomes known shortcomings of traditional clinical education (Founds et al., 2011; Ironside et al., 2014; Jayasekara et al., 2018; Weaver, 2011). Specifically, SBLE is known to have a large effect (Cohen's d=1.72) on CJ development (Lee & Oh, 2015). During SBLE, novice nurses benefit from the structure of a clinical encounter guided by learning objectives which also reflects a real clinical situation (Lioce et al., 2020). Novice nurses gain similar learning outcomes when high-quality SBLE replaces up to half of clinical hours (Hayden et al., 2014) because they practice higher levels of thinking in shorter time than traditional clinical experiences (Sullivan et al., 2019).

Background

Including both active simulation participants and observers helps increase the capacity of simulation programs. Faculty assign novice nurses to active roles to deliver portions of care with the assumption hands-on practice increases CJ (Price et al., 2017; Zulkosky et al., 2016). However, novice nurses spend the majority of their simulation time in the observer role (Hayden et al., 2014; Howard et al., 2017). Simulation observers are not involved in the scenario, but still achieve desired learning outcomes (Johnson, 2019; Rogers et al., 2020). The literature measuring observers' CJ is emerging. We know when CJ is measured at a decision point in the simulation scenario, researchers find varying levels of CJ between active participants and simulation observers (Zulkosky et al., 2016). Active participants rely on intuition to make decisions in unfamiliar scenarios (Price et al., 2017). We also know that observing prior to active participation relates to higher CJ (Hallin et al., 2016), and observers report that seeing their peers in simulation fosters learning (Bonnel & Hober, 2016; Hober & Bonnel, 2014). Most of the simulation observer body of literature compares active participant versus observer outcomes after debriefing. There is a gap in the literature related to describing simulation observers' CJ outcomes after simulation and before debriefing.

Expert modeling videos used as simulation preparation place novice nurses in the observer role. Faculty appreciate expert modeling videos because they minimize variation in instruction and do not require instructor supervision (Huun, 2018). There is evidence to support expert modeling videos used in classroom settings improve critical thinking, communication, assessment, patient safety (Sharpnack et al., 2013), and recognition of patient risks (Ferguson & Estis, 2018). Hospital educators have also used expert modeling videos to evaluate novice nurses’ readiness for practice (Del Bueno, 2005).

Nurse educators use expert modeling (EM) videos as asynchronous simulation or simulation preparation. EM videos utilize faculty or clinical experts to model desired nursing care and expert clinical thinking (Baldwin et al., 2014). There is evidence supporting EM videos for clinical training with nurse practitioner students (LeFlore et al., 2007), interprofessional teams (Selle et al., 2008), and novice nurses who transfer vicarious learning to subsequent in-person simulation (Aronson et al., 2013; Franklin & Lee, 2014). In a seminal, multi-site study with simulation-naïve students in their first clinical course, Johnson et al. (2012) found team leaders trained with EM videos demonstrated significantly more CJ in medical-surgical simulation. The EM videos had large effects (Cohen’s $d > 1.13$) for noticing, interpreting, and responding. However, all aforementioned studies involved students observing the EM videos with an instructor prior to an in-person simulated experience. There is a gap in the literature related to learning outcomes after novice nurses watch EM videos, but before debriefing.

CJ is a cognitive process nurses use to notice salient cues, interpret their meaning, respond to clinical situations, and reflect on action to apply learning to future patient encounters (Lasater, 2007; Tanner, 2006). Novice nurses have known deficits in noticing important and unexpected findings (Burbach & Thompson, 2014; Fisher & King, 2013). Lack of background (Lasater et al., 2019), simulation experience (Hallin et al., 2016), clinical experience (Baxter et al., 2012; Hallin et al., 2016; Shinnick & Cabrera-Mino, 2021; Zulkosky et al., 2016), and age

(Rode et al., 2016) negatively impacts novice nurses' CJ. Furthermore, simulation design impacts CJ (Cappelletti et al., 2014; Rogers & Franklin, 2021).

This study aimed to describe the trajectory of novice nurses' CJ after observing asynchronous EM videos over a semester. Our paper aims to answer the following research questions: 1. What is the trajectory novice nurses' CJ development after observing asynchronous simulation with EM videos? 2. What characteristics of clinical judgment are displayed in the written reflections after asynchronous simulation? 3. What is the relationship between CJ and background variables?

Theoretical Framework

Tanner's CJ Model describes a four-stage process nurses use to make decisions: noticing, interpreting, responding, and reflecting (Tanner, 2006). Nurses first notice salient cues and gather data when making clinical judgments. Next, nurses determine the significance and meaning of assessment findings during the interpretation phase. Then, a nurse must choose the appropriate intervention. Finally, during reflection, nurses evaluate interventions and consider how similar interventions might guide future patient encounters (Tanner, 2006). The theoretical framework guided our mixed methods design, measurement, and analysis.

Methods

Study Design

This explanatory, sequential mixed methods study aimed first to describe novice nurses' clinical judgment trajectory after observing eight EM videos asynchronously over a semester quantitatively. We then used thematic analysis to examine characteristics of low, medium, and high performers' writing about their clinical judgment. The university institutional review board concluded our study was exempt from board oversight.

Setting

This study was completed at a private university in the Southwest region of the United States. Investigators recorded eight EM videos in a familiar, high-fidelity simulation laboratory with faculty serving as the model nurse. Novice nurses observed eight scenarios via the learning management system (see Appendix A).

Novice Nurse Participants

We recruited a convenience sample from all students (n=73) enrolled in the first simulation course. Participation did not impact the students' grade. There was no compensation for participation. Sixty-three junior-level nursing students provided informed consented to participate, a participation rate of 86 percent. There were no exclusion criteria. Participants had similar clinical backgrounds and no previous simulation experience. Purposive sampling identified a subset of novice nurses with varying levels of CJ whose data were further used for qualitative analysis.

Data Collection

After providing informed consent, novice nurses completed a demographic survey on Qualtrics XM. Researchers obtained subjects' GPA from the registrar. Novice nurses reviewed case-specific simulation preparatory materials (e.g., textbook readings, journal articles, patient information sheet). Next, they observed an EM video. Immediately after observing the EM video and before debriefing, novice nurses responded to CJ prompts adapted from Lasater (2011) via a Qualtrics XM survey (see Table 4.1; Appendix B). CJ prompts allowed for open-ended written responses. We also asked novice nurses to report which simulation preparation resources they reviewed. The Qualtrics survey recorded time participants spent completing written responses.

Table 4.1

Clinical Judgment Prompt Relation to LCJR and Tanner Model of CJ Concept

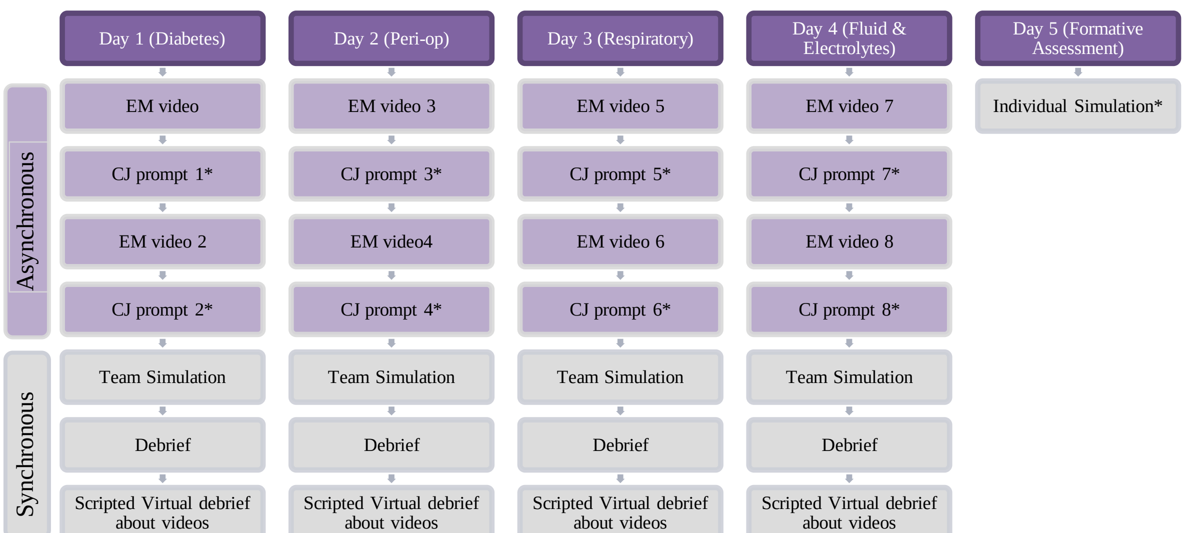
Tanner CJ concept	LCJR Subscale	Prompt
Noticing	Focused observation	*What did you first notice about the patient?*
	Recognizes deviation from expected pattern	*What was different than you expected? Have you seen this before in other patients?*
	Information seeking	*What other information would be helpful? How can you get that information?*
Interpreting	Prioritizing data	*How did you prioritize the patient information/data? In other words, what was most important for this patient now?*
	Making sense of the data	*How do you think the nurse based her intervention? If intuition, what kinds of data might offer evidence to support a gut feeling?*
Responding	Calm manner	*What was the nurse's approach with the patient? How comfortable would you be in this situation?*
	Clear communication	*How did the nurse gain the patient's trust? What did she say to the patient? To the family member(s)?*
	Well-planned intervention	*What factors, including patient feedback, impacted the treatment plan?*
	Being skillful	*How did the nurse's skill compare to nursing standards of care?*
Reflecting	Evaluation/self-analysis	*What went well? What didn't go as smoothly? Why or why not?*
	Commit to improve	*What would you do differently if you had the opportunity?*

Note: The table shows each CJ prompt (adapted from Lasater [2011] with permission from the author; see Appendix B).

Novice nurses viewed two EM videos and completed two sets of CJ prompts before four in-person team simulation experiences. Our curriculum uses a concept-based simulation model where the two EM videos related to the in-person team simulation experience (e.g., all were post-operative patients). Immediately after the in-person team simulation, faculty facilitated debriefing about the in-person simulation case. Several hours later, faculty facilitated virtual debriefing to tie together both the EM videos and in-person simulation experience (see Appendix C). Neither debriefing activity was included in data collection. At the end of the semester, novice nurses completed an individual simulation, and faculty scored simulation performance using the Creighton Simulation Evaluation Instrument™. Figure 4.1 depicts an overview of the study process.

Figure 4.1.

Study Flow



Note: Students performed the work from top to bottom each simulation day and then moved to the next column. An * indicates when data were collected for this study.

Measures

Dependent Variable

Clinical Judgment.

We operationalized CJ using the Lasater Clinical Judgment Rubric (LCJR; Lasater, 2011). The LCJR consists of four levels or stages of development (i.e., beginning, developing, accomplished, and exemplary) for each phase of CJ based on Tanner's CJ Model (i.e., noticing, interpreting, responding, and reflecting; see Appendix D). The LCJR uses a Likert scale (possible range = 11-44) with high scores representing greater CJ. The tool has acceptable reliability for use in undergraduate students. Interrater reliability was between 0.889 and 0.960 with stable raters and cases (Adamson, Gubrud, Sideras, & Lasater, 2012; Victor-Chmil & Larew, 2013). We measured interrater reliability in 10 percent of the sample.

Background Variables

Demographic Variables and Personal Characteristics.

We asked novice nurses to report their age, gender, race, ethnicity, previous degree, work experience, healthcare experience, language spoken in the home, and preferred learning style using a researcher-developed Qualtrics XM survey.

Completion Time.

Qualtrics XM recorded the time participants spent responding to each CJ prompt from opening each question to submitting the response. We used the cumulative average of time spent.

Simulation Preparation.

Participants reported which simulation preparation materials they reviewed associated with each EM video. We scored simulation preparation according to the percentage of materials reviewed (0 = 0 points, 1-25% = 1 point, 26-50% = 2 points, 51-75% = 3 points, or 76-100% = 4 points) and calculated an average score. Higher score indicates more exposure to simulation preparation materials.

Individual Simulation Performance.

Faculty scored simulation performance using the Creighton Simulation Evaluation Instrument™ (CSEI; see Appendix E) for formative assessment of participants' behavioral performance providing total care for a single post-operative patient and administering *pro re nata* medications for pain and glucose management. The CSEI is a dichotomous scale with 19 items, and the range of scores is 0-19; higher scores represent better simulation performance. The CSEI has high internal consistency (α= 0.979; Adamson et al., 2011) and interrater-reliability (Parsons et al., 2012). A team of four faculty members evaluated participants' individual simulation, though only one faculty scored each participant.

Quantitative Analysis

A statistician provided oversight for analysis. First, we calculated inter-rater reliability for LCJR scores on 10 percent of the sample using Cohen's kappa (Cohen, 1960) and Gwet's AC statistic (Gwet, 2008; see Chapter V). After exploratory analysis, researchers grouped participants according to cumulative LCJR scores as low, medium, and high-performers by dividing ranked scores into thirds. We compared CJ scores over time using one-way repeated-measures analysis of variance (RM-ANOVA) for the entire sample and for each performance group.

Next, we examined the relationship between each background variable and CJ score using one-way ANOVA and chi-square. Only variables meeting the preset cutoff for marginal significance ($p < 0.20$) were included as potential predictors in the multivariate model (see Table 4.2). Finally, we used the "forced entry" method for entering variables into a multinomial logistic regression to examine the association between CJ as a categorical outcome (i.e., low performance group as the reference group) and the potential predictors.

Qualitative Analysis

We purposively sampled three participants from each performance group (low, medium, and high) and used the Framework Method (Gale et al., 2013) to perform thematic analysis on 72

CJ responses (i.e., 24 responses from each performance category). A qualitative methods expert provided oversight for the Framework Method. First, we compiled written CJ responses for each performance group and checked for organization and accuracy. Next, two researchers familiarized themselves with the data by reading responses and taking notes in the margins to represent analytical notes, thoughts, and impressions. Researchers created a list of inductive codes from their notes. Researchers coded qualitative data independently line-by-line, identified new codes, and then met to compare codes. After coding the first one-third of the sample, we grouped some codes into categories and formed a working analytical framework. We then independently coded all 72 CJ responses. The final analytical framework consisted of 121 codes grouped into three categories (see Appendix F). We generated a matrix using Microsoft Excel to chart the data and included references to illustrative quotations. Researchers maintained field notes of their impressions, ideas, and early interpretations. A third researcher validated the coding and data charting process against the raw data. Finally, characteristics of each performance group's CJ began to emerge when researchers compared the matrix between and within groups.

Results

Demographic and personal characteristics of the sample based on performance group are presented in Table 4.2. The sample was predominantly white and female. Groups were similar in age, previous healthcare experience, and previous degree. The kappa statistic for interrater reliability was between 0.34 to 0.86, with a cumulative kappa 0.58 representing moderate agreement between the two raters. Gwet's AC statistic was between 0.48 to 0.9, with a cumulative AC 0.74, which represents substantial agreement.

Table 4.2

Demographic and Personal Characteristics of Performance Groups

Variable		Performance Group			Group Differences			
		Low (n=21) % (n)	Medium (n=21) % (n)	High (n=21) % (n)	χ^2	*F*	*H*	p value
Race	Asian	0% (0)	9.5% (2)	14.3% (3)	5.055			.298
	African American	4.8% (1)	9.5% (2)	0% (0)				
	White	95.2% (20)	81.0% (17)	85.8% (18)				
Gender	Female	95.2% (20)	85.7% (19)	95.2% (20)	1.738			.606
	Male	4.8% (1)	14.3% (3)	4.8% (1)				
Ethnicity	Hispanic	14.3% (3)	23.8% (5)	9.5% (2)	1.664			.580
	Non-Hispanic	85.7% (18)	76.2% (16)	90.5% (19)				
Learning style preference	Read/Write	19% (4)	14.3% (3)	23.8% (5)	3.734			.476
	Auditory	4.8% (1)	23.8% (5)	19% (4)				
	Kinesthetic	76.2% (16)	61.9% (13)	57.1% (12)				
Previous degree	No	80% (17)	85.7% (18)	76.2% (16)	.618			.922
	Yes	19% (4)	14.3% (3)	23.8% (5)				
Previous healthcare experience	No	80% (17)	66.7% (14)	61.9% (13)	1.959			.375
	Yes	19% (4)	33.3% (7)	38.1% (8)				
Completion time	11- 19.99 minutes	47.6% (10)	28.6% (6)	14.3% (3)	8.49			.075
	20 to 30 minutes	28.6 (6)	42.9% (9)	28.6% (6)				
	>30 minutes	23.8% (5)	28.6% (6)	57.1% (12)				
Hours worked per week	None	42.9% (9)	28.6% (6)	52.4% (11)	6.05			.19
	1 to 14.99	19% (4)	23.8% (5)	33.3% (7)				
	≥15	38.1% (8)	47.6% (10)	14.3% (3)				
Age mean (SD)		23.4 (5.7)	23.1 (4.9)	23.2 (4.3)			1.75	.417
GPA mean (SD)		3.4 (0.2)	3.3 (0.3)	3.3 (0.3)		.778		.464
Individual simulation performance mean (SD)		6.9 (2.4)	7.6 (2.1)	7.7 (2.2)		.814		.448
Simulation preparation mean (SD)		2.6 (1.0)	2.9 (0.6)	3.0 (0.7)		1.256		.292

Clinical Judgment Trajectory

Overall, there was a statistical difference between CJ over time, $F(5.514, 341.858) = 24.18$, $p < .001$, $\eta_p^2 = 0.28$. Scores ranged from 15.857 ± .356 after the second EM video to 19.714 ± .272 after the fifth (see Table 4.3 and Figure 4.2). Post hoc analysis with a Bonferroni adjustment revealed CJ significantly increased from the first to eighth EM video (1.719 (95% CI, 2.960 to .628), $p < .001$).

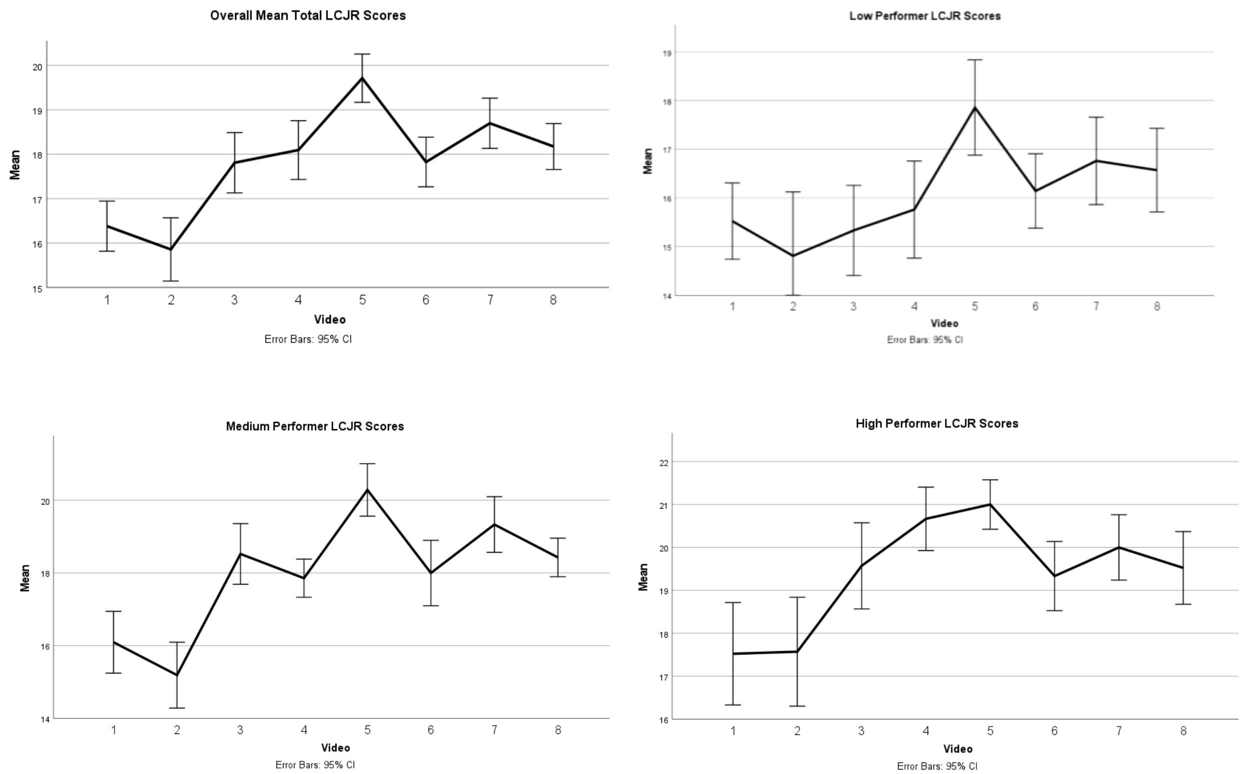
Table 4.3

Overall Total Mean LCJR Scores and Mean Total LCJR Scores by Performance Group

Mean Total LCJR Scores								
	Overall		Low		Medium		High	
EM Video	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	16.38	2.24	15.52	1.72	16.10	1.87	17.52	2.62
2	15.86	2.83	14.81	2.89	15.19	1.99	17.57	2.79
3	17.81	2.70	15.33	2.03	18.52	1.83	19.57	2.20
4	18.10	2.63	15.76	2.19	17.86	1.15	20.67	1.62
5	19.71	2.16	17.86	2.15	20.29	1.59	21.00	1.26
6	17.83	2.22	16.14	1.68	18.00	1.97	19.33	1.77
7	18.70	2.25	16.76	1.97	19.33	1.68	20.00	1.67
8	18.17	2.05	16.57	1.89	18.43	1.16	19.52	1.86

Figure 4.2

Mean Total LCJR Scores Overall and by Performance Group



Note: The top left graph demonstrates the overall mean scores over time. The top right shows low-performing participants' mean total LCJR scores over time. The bottom left shows medium-performing participants' mean total LCJR scores over time. The bottom right shows high-performing participants' mean total LCJR scores over time.

Clinical Judgment Trajectory by Performance Group

Regardless of performance group, all novice nurses had a trend of increasing CJ from EM videos 1 to 5, but the trend in high performance group appears more linear than in lower performance groups. There is an apparent drop of CJ from EM video 5 to 6. Even with the drop, CJ at EM video 8 is still higher than EM video 1.

Low-Performing

There was a statistical difference between CJ over time among low-performing participants, $F(4.083, 81.654) = 4.704$, $p < .01$, $\eta_p^2 = 0.64$. Post hoc analysis with a Bonferroni adjustment revealed CJ significantly increased in low-performing participants from the first to fifth EM video (2.33 (95% CI, 4.402 to .264), $p < .05$) second to fifth (3.048 (95% CI, 5.809 to .287), and third to fifth video (2.524 (95% CI, 4.966 to .082).

Medium-Performing

There was a statistical difference between CJ over time among medium-performing participants, $F(7, 140) = 18.294$, $p < .001$, $\eta_p^2 = 0.90$. Post hoc analysis with a Bonferroni adjustment revealed CJ significantly increased in medium-performing students from the lowest score after the second video to third, fourth, fifth, sixth, and seventh videos. The greatest difference being between the second and fifth (5.095 (95% CI, 7.344 to 2.847), $p < .001$).

High-Performing

There was a statistical difference between CJ over time among high-performing participants, $F(7, 140) = 8.417$, $p < .001$, $\eta_p^2 = .76$. Post hoc analysis with a Bonferroni adjustment revealed CJ significantly increased in high-performing participants from the lowest score after the first to fourth (3.143 (95% CI, 5.355 to .930), $p = .001$) and first to fifth video (3.476 (95% CI, 5.854 to 1.98), $p = .001$).

Predictors of CJ Performance

Only two potential predictors, hours worked per week and completion time, were included in the multinomial logistic regression (see Table 4.4). The results revealed that the only significant predictor for CJ performance is the average time spent responding to CJ prompts for high versus low-performing, $b = 2.45$, Wald $\chi2(1) = 6.94$, p< .01. Spending greater than 30 minutes responding to CJ prompts, novice nurses had 11.59 (95% CI: 1.87- 71.72) higher odds of being in the high versus low-performing group than those spending 11-19.9 minutes. Number of hours worked per week was not significant for either high versus low-performing or medium versus low-performing groups.

Table 4.4

Relationship of Demographic Variables and Personal Characteristics to Performance Group

Performance Group (reference= Low-performing)		B	SE	Wald	Sig	Exp (B)	95% Confidence Interval	
Medium	*Time Spent on Assignment*							
	> 30 minutes	0.84	0.83	1.03	0.31	2.32	0.46	11.76
	20 to 30 minutes	1.00	0.76	1.72	0.19	2.71	0.61	12.02
	11- 19.99 minutes = reference							
	Hours Worked per Week							
	15 or greater	0.63	0.72	0.76	0.38	1.88	0.46	7.78
	1 to 14.99	0.87	0.90	0.95	0.33	2.39	0.41	13.87
	None= Reference							
High	*Time Spent on Assignment*							
	> 30 minutes	2.45	0.93	6.94	0.01	11.59	1.87	71.72
	20 to 30 minutes	1.48	0.93	2.52	0.11	4.38	0.71	27.11
	11- 20 minute = reference							
	Hours Worked per Week							
	15 or greater	-1.12	0.86	1.70	0.19	0.33	0.06	1.76
	1 to 14.99	0.98	0.88	1.25	0.26	2.68	0.48	15.06
	None= Reference							

Note. R^2= .225 (Cox-Snell), .253 (Nagelkerke). Model χ^2 (8)= 8.326. The reference category is: Low-performing group.

Qualitative Findings

Thematic analysis using the Framework Method revealed low, medium, and high-performing novice nurses demonstrate differences in knowledge, thinking, and approach when writing about their clinical judgment (see Table 4.5). Comparative analysis highlighted characteristics of written responses across low, medium, and high-performing groups when participants answered the same clinical judgment prompts (see Table 4.1). Examples provided here relate to a well-known simulation with an EM video portraying care for Eugene Shaw from the National League for Nursing (NLN) Advancing Care Excellence for Veterans curriculum (NLN, 2021). Mr. Shaw is an 87-year-old man with Type II Diabetes who is hospitalized for a popliteal artery clot and scheduled for a femoral-popliteal bypass surgery.

Low-Performing Group

Low-performing participants' writing illustrated several knowledge gaps that prevented recognition of salient clues. For example:

> *A finding that I would not expect would be the ulcerations due to the clot in the artery. However, this could be very normal, but it is not something I had learned about. I have not seen this before in any other patients.*

Knowledge gaps prevented low-performing participants from identifying next steps in assessment or where to seek information. Another low performer wrote: "*More vital signs would be helpful and I would perform a head-to-toe assessment upon the start of my shift so that I can evaluate the patient's current status."*

Low-performing participants' written responses revealed they perceived that expert models act mostly on gut feelings or in response to patient requests rather than intentionally seeking the most-relevant data. *The nurse based her intervention on intuition. She was listening to the patient and had reviewed his chart…Upon entering the room, she already had her plan of care, and talking to the patient helped direct her interventions as well.*

Because low-performing participants lacked knowledge about care of a patient with a femoral-popliteal artery clot, they were not able to critique nursing care or offer solutions to improve it. One participant wrote: "*I don't think I would do anything differently, because the nurse did an excellent job providing nursing care."*

Written responses demonstrated that low-performing participants rely on patient's perspective to guide care. They also focus heavily on patient behaviors, both good and bad, which affect nursing care. One wrote: "*I think this patient would have a better treatment plan if they were more open to sharing how they felt."* While another stated: *"He almost seemed kind of careless about his health… I've seen some patients during clinical who aren't in a great mood so the nurse does what she can to provide the best care."*

Medium-Performing Group

Medium-performing participants demonstrate a maturing knowledge base. They can relate knowledge to key interventions. For example, one participant stated: "*Nurse Ashley asks many questions about his leg pain, assessed the sores on his leg, and checked for a pulse in his leg, which is very important."* Medium-performing participants were more likely to recognize obvious patterns. Further, they utilize past experiences and knowledge to help identify next steps for gathering related assessments. For example, one participant wrote:

> *I would have liked to see the Nurse Ashley ask more questions about the background of his pain and leg sores. I also would have liked to know more information about his diabetes since that could be one of the contributing factors to his loss of blood flow to his leg.*

They also demonstrate the ability to critique nursing performance. For example, "*I would have given Mr. Shaw the morphine first, rather than the insulin."* Because their knowledge is emerging, occasional responses may be incorrect. For example, one participant wrote: "*He* *mentioned that he hurt his foot when he was in Vietnam, so I would be interested in finding out how he hurt it and how that relates to the diabetes and this injury now."*

Medium-performing participants' thinking is characterized by matching related details in a clinical context (e.g., simulation cues to assessments, rationales, and interventions). One participant stated:

> "*I first noticed the patient's tone of voice. The patient sounded in distress from the pain in his leg. He rated his pain as a 7 out of 10…I think the nurse based her intervention on the distressed tone of voice and pain rating of a 7/10. Her intervention of gathering morphine was due to the patient's obvious need for pain control."*

While another participant stated: *"The nurse based her interventions on what the patient was expressing. She wanted to get pain medication, teachings and advocate."*

While medium-performing students match related details, they are more like low-performing students in prioritization because they tend to focus on one priority at a time. One participant stated: "*The most important thing for the patient is to alleviate the patient's pain"* without considering other competing priorities or explaining their rationale.

Medium-performing participants were nurse-centered in written responses. They recognized when and how the nurse gained patient trust. For example, one medium-performing novice nurse wrote:

> *The nurse used a calm and soothing voice with the patient. The nurse asked about family members and said that she would like to meet them. The nurse assessed the level of patient education Mr. Shaw had received, then provided reassurance when Mr. Shaw became worried about the amputation of his leg in order to gain patient trust.*

While another stated:

> *The nurse gained the patient's trust by constantly reassuring him. She was his advocate. She explained things to him that he didn't understand and helped him get back in touch with the doctor that spoke over his head.*

Because their nursing knowledge is not yet complete, medium-performing participants often approach clinical situations with inaccurate expectations. For example,

> *I thought when they started talking about the surgery that it was going to be an amputation surgery. What shocked me was that it was going to be a bypass instead. I have not seen this type of surgery in any other patients, but I have taken care of a post op patient recovering from an amputation due to diabetes.*

High-Performing Group

Written responses from high-performing participants were characterized by application of previous knowledge and experiences to a clinical context. For example, one high performer wrote:

> *I would want to know if this patient has had any history of blood clots before. I would also want to know if he manages his diabetes properly since diabetes puts him at a higher risk of developing blood clots and ulcers.*

High-performing participants' written responses demonstrate how they "connect the dots" in a clinical context. They tell stories in a format resembling "*A* led to *B* because of *C,* and this led to *D.*" Storytelling helps high-performing students highlight priorities and explain appropriate rationales for interventions. Another participant wrote:

> *When she saw that the patient was confused about the surgical procedure, the nurse offered to call the doctor for the patient to have him explain the procedure. This alleviates a lot of stress for the patient and could possibly lead to better surgical*

> *outcomes; you never want a patient to go into surgery stressed out, and you definitely don't want a patient giving voluntary consent when they do not know how the actual procedure works.*

High-performing novice nurses are detail-oriented in articulating their approach to care delivery, and they have accurate expectations in consideration of the patient's background. High-performers easily identify specific ways the nurse communicated clearly.

> *The nurse gains the patient's trust by talking to him using simple words/no jargon and using therapeutic communication. "I'm glad that you're here and that I get to care for you." "Is there anything else on your mind that you want to talk about today?" "It sounds like you don't fully understand the surgery you're having tomorrow, so I'm going to have the doctor come to explain it." "What is your goal pain level?" "I would love to meet your wife tomorrow and have a chance to talk to her."*

Table 4.5

Characteristics of Clinical Judgment by Performance Group

	Knowledge	Thinking	Approach
Low	• Lack of experience made them unable to recognize deviations from expected patterns • Unsure of what a gut feeling was and often described it inappropriately • Unable to identify nursing standards of care • Critique was not appropriate and often reflected surprise with professionalism in expert nurse	• Process one assessment finding or problem at a time • Unable to prioritize clinical problems • Provide incorrect rationales for interventions • Display confidence in being able to perform in the same situation • Did not identify how the nurse changed priorities	• No expectations or unable to see anything different than expected • Describe nursing actions as being driven by patient requests • Blame patient behaviors, personality, and choices for unsuccessful nursing interactions • Describe-communication techniques used in everyday conversations; unable to show how the nurse gained the patient's trust
Medium	• Seek related information about patients' past experience with the disease • Identify key interventions in plan of care • Recognize standards of care as observers (e.g., infection control, privacy) • Ability to provide critique reveals maturing knowledge base • Prefer to praise nurse behaviors but also offer critique • Occasional suggestions are not realistic	• Notice cues from simulation environment and patient behaviors, but unable to cluster information by pattern • Consider one priority at a time • Justify interventions with assessment data, but do not describe changes in nurse priorities • More aware of their own nerves/anxiety and lack of confidence in specific clinical situations • More able to prioritize and give rationale	• Identify expectations as a factor in clinical judgment, though sometimes expectations are inaccurate • Use assessment findings to make sense of data • Articulate communication in context of nurse behaviors
High	• Apply and incorporate knowledge and experience (e.g., simulation preparation) • Displays knowledge of risk factors/ antecedents contributing to the patient situation • Recognize nursing behaviors which are key to the situation • Connect nursing interventions with best practice • Able to critique nursing performance and offer solutions	• Make connections between many pieces of information and interpret significance • Identify multiple priorities and focus on the most important one in non-acute care scenarios • Articulate rationales and priority setting strategies • Consistently associate interventions with assessment data • Recognize links between clinical judgment prompts and explain connections	• Approach situations with accurate expectations and contemplate next steps • Summarize to globally make sense of the data • Identify therapeutic communication and pull out specific nurse-patient quotations

Discussion

CJ is a necessary skill novice nurses must develop to "think like a nurse" (Tanner, 2006). This is the first study to evaluate CJ trajectory using the LCJR and novice nurses' written responses to CJ prompts after watching asynchronous EM videos. Empirical findings from this study of 63 junior prelicensure novice nurses indicate the LCJR can differentiate among participants' CJ trajectory using written responses to CJ prompts. Regardless of ability, novice nurses have increased CJ after observing eight EM videos and answering CJ prompts over the course of a semester. Thematic analysis revealed distinctive writing characteristics among CJ performance groups. Application of the LCJR to evaluate written work, combined with incorporation of EM videos, can assist nurse educators to develop asynchronous learning activities and meet CJ course objectives.

Our findings build upon work supporting simulation observer learning. Price et al. (2017) and Zulkosky et al. (2016) found simulation observers have greater CJ in unfamiliar situations and use analytical reasoning to make CJs. Similarly, observing EM videos prior to simulation leads to CJ in subsequent simulations (Aronson et al., 2013; Franklin & Lee, 2014). Quantifying simulation observer outcomes is important since novice nurses spend the majority of time observing their peers in simulation. Our study extends this line of research by describing observers' CJ outcomes after asynchronous EM videos.

Broadly, junior prelicensure novice nurses in this study had more CJ over the course of a semester. Our findings are similar to a study with junior, diploma nursing students who completed four scaffolding medical-surgical in-person simulations over the course of a semester where faculty also used the LCJR to examine the progression of CJ (Bussard, 2018). However, the shape of the CJ trajectory in Bussard (2018) is steeper than our findings. In an earlier study, Bussard (2015) asked prelicensure nursing students to answer clinical judgment prompts after participating in simulation and facilitator-guided debriefing. Interestingly, even after debriefing, novice nurses' comments in reflective journals remained at the beginning or developing levels (e.g., equivalent to our low-performing group). Importantly, Bussard's (2015) sample demonstrated CJ growth in reflective journals over time, but again followed a steeper curve than our findings. Lasater (2011) establishes that novice nurses are only expected to reach the "accomplished" category at graduation. As such, faculty need to be cautious of the halo effect when scoring one cohort over one semester. Our distribution of scores across performance groups was similar to previous studies in Sweden using the LCJR where faculty scored in-person simulation with senior-level student nurses (Hallin et al., 2016). In both instances, two-thirds of the sample scored in the "beginning" to "developing" range on the LCJR. It is important to recognize the aforementioned applications of the LCJR involve faculty rating student performance, including methods in this study. There is some evidence in the literature of novice nurses' self-assessment using the LCJR after simulation, where novices rate their performance significantly higher than faculty (Kubin & Wilson, 2017). Novice nurses' high levels of self-confidence may confound their self-assessment.

Our findings are similar to previous research involving senior-level novice nurses. Hallin et al. (2016) reported no significant correlation between CJ and age, previous training as a nursing assistant, health care experience, or similar experience in a clinical situation. Only previous exposure to high-fidelity simulation related to CJ in a medical-surgical simulation (Hallin et al., 2016). Our findings suggest CJ relates to the average time the participant spent responding to CJ prompts. This implies that students who spend more time completing written responses will demonstrate higher CJ. However, no other demographic variables or personal characteristics related to CJ scores.

Stages of Clinical Judgment

CJ leads a nurse to notice, interpret, and respond to health concerns and then reflect on a similar situation (Tanner, 2006). Cazzell and Anderson (2016) used the LCJR to evaluate simulation performance with graduating novice nurses in a pediatric medication administration simulation and reported much higher scores than our findings. While experience in the curriculum (graduating students in Cazzell’s study versus junior students in our study) may explain why Cazzell and Anderson's (2016) sample scored higher, scenario-specific behavioral descriptors that correspond to LCJR items may partially explain the variation. Whereas our study used CJ prompts and required novice nurses to write about their focused observations, what they noticed that was different than expected, and where they would like to seek additional information, Cazzell and Anderson (2016) scored their participants’ noticing based on observable performance during simulation (e.g., medication safety checks, assessing an intravenous site, and performing hand hygiene). Finally, learning style preference may explain the difference in noticing scores between Cazzell and Anderson's (2016) sample and this study.

Low-performing participants’ knowledge gaps led them to provide incorrect rationales for interventions in this study. Similarly, Del Bueno's (2005) seminal work described novice nurses have trouble differentiating when and why medications were indicated, discriminating relevance of vital signs, and responding to changing patient conditions in the valid and reliable Performance Based Development System (PBDS) with video simulations. Novice nurses possess cognitive biases which impair their ability to process cues and make accurate judgments (Al-Moteri et al., 2019). Our low-performing participants demonstrated many cognitive biases. Low-performing participants' misconceptions about patient behaviors and their global view of the simulation environment led them to miss the most salient cues in EM videos.

High-performing participants made connections between assessment data, potential causes of abnormal findings, and rationales. Medium-performers linked assessment findings to interventions most often. However, low-performers' knowledge gaps prevented them from drawing connections or explaining rationales. Del Bueno (2005) reported findings consistent with our low-performing group where novice nurses lack the ability to differentiate assessment data and instead try to match assessment data to a nursing diagnosis instead of a potential physiologic cause. Both examples of novice nurses' knowledge gaps point to the need to teach novice nurses to approach clinical situations with a cognitive framework that underpins decision-making (Dickison et al., 2019).

Our low-performing participants could not identify how expert nurses changed priorities, and they were unable to prioritize clinical problems. Our findings are similar to seminal work by Del Bueno (2005) using PBDS. Low-performing participants approach clinical situations as patient-driven, and they did not discuss priority-setting strategies. It is possible low-performers lack knowledge of priority-setting strategies which leads them to rely on patient requests rather than formulate their own plan of care (Hendry & Walker, 2004). Cappelletti et al. (2014) and Lasater et al. (2019) both postulate that educational preparation impacts how novice nurses interpret data and approach clinical reasoning. Our findings highlight the need for nursing education programs to teach clinical problem-solving and help novice nurses build a cognitive framework for problem-solving throughout the curriculum.

Medium and low-performing participants had trouble thinking beyond themselves because they were so overwhelmed with the thought of independent nursing. They were unable to articulate how expert nurses' decisions impacted patient care. It could be that our medium and low-performing groups lack situational awareness that can help them predict patient outcomes (Stubbings et al., 2012). There is emerging evidence that novice nurses can use their knowledge of septic shock to recognize symptoms (Fraser et al., 2009; White et al., 2021) and respond in a timely manner (White et al., 2021), but in less time than expert nurses (Shinnick, 2016). Tying CJ to behavioral performance is an important direction for nursing simulation research to move. Though we prioritized cognitive learning outcomes in this study, we were able to describe the CJ trajectory over time and use LCJR with simulation observers' written assignments. With this proof of concept, researchers have an opportunity to change clinical judgment prompts to better capture situational awareness in future research. More research is needed to understand how situational awareness informs CJ and how situational awareness impacts what novice nurses anticipate will happen next.

High-performing novice nurses demonstrate much more reflection-on-action than their peers. High-performing participants were able to critique nursing performance, offer accurate solutions to improve care, and relate solutions to improving patient outcomes. Interestingly, previous EM research with a similar sample revealed EM did not significantly impact mean reflection scores (Johnson et al., 2012). Our findings could differ primarily related to repeated exposure to EM, because we used eight EM videos compared to Johnson et al.'s (2012) one EM video. It is also possible that viewing an expert model led students to mimic behavior and not see flaws in the expert model. We know breakdowns in CJ prompt reflection (Cappelletti et al., 2014) and that debriefing is necessary to build novice nurses's reflection skills (Al Sabei & Lasater, 2016; Nagle & Foli, 2020). As such, measuring reflection both before and after debriefing could add to the literature.

An inherent limitation of measuring reflection as a cognitive domain is that faculty rely on novice nurses to describe their observations. Reflection-on-action in this study aligns with Level 2 (“Knows how”) in Miller’s Prism of Clinical Competence (Miller, 1990). There is some evidence in the literature that reflection scores on LCJR do not relate to nursing behaviors (Fedko & Dreifuerst, 2017). As such, it is possible our high-performing novice nurses might not be able to demonstrate their learning or integrate solutions they identified *in writing* into in-person simulation or traditional hospital clinicals.

Strengths and Limitations

One of the main strengths of this study is the practicality of describing the trajectory of novice nurses’ CJ after observing asynchronous EM videos. We required participants to respond to CJ prompts in writing; thus, it is possible learning style preferences could limit how much detail participants provided. Despite this limitation, our findings reveal a trajectory of increased CJ for low, medium, and high-performing groups. Some participants failed to see CJ prompts as a comprehensive story of nursing decision-making. Findings could be different if participants were more familiar with CJ prompts. Our findings have limited generalizability due to sampling students from one campus and one course. If we had included a more heterogeneous sample from multiple campuses, results could be different. In quantitative analysis, we did not blind raters. Despite this limitation, our mixed-methods approach and high interrater reliability confirm rigorous methods to identify three performance groups. Finally, EM videos portrayed faculty known to participants. There is a chance faculty were unintentional confounders and that participants’ reflection scores could be stronger than our data set reveals.

Implications for Nursing Education

Using written responses to CJ prompts and EM videos provides novice nurses with opportunities to think at the application, analysis, and synthesis levels of Bloom's taxonomy. Novice nurses often have a hard time differentiating *what* to think versus *how* to think because didactic courses use mostly multiple-choice items and clinical faculty use rapid-fire clinical questions that reinforce only knowledge and comprehension. As a result, novice nurses seek information from the electronic health record because they are conditioned to look for information rather than think about it. Using EM videos can help novice nurses connect trends in assessment data, interventions, and patient outcomes without faculty prompting. EM videos can increase consistency in the curriculum while allowing students to focus on and manage shifting priorities without the random-access limitations of traditional hospital clinicals. Our most discriminating case was a simple scenario involving a stable patient recovering from an emergency appendectomy. As such, EM videos do not need to be high-risk, low frequency exemplars.

We offer some recommendations for revising CJ prompts listed in Table 4.1. First, we suggest limiting each prompt to one question. Having too many questions listed in a prompt puts novice nurses at a disadvantage when they are not comfortable answering part of the series. Second, because concrete thinkers can be distracted by one word, we recommend getting rid of the word "first" in the focused observation prompt.

Next, we suggest adding the qualifier "Please provide a rationale or explain your priority setting strategy (e.g., airway, breathing, circulation; urgency; acuity; patient outcomes; or practical)" to the prioritizing data prompt. To the prompt about responding in a calm manner, we recommend changing the word "approach" to "strategies" to increase clarity and adding the clarifier “as the nurse” after “How comfortable would you be in this situation” so novice nurses avoid answering from the patient’s perspective. Finally, because novice nurses do not have a large knowledge base of standards of care, we recommend giving examples of standards of care in the prompt about responding skillfully (e.g., infection control, safety, patient-centered care, evidence-based practice, or collaboration).

Finally, we offer the following recommendations to utilize EM videos as asynchronous learning activities. We recommend faculty provide novice nurses a report to start the scenario and replicate pre-briefing activities from in-person simulation (e.g., provide a completed SBAR modeling expert CJ, describe goals for the shift, and articulate who is involved in plan of care). Next, we suggest using the learning management system to provide feedback to CJ prompts (Keller & Spangler, 2021). For example, set up CJ prompts as an automatically-graded quiz, and then provide feedback at the “accomplished” level on the LCJR so novices can compare their response with an expert’s response. Finally, we recommend faculty facilitate debriefing after EM videos to clarify novice nurses’ misconceptions. Use Socratic questions in debriefing to target specific learning objectives in a similar manner to debriefing after in-person simulation.

Conclusion

This longitudinal, descriptive, mixed methods study makes a significant contribution to nursing education because it provides evidence supporting the LCJR to score novice nurses’ written responses to CJ prompts used after watching asynchronous EM videos. Our findings indicate the combination of observing eight EM videos and answering CJ prompts increases global CJ over the course of a semester. Low, medium, and high-performing participants all showed growth in CJ, with the greatest effect being on the medium-performing group. Qualitative analysis demonstrated each performance group displayed distinct knowledge, thinking, and approach when writing about CJ. Finally, novice nurses who spent more time responding to CJ prompts had increased odds of being in the high-performing group. Future research is needed to investigate how the CJ trajectory continues throughout nursing school and beyond graduation.

References

AACN. (2020). *AACN essentials - baccalaureate, master's, DNP, and clinical resources*. https://www.aacnnursing.org/Education-Resources/AACN-Essentials

Adamson, K. A., Parsons, M. E., Hawkins, K., Manz, J. A., Todd, M., & Hercinger, M. (2011). Reliability and internal consistency findings from the C-SEI. *Journal of Nursing Education*, *50*(10), 583–586. https://doi.org/10.3928/01484834-20110715-02

Al-Dossary, R., Kitsantas, P., & Maddox, P. J. (2014). The impact of residency programs on new nurse graduates' clinical decision-making and leadership skills: A systematic review. *Nurse Education Today*, *34*(6), 1024–1028. https://doi.org/10.1016/j.nedt.2013.10.006

Al-Moteri, M., Cooper, S., Symmons, M., & Plummer, V. (2019). Nurses' cognitive and perceptual bias in the identification of clinical deterioration cues. *Australian Critical Care: Official Journal Of The Confederation Of Australian Critical Care Nurses*. https://doi.org/10.1016/j.aucc.2019.08.006

AL Sabei, S. D., & Lasater, K. (2016). Simulation debriefing for clinical judgment development: A concept analysis. *Nurse Education Today*, *45*, 42–47. https://doi.org/10.1016/j.nedt.2016.06.008

Aronson, B., Glynn, B., & Squires, T. (2013). Effectiveness of a role-modeling intervention on student nurse simulation competency. *Clinical Simulation in Nursing*, *9*(4), e121–e126. https://doi.org/10.1016/j.ecns.2011.11.005

Baldwin, A., Mills, J., Birks, M., & Budden, L. (2014). Role modeling in undergraduate nursing education: An integrative literature review. *Nurse Education Today*, *34*(6), e18–e26. https://doi.org/10.1016/j.nedt.2013.12.007

Bashford, C. W., Shaffer, B. J., & Young, C. M. (2012). Assessment of clinical judgment in nursing orientation: Time well invested. *Journal for Nurses in Staff Development*, *28*(2), 62–65. https://doi.org/10.1097/NND.0b013e31824b4155

Baxter, P., Akhtar-Danesh, N., Landeen, J., & Norman, G. (2012). Teaching critical management skills to senior nursing students: Videotaped or interactive hands-on instruction? *Nursing Education Perspectives*, *33*(2), 106–110. https://doi.org/10.5480/1536-5026-33.2.106

Bonnel, W., & Hober, C. (2016). Optimizing the reflective observer role in high-fidelity patient simulation. *Journal of Nursing Education*, *55*(6), 353–356. https://doi.org/10.3928/01484834-20160516-10

Bradley, C. S., Johnson, B. K., Dreifuerst, K. T., White, P., Conde, S. K., Meakim, C. H., Curry-Lourenco, K., & Childress, R. M. (2019). Regulation of simulation use in United States prelicensure nursing programs. *Clinical Simulation In Nursing*, *33*, 17–25. https://doi.org/10.1016/j.ecns.2019.04.004

Bratt, M. M., & Felzer, H. M. (2011). Perceptions of professional practice and work environment of new graduates in a nurse residency program. *Journal of Continuing Education in Nursing*, *42*(12), 559–568. https://doi.org/10.3928/00220124-20110516-03

Burbach, B. E., & Thompson, S. A. (2014). Cue recognition by undergraduate nursing students: an integrative review. *The Journal of Nursing Education*, *53*(9), S73–S81. https://doi.org/10.3928/01484834-20140806-07

Bussard, M. (2015). The nature of clinical judgment development in reflective journals. *Journal of Nursing Education*, *54*(8), 451–454. https://doi.org/10.3928/01484834-20150717-05

Bussard, M. E. (2018). Evaluation of clinical judgment in prelicensure nursing students. *Nurse Educator*, *43*(2), 106–108. https://doi.org/10.1097/NNE.0000000000000432

Cantrell, M. A., Franklin, A., Leighton, K., & Carlson, A. (2017). The evidence in simulation-based learning experiences in nursing education and practice: An umbrella review. *Clinical Simulation in Nursing*, *13*(12). https://doi.org/10.1016/j.ecns.2017.08.004

Cappelletti, A., Engel, J. K., & Prentice, D. (2014). Systematic review of clinical judgment and reasoning in nursing. *Journal of Nursing Education*, *53*(8), 453–458. https://doi.org/10.3928/01484834-20140724-01

Cazzell, M., & Anderson, M. (2016). The impact of critical thinking on clinical judgment during dimulation with senior nursing students. *Nursing Education Perspectives*, *37*(2), 83–90. https://doi.org/10.5480/15-1553

Cheng, A., Kessler, D., Mackinnon, R., Chang, T. P., Nadkarni, V. M., Hunt, E. A., Duval-Arnould, J., Lin, Y., Cook, D. A., Pusic, M., Hui, J., Moher, D., Egger, M., & Auerbach, M. (2016). Reporting guidelines for health care simulation research. *Simulation in Healthcare, 11*(4), 238–248. https://doi.org/10.1097/SIH.0000000000000150

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, *20*, 37–46.

Del Bueno, D. (2005). A crisis in critical thinking. *Nursing Education Perspectives*, *26*(5), 278–282.

Dickison, P., Haerling, K. A., & Lasater, K. (2019). Integrating the National Council of State Boards of Nursing Clinical Judgment Model into n nursing educational frameworks. *Journal of Nursing Education*, *58*(2), 72–78. https://doi.org/10.3928/01484834-20190122-03

Fedko, A. S., & Thomas Dreifuerst, K. (2017). Examining the relationship between clinical judgment and nursing actions in prelicensure students. *Nurse Educator*, *42*(1), 47–50. https://doi.org/10.1097/NNE.0000000000000290

Ferguson, N. F., & Estis, J. M. (2018). Training students to evaluate preterm infant feeding safety using a video-recorded patient simulation approach. *American Journal of Speech-Language Pathology*, *27*(2), 566–573. https://doi.org/10.1044/2017_AJSLP-16-0107

Fisher, D., & King, L. (2013). An integrative literature review on preparing nursing students through simulation to recognize and respond to the deteriorating patient. *Journal of Advanced Nursing*, *69*(11), 2375–2388. https://doi.org/10.1111/jan.12174

Founds, S. A., Zewe, G., & Scheuer, L. A. (2011). Development of high-fidelity simulated clinical experiences for baccalaureate nursing students. *Journal of Professional Nursing*, *27*(1), 5–9. https://doi.org/10.1016/j.profnurs.2010.09.002

Franklin, A. E., & Lee, C. S. (2014). Effectiveness of simulation for improvement in self-efficacy among novice nurses: A meta-analysis. *Journal of Nursing Education*, *53*(11), 607–614. https://doi.org/10.3928/01484834-20141023-03

Fraser, K., Peets, A., Walker, I., Tworek, J., Paget, M., Wright, B., & McLaughlin, K. (2009). The effect of simulator training on clinical skills acquisition, retention and transfer. *Medical Education, 43*(8), 784–789. https://doi.org/10.1111/j.1365-2923.2009.03412.x

Gwet, K. L. (2008). Computing inter-rater reliability and its variance in the presence of high agreement. *British Journal of Mathematical and Statistical Psychology*, *61*(1), 29–48. https://doi.org/10.1348/000711006X126600

Hallin, K., Bäckström, B., Häggström, M., & Kristiansen, L. (2016). High-fidelity simulation: Assessment of student nurses' team achievements of clinical judgment. *Nurse Education in Practice*, *19*, 12–18. https://doi.org/10.1016/j.nepr.2016.03.010

Hayden, J., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Regulation Nursing*, *5*(2), S3–S40. https://doi.org/https://doi.org/10.1016/S2155-8256(15)30062-4

Hendry, C., & Walker, A. (2004). Priority setting in clinical nursing practice: Literature review. *Journal of Advanced Nursing*, *47*(4), 427–436. https://doi.org/10.1111/j.1365-2648.2004.03120.x

Hickerson, K. A., Taylor, L. A., & Terhaar, M. F. (2016). The preparation–practice gap: An integrative literature review. *Journal of Continuing Education in Nursing*, *47*(1), 17–23. https://doi.org/10.3928/00220124-20151230-06

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high-fidelity simulation. *Clinical Simulation in Nursing*, *10*(10), 507–514. https://doi.org/10.1016/j.ecns.2014.07.008

Howard, S., Mahaffey, E., Alicia Lundstrom, C., Daly, A., & Roberts, J. (2017). *Comparison of satisfaction, self-confidence, and segagement of baccalaureate nursing students using defined observational roles and expectations versus traditional role assignments in high fidelity simulation and debriefing* (No. 10624882). ProQuest.

Huun, K. (2018). Virtual simulations in online nursing education: Align with quality matters. *Clinical Simulation in Nursing*, *22*, 26–31. https://doi.org/10.1016/j.ecns.2018.07.002

Ironside, P. M., McNelis, A. M., & Ebright, P. (2014). Clinical education in nursing: Rethinking learning in practice settings. *Nursing Outlook*, *62*(3), 185–191. https://doi.org/10.1016/j.outlook.2013.12.004

James, J. T. (2013). A new, evidence-based estimate of patient harms associated with hospital care. *Journal of Patient Safety*, *9*(3), 122–128. https://doi.org/10.1097/PTS.0b013e3182948a69

Jayasekara, R., Smith, C., Hall, C., Rankin, E., Smith, M., Visvanathan, V., & Friebe, T. R. (2018). The effectiveness of clinical education models for undergraduate nursing programs: A systematic review. *Nurse Education in Practice*, *29*, 116–126. https://doi.org/10.1016/j.nepr.2017.12.006

Johnson, B. K. (2019). Simulation observers learn the same as participants: The evidence. *Clinical Simulation In Nursing*, *33*, 26–34. https://doi.org/10.1016/j.ecns.2019.04.006

Johnson, E. A., Lasater, K., Hodson-Carlton, K., Siktberg, L., Sideras, S., & Dillard, N. (2012). Geriatrics in simulation: Role modeling and clinical judgment effect. *Nursing Education Perspectives*, *33*(3), 176–180. https://doi.org/10.5480/1536-5026-33.3.176

Kavanagh, J. M., & Szweda, C. (2017). A crisis in competency: The strategic and ethical imperative to assessing new graduate nurses' clinical reasoning. *Nursing Education Perspectives*, *38*(2), 57–62. https://doi.org/10.1097/01.NEP.0000000000000112

Keller, C., & Spangler, S. (2021). An innovative remote simulation approach for acute care clinical hour replacement. *Journal of Nursing Education*, *60*(1), 60–60. https://doi.org/10.3928/01484834-20201217-16

Kenward, K., & Zhong, E. H. (2006). *Report of findings from the practice and professional issues survey fall 2004 National Council of State Boards of Nursing (NCSBN)*.

Kubin, L., & Wilson, C. E. (2017). Effects of community volunteer children on student pediatric assessment behaviors. *Clinical Simulation in Nursing, 13*(7), 303–308. https://doi.org/10.1016/j.ecns.2017.04.011

Lasater, K. (2007). Clinical judgment development: Using simulation to create an assessment rubric. *Journal of Nursing Education*, *46*(11), 496–503. https://doi.org/10.3928/01484834-20071101-04

Lasater, K. (2011). Clinical judgment: The last frontier for evaluation. *Nurse Education in Practice*, *11*(2), 86–92. https://doi.org/10.1016/j.nepr.2010.11.013

Lasater, K., Holloway, K., Lapkin, S., Kelly, M., McGrath, B., Nielsen, A., Stoyles, S., Dieckmann, N. F., & Campbell, M. (2019). Do prelicensure nursing students' backgrounds impact what they notice and interpret about patients? *Nurse Education Today*, *78*, 37–43. https://doi.org/10.1016/j.nedt.2019.03.013

Lee, J., & Oh, P. J. (2015). Effects of the use of high-fidelity human simulation in nursing education: A meta-analysis. *Journal of Nursing Education*, *54*(9), 501–507. https://doi.org/10.3928/01484834-20150814-04

LeFlore, J. L., Anderson, M., Michael, J. L., Engle, W. D., & Anderson, J. D. (2007). Comparison of self-directed learning versus instructor-modeled learning during a simulated clinical experience. *Simulation in Healthcare*, *2*(3), 170–177. https://doi.org/10.1097/SIH.0b013e31812dfb46

Lioce, L. (ed. ., Downing, D., Chang, T. P., Robertson, J. M., Anderson, M., Diaz, D. A., Spain, A. E. (Assoc. E. ., & Terminology and Concepts Working Group. (2020). *Healthcare simulation dictionary- 2nd edition*. https://doi.org/10.23970/simulationv2

Makary, M. A., & Daniel, M. (2016). Medical error-the third leading cause of death in the US. *BMJ (Online)*, *353*. https://doi.org/10.1136/bmj.i2139

Miller, G. E. (1990). The assessment of clinical skills/competence/performance. *Academic Medicine*, *65*(9), S63–S67. https://doi.org/10.1097/00001888-199009000-00045

Nagle, A., & Foli, K. J. (2020). Student-centered reflection in debriefing: A concept analysis. *Clinical Simulation in Nursing*, *39*, 33–40. https://doi.org/10.1016/j.ecns.2019.10.007

NLN. (2021). *Eugene Shaw*. http://www.nln.org/professional-development-programs/teaching-resources/veterans-ace-v/unfolding-cases/eugene-shaw

Olejnik, S., & Algina, J. (2003). Generalized eta and omega squared statistics: Measures of effect size for some common research designs. *Psychological Methods*, *8*(4), 434–447. https://doi.org/10.1037/1082-989X.8.4.434

Parsons, M. E., Hawkins, K. S., Hercinger, M., Todd, M., Manz, J. A., & Fang, X. (2012). Improvement in scoring consistency for the creighton simulation evaluation instrument ©. *Clinical Simulation in Nursing*, *8*(6). https://doi.org/10.1016/j.ecns.2012.02.008

Price, A., Zulkosky, K., White, K., & Pretz, J. (2017). Accuracy of intuition in clinical decision-making among novice clinicians. *Journal of Advanced Nursing*, *73*(5), 1147–1157. https://doi.org/10.1111/jan.13202

Rode, J. L., Callihan, M. L., & Barnes, B. L. (2016). Assessing the value of large-group simulation in the classroom. *Clinical Simulation in Nursing*, *12*(7), 251–259. https://doi.org/10.1016/j.ecns.2016.02.012

Rogers, B. A., & Franklin, A. E. (2021). Cognitive load experienced by nurses in simulation-based learning experiences: An integrative review. *Nurse Education Today*, *In press*. https://doi.org/10.1016/j.nedt.2021.104815

Rogers, B., Baker, K. A., & Franklin, A. E. (2020). Learning outcomes of the observer role in nursing simulation: A scoping review. *Clinical Simulation in Nursing*, *49*, 81–89. https://doi.org/10.1016/j.ecns.2020.06.003

Saintsing, D., Gibson, L. M., & Pennington, A. W. (2011). The novice nurse and clinical decision-making: How to avoid errors. *Journal of Nursing Management*, *19*(3), 354–359. https://doi.org/10.1111/j.1365-2834.2011.01248.x

Selle, K. M., Salamon, K., Boarman, R., & Sauer, J. (2008). Providing interprofessional learning through interdisciplinary collaboration: The role of "modelling." *Journal of Interprofessional Care*, *22*(1), 85–92. https://doi.org/10.1080/13561820701714755

Sharpnack, P. A., Goliat, L., Baker, J. R., Rogers, K., & Shockey, P. (2013). Thinking like a nurse: Using video simulation to rehearse for professional practice. *Clinical Simulation in Nursing*, *9*(12), e571–e577. https://doi.org/10.1016/j.ecns.2013.05.004

Shinnick, M. A. (n.d.). Time-to-task validation in sequential simulations as a component of nursing student competency. *Nurse Educator*, *In press*. https://doi.org/10.1097/nne.0000000000000898

Shinnick, M. A. (2016). Validating eye tracking as an objective assessment tool in simulation. *Clinical Simulation in Nursing*, *12*(10), 438–446. https://doi.org/10.1016/j.ecns.2016.06.001

Smiley, R. A. (2019). Survey of simulation use in prelicensure nursing programs: changes and advancements, 2010- 2017. *Journal of Nursing Regulation*, *9*(4), 48–61. https://doi.org/10.1016/S2155-8256(19)30016-X

Statistics, L. (2015). *One-way repeated measures ANOVA using SPSS Statistics*. Statistical Tutorials and Software Guides. https://statistics.laerd.com/

Stubbings, L., Chaboyer, W., & McMurray, A. (2012). Nurses' use of situation awareness in decision-making: An integrative review. *Journal of Advanced Nursing*, *68*(7), 1443–1453. https://doi.org/10.1111/j.1365-2648.2012.05989.x

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (Suzie). (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: A study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing*, *30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, *45*(6), 204–211. https://doi.org/10.3928/01484834-20060601-04

Weaver, A. (2011). High-fidelity patient simulation in nursing education: An integrative review. *Nursing Education Perspectives*, *32*(1), 37–40. https://doi.org/10.5480/1536-5026-32.1.37

White, A., Maguire, M. B. R., Brannan, J., & Brown, A. (2021). Situational awareness in acute patient deterioration. *Nurse Educator*, *46*(2). https://doi.org/10.1097/nne.0000000000000968

Zulkosky, K. D., White, K. A., Price, A. L., & Pretz, J. E. (2016). Effect of simulation role on clinical decision-making accuracy. *Clinical Simulation in Nursing*, *12*(3), 98–106. https://doi.org/10.1016/j.ecns.2016.01.007

LCJR Reliability for Scoring Written Reflections After Asynchronous Simulation and Feasibility/ Usability with Novice Nurses

Authors: Beth Rogers, MSN, RN, Ashley E. Franklin, PhD, RN, CNE, CHSE-A

Corresponding Author: Beth Rogers

Beth Rogers conducted the data collection and analysis under the supervision of Dr. Ashley Franklin. Dr. Franklin also contributed to the conception and design of the study. This paper will be submitted after dissertation defense as a research report to *Nurse Education Today* (impact factor 1.713). a peer-reviewed journal with a readership interested in simulation.

The Texas Christian University Institutional Review Board determined this study was exempt.

Acknowledgment: The authors would like to thank Dr. Kathy Baker, PhD, APRN, ACNS-BC, FCNS, FAAN, and Dr. Yan Zhang, PhD, for guidance with editing and revisions. We also want to thank Dr. Yan Zhang, PhD for consulting on statistical analysis.

Abstract

Background: There is strong evidence supporting the Lasater Clinical Judgment Rubric for use in simulation and clinical experiences and with novice nurses' reflections after in-person learning experiences. However, a gap in the literature exists for using the rubric to evaluate clinical judgment after asynchronous learning activities.

Methods: The reliability of the Lasater Clinical Judgment Rubric was studied among a sample of pre-licensure novice nurses who observed eight expert asynchronous modeling videos and provided written responses to clinical judgment prompts by measuring internal consistency of 11 CJ prompts and interrater reliability with two raters. This study also investigated the feasibility and usability of the asynchronous simulation learning activity using descriptive statistics. Feasibility included the time novice nurses spent completing written responses as well as the amount of time raters spent evaluating written responses. Novice nurses reported their perceptions of usability using an instructor-developed survey.

Results: Sixty-three novice nurses completed a total of 504 written responses to clinical judgment prompts. Cohen's kappa ranged from 0.34 to 0.86 with a cumulative $\kappa = 0.58$. Gwet's AC ranged from 0.48 to 0.90, with a cumulative AC = 0.74. Cronbach's alpha was from 0.51 to 0.72. Novice nurses spent on average 28.32 ± 12.99 minutes per expert modeling video. Raters spent on average 4.85 ± 1.34 minutes evaluating written responses for each participant. Novice nurses reported the asynchronous learning activity was usable.

Conclusions: There is sufficient reliability, feasibility, and usability evidence to support the Lasater Clinical Judgment Rubric for evaluating novice nurses' written responses after asynchronous simulation.

Key words: Expert modeling, Clinical judgment, Measurement, Observer, Simulation

LCJR Reliability for Scoring Written Reflections After Asynchronous Simulation and Feasibility/ Usability with Novice Nurses

Introduction

One of the central challenges for undergraduate nurse educators is the mismatch between patient acuity in acute care hospitals and gaps in novice nurses' clinical judgment (CJ). Novice nurses are graduating without CJ skills necessary for safe, independent practice (Kavanagh & Szweda, 2017; Lasater et al., 2015). As a result, up to 53 percent report making an error during the first year of practice (Kenward & Zhong, 2006). Medical errors are the third leading cause of death in the United States (James, 2013; Makary & Daniel, 2016). Gaps in CJ lead to patient harm, failure to rescue, and patient death (Hickerson et al., 2016; Kenward & Zhong, 2006; Saintsing et al., 2011). We know novice nurses need more support to develop CJ before graduation (Dickison et al., 2019; Lasater et al., 2015). Further, it is critical to evaluate novice nurses' CJ using valid and reliable tools (Hayden et al., 2014).

Nurse educators evaluate novice nurses' CJ in writing with exam questions and reflections, verbally with Socratic questions, and behaviorally during experiential learning activities. Experiential simulations depict real-life patient encounters (Lioce et al., 2020) and provide nurse educators a way to measure CJ without the risk of medical errors (Cappelletti et al., 2014; Fisher & King, 2013; Klenke-Borgmann et al., 2020; O'Donnell et al., 2014). Most educators measure CJ verbally and behaviorally in simulation, and there are a handful of reliable and valid tools to measure CJ (Adamson & Kardong-Edgren, 2012; Davis & Kimble, 2011; Kardong-Edgren et al., 2010; NLN, 2020). Since 2005, the Lasater Clinical Judgment Rubric (LCJR) has been widely used in simulation and clinical settings to measure the trajectory of novice nurses' CJ (Lasater, 2011) with a combination of novice nurses' self-assessment and educators' or preceptors' ratings after in-person simulation and clinical activities. The LCJR has strong psychometric evidence of reliability (Adamson & Kardong-Edgren, 2012; Adamson et al., 2013), validity (Victor-Chmil & Larew, 2013), and sensitivity with in-person learning experiences (Shinnick & Cabrera-Mino, 2021;).

Background

Some nurse educators use the LCJR to measure CJ cross-sectionally by observing novice nurses' performance in one scenario (Blum et al., 2010; Cazzell & Anderson, 2016; Coram, 2016; Hallin et al., 2016; Jensen, 2013; Johnson et al., 2012; Klenke-Borgmann et al., 2020; Lioce et al., 2015; Mariani et al., 2013; Reid et al., 2020; Schlairet & Fenster, 2012; Shinnick & Woo, 2020; Strickland et al., 2017). The majority of researchers use the LCJR in multiple scenarios and report findings either at the end of a semester (Shin & Kim, 2014; Yang et al., 2019) or as a trajectory (Albaqawi, 2018; Andrea & Kotowski, 2017; Ashcraft et al., 2013; Bussard, 2018; Letcher et al., 2017; Mariani et al., 2013; Victor et al., 2017). Only a few studies include debriefing with the LCJR (Dillard et al., 2009; Fedko & Dreifuerst, 2017; Lioce et al., 2015).

Lasater (2007) developed the Lasater Clinical Judgment Rubric (LCJR) to measure the four stages of Tanner's Model of Clinical Judgment (see Appendix D; Tanner, 2006). The rubric consists of 11 items which describe how novice nurses notice, interpret, respond, and reflect in clinical situations. Nurse educators use this 11-item holistic rubric for assessing and providing feedback on novice nurses' clinical judgment because each item awards points for four levels of clinical judgment development, from beginner to expert (e.g., beginner = 1, developing = 2, advanced = 3, expert = 4). Scores range from 11-44 with higher scores indicating more CJ.

Lasater (2011) also developed a set of CJ prompts corresponding with the LCJR to assist nurse educators to guide novice nurses in discussions about CJ.

Nurse educators also use the LCJR with written reflections after simulation (Bussard, 2015; Cato et al., 2009; Lasater et al., 2014) and clinical experiences (Lasater et al., 2014; Lasater & Nielsen, 2009). In written reflections, nurse educators prompt novice nurses to write about judgments made during simulation or clinical (Bussard, 2015; INACSL, 2016; Ruth-Sahd, 2003). There is, however, a gap in the literature about the LCJR's reliability with scoring written reflections after asynchronous learning activities.

All of the psychometric work supporting the LCJR is in simulation with behavioral performance. Researchers have established reliability of the LCJR by measuring internal consistency using Cronbach alpha, test-retest using intraclass correlations, and interrater reliability using Cohen's kappa and percent agreement. Ashcraft et al., (2013) studied 188 senior bachelor's students in four in-person simulations and found the Cronbach alpha of the LCJR is 0.95. This was consistent with Adamson & Kardong-Edgren (2012), who reported a Cronbach alpha of 0.974 using 29 raters scoring video performances of nurses at three performance levels. Jensen (2013) measured CJ in 62 senior associates' degree and 26 bachelor's nurses using the LCJR while performing a multi-patient simulation with an unspecified number of raters and found the Cronbach alpha for noticing (α=0.88); interpreting (α=0.88); responding (α=0.88); and reflecting subscales (α=0.86). Adamson & Kardong-Edgren, (2012) asked 29 raters to score three videos demonstrating three levels of simulation performance twice and found raters achieved an intraclass correlation of 0.908. Interrater reliability in previous studies fell between 0.889 and 0.960 with stable raters and cases (Adamson et al., 2012). The LCJR has good content construct, content, and convergent validity (Victor-Chmil & Larew, 2013).

Asynchronous simulations are a relatively new trend in nursing education (Huun, 2018). Asynchronous simulations (e.g., video, expert modeling [EM], e-simulation, and telepresence) place observers in patient care situations without educators' supervision. Asynchronous simulation has advantages including: increasing simulation exposure, providing flexible scheduling, enduring from semester-to-semester, and reducing faculty workload (Huun, 2018). Educators easily stream asynchronous simulation videos on the learning management system. Because asynchronous simulation is a relatively new trend, there is not reliable evidence to support related learning outcomes.

Based on the gaps identified in the literature, the purpose of this study was to determine the reliability, feasibility, and usability of the LCJR for scoring novice nurses' written reflections after asynchronous simulation with EM videos.

Methods

Sample and Setting

The sample consisted of 63 novice nurses at a private university in the Southwest region of the United States who completed 504 written reflections after observing eight asynchronous EM simulation videos. Novice nurses were juniors in a traditional baccalaureate nursing program who had no previous simulation experience or exposure to the LCJR. They observed asynchronous simulation with EM videos as part of their regularly scheduled coursework after providing voluntary consent to participate in the study. The institutional review board concluded the study was exempt from board oversight.

Data Collection Procedure

Over the course of a semester, participants observed eight asynchronous simulation EM videos online as part of simulation preparation. Educators filmed the eight EM videos in a familiar, high-fidelity simulation lab, and each video portrayed one faculty expert modeling nursing care for one patient. Our school uses a concept-based simulation model where the EM videos pertain to the same theme (e.g., diabetes) as the in-person simulation participants experienced during that same week. After viewing each 20-minute EM video, but before debriefing, participants submitted a written reflection in response to 11 clinical judgment prompts, adapted form Lasater (2011) with permission, using Qualtrics XM (see Table 5.1). Qualtrics XM recorded the time, in seconds, participants spent on each prompt. A detailed description of the design, sample, and procedures is available in Chapter IV. Participants observed two asynchronous simulation EM videos prior to each in-person simulation day throughout the Fall 2020 semester, for a total of eight EM videos.

Table 5.1

Clinical Judgment Prompts Matched to the LCJR and Tanner's Model of CJ

Tanner CJ concept	**LCJR Subscale**	**Prompts Item**
Noticing	Focused observation	*What did you first notice about the patient?*
	Recognizes deviation from expected pattern	*What was different than you expected? Have you seen this before in other patients?*
	Information seeking	*What other information would be helpful? How can you get that information?*
Interpreting	Prioritizing data	*How did you prioritize the patient information/data? In other words, what was most important for this patient now?*
	Making sense of the data	*How do you think the nurse based her intervention? If intuition, what kinds of data might offer evidence to support a gut feeling?*
Responding	Calm manner	*What was the nurse's approach with the patient? How comfortable would you be in this situation?*
	Clear communication	*How did the nurse gain the patient's trust? What did she say to the patient? To the family member(s)?*
	Well-planned intervention	*What factors, including patient feedback, impacted the treatment plan?*
	Being skillful	*How did the nurse's skill compare to nursing standards of care?*
Reflecting	Evaluation/self-analysis	*What went well? What didn't go as smoothly? Why or why not?*
	Commit to improve	*What would you do differently if you had the opportunity?*

Note: The table shows how each prompt (adapted from Lasater (2011) with permission from the author) relates to the LCJR subscales and Tanner's (2006) CJ Model.

Operational Definitions

This study evaluates reliability of the LCJR for scoring novice nurses' written reflections as part of an asynchronous learning activity. We evaluated feasibility and usability of the asynchronous learning activity with the intent nurse educators would translate findings to the classroom. We operationalized reliability using internal consistency and interrater reliability. We were not able to do test-retest reliability because our participants completed each asynchronous learning activity only once. Feasibility in educational research includes time required of participants and raters to complete study activities. In terms of faculty time, feasability refers to the amount of time it would take one faculty member to evaluate assignments submitted by a clinical group of ten novice nurses. Feasibility data indirectly represents faculty workload (Bittner & Bechtel, 2017). Usability includes how novice nurses perceived CJ prompts were understandable and what technical difficulties they experienced with the asynchronous learning activity (i.e., EM video, CJ prompts, learning management system, internet connections).

Measures

Reliability of Lasater Clinical Judgment Rubric (LCJR)

Internal Consistency.

Researchers measured internal consistency using Cronbach's alpha for each of 11 CJ prompts from Lasater (2011).

Interrater Reliability.

We measured interrater reliability using Cohen's kappa, Gwet AC statistics, and percent agreement. Raters developed scenario-specific descriptors to match each LCJR item and level of performance. Next, they scored participants' written reflections using an electronic LCJR built on a Qualtrics XM survey. The primary investigator scored the entire sample, while a second rater scored ten percent of the sample for interrater reliability. Raters discussed their rationale for scoring differences after each of the first six EM videos, without changing scoring, to improve reliability.

Feasibility of the Asynchronous Learning Activity

Qualtrics XM recorded time, in seconds, raters spent scoring each written reflection. Qualtrics XM recorded time, in seconds, participants took to respond to CJ prompts. Novice nurses should spend one to two times longer reflecting than they do in actual simulation (Al Sabei & Lasater, 2016; INACSL Standards Committee, 2016; Levett-Jones & Lapkin, 2014)

Usability of the Asynchronous Learning Activity

We developed a seven-item questionnaire focused on participant satisfaction with the eight asynchronous simulation EM videos, understandability of CJ prompts, and technical difficulties with the asynchronous learning activity related to internet connections, device, or browser (see Appendix G). For each item, participants indicated their personal feelings about a statement that described their own attitudes or beliefs. Response options were 1) *strongly disagree*, 2) *disagree*, 3) *undecided*, 4) *agree*, and 5) *strongly agree* using a Likert-style scale. Researchers asked participants to provide a rationale for ratings below a "5) *strongly agree"* in a free text box. Participants completed the questionnaire after viewing the first EM video and again at the end of the semester.

Data Analysis

The authors used commercially available statistical software (IBM SPSS v.26, Armonk New York; Stata MP v.15 64-bit, College Station, Texas).

Reliability

First, we calculated Cronbach's alpha as an index of internal consistency for each CJ prompt (Lasater, 2011) and by EM video. Generally, an acceptable alpha is > 0.75 (Cronbach, 1951)

Next, we calculated inter-rater reliability on 10 percent of the sample. We used Cohen's kappa (Cohen, 1960) and Gwet's AC statistics (Gwet, 2008) to quantify agreement between the two raters' scoring as there are known issues with measuring reliability using Cohen's kappa statistic (Feinstein & Cicchetti, 1990; Zec et al., 2017). Specifically, Cohen's kappa is prone to a paradoxical bias because kappa is affected by bias between observers by prevalence of marginal distributions. Ironically, low kappa scores can occur at high agreement because of paradoxical bias. Alternatively, Gwet proposed the use of AC statistics to resolve paradoxical bias because AC prevents erratic behavior of agreement statistics (Gwet, 2008).

Feasibility

Raters' Time

After exploratory analysis, we calculated the average time, in minutes, raters spent scoring participants' written reflections.

Participants' Time

During exploratory analysis, we discovered outliers in the data set. We excluded outliers beyond three standard deviations away from the usual data. Next, we calculated the average time, in minutes, participants spent on written reflections.

Usability

We used frequency tables to describe usability for participant satisfaction, understandability, and technical difficulties. Favorable usability represents satisfaction and understandability of the learning activity with few technical difficulties.

Results

Reliability

Results for internal consistency are found in Table 5.2. The LCJR consists of four subscales (i.e., noticing, interpreting, responding, and reflecting) often reported as a summary score. There are three items in the noticing subscale, two in interpreting, four in responding, and two in reflecting. Cronbach alpha scores are generally considered acceptable greater than 0.75. However, alpha is highly dependent on the number of items and relatedness of dimensions on the scale (Field, 2017). The internal consistency (0.67) of all 11 items representing CJ prompts associated with the LCJR represent the low end of the acceptable range (0.65 to 0.8).

Table 5.2

Internal Consistency and Test Retest Reliability of Cumulative Total and Subscale LCJR Scores

	Internal Consistency (α)
Noticing	.36
Interpreting	.38
Responding	.58
Reflecting	.1
Total Score	.67

Two raters had increased interrater reliability over time, ultimately reaching a moderate level of agreement using Gwet AC statistics (see Table 5.3). After five rater training sessions, two raters become more consistent and maintained consistency for the final three EM videos without further rater training.

Table 5.3 *Interrater Reliability With the LCJR*

EM VIDEO	Cohen's Kappa			Gwet's AC			Percent Agreement		
	κ	95% CI		**AC**	95% CI		**P_a**	95% CI	
1	**0.363**	.1962	.5315	**0.554**	.4160	.6916	**0.6364**	.5265	.7463
2	**0.338**	.1512	.5248	**0.475**	.3160	.6336	**0.6234**	.5127	.7341
3	**0.422**	.2199	.6231	**0.562**	.3953	.7295	**0.6818**	.5664	.7972
4	**0.537**	.3385	.7362	**0.732**	.6077	.8571	**0.7922**	.6995	.8849
5	**0.7108**	.5243	.8973	**0.8734**	.7852	.9616	**0.8961**	.8264	.9658
6	**0.7415**	.5713	.9126	**0.8417**	.7346	.9487	**0.8788**	.7979	.9596
7	**0.5272**	.2747	.7787	**0.8196**	.7075	.9317	**0.8485**	.7597	.9373
8	**0.8593**	.7363	.9822	**0.8963**	.8068	.9859	**0.9242**	.8587	.9898
Cumulative	**0.5758**	.5123	.6394	**0.7363**	.6946	.7781	**0.7815**	.7475	.8154

Note: $p < .001$ for all Kappa, Gwet AC, and percent agreement

Feasibility

Participants spent on average 28.32 ± 12.99 minutes completing each written reflection (see Table 5.4). We removed outlier times ranging from greater than 57 to 97 minutes, dependent upon the case. Raters spent on average 4.85 ± 1.34 minutes scoring each participants' written reflections. Grading time decreased with each case.

Table 5.4

Mean Participant Time Spent Completing Written Reflections and Rater Time Spent Scoring

	Participant Time		**Rater Time**	
	Mean (SD)	n	Mean (SD)	n
1	38.23 (19.20)	59	6.43 (2.24)	63
2	31.75 (20.12)	63	4.51 (1.80)	63
3	30.64 (19.76)	63	6.09 (4.49)	63
4	28.57 (18.85)	61	4.74 (2.20)	63
5	25.27 (13.79)	61	4.72 (2.09)	63
6	22.106 (11.95)	58	4.79 (1.80)	63
7	21.35 (13.08)	59	3.62 (1.45)	63
8	21.56 (15.23)	61	3.54 (1.25)	63
Overall Mean	28.32 (12.99)		4.85 (1.34)	

Note: All times are listed in minutes. Sample size varies due to excluding outliers.

Usability

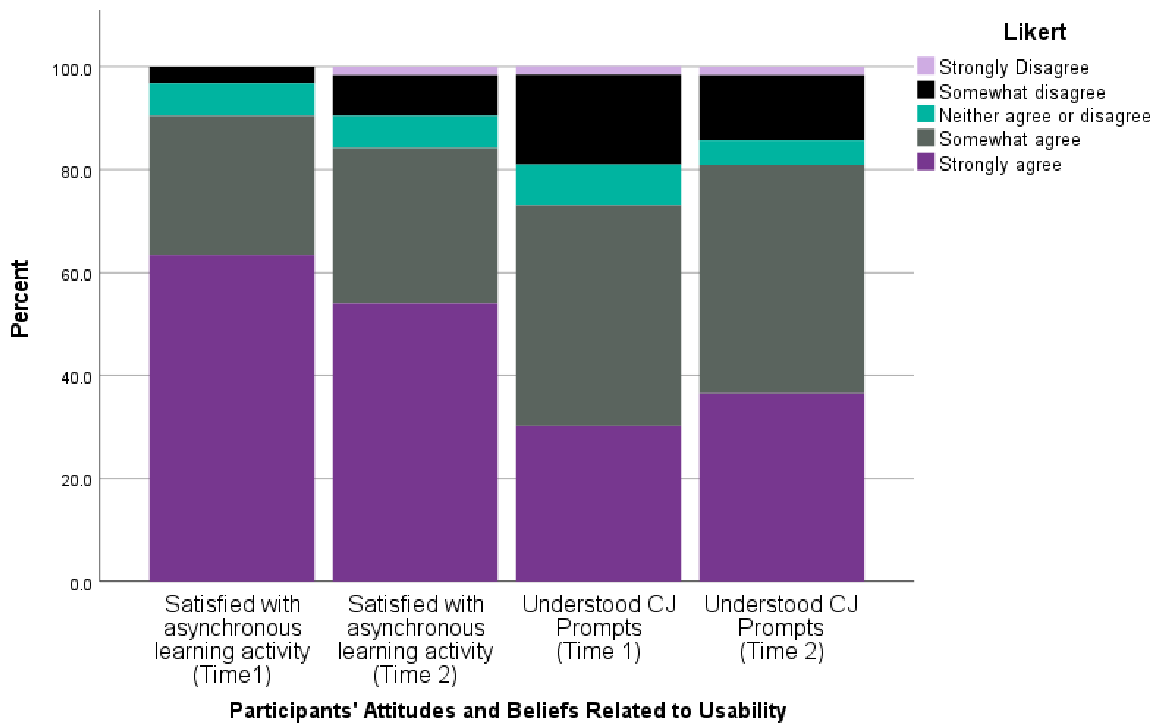
Most participants indicated satisfaction with observing EM videos and found the questions understandable (see Figure 5.1). Mean satisfaction scores decreased from 3.51 ± .759 to 3.27 ± 1.003 (possible score range 0 to 5) from the beginning to end of the semester, but most participants reported a score of "*somewhat agree"* or "strongly *agree*." Participants who were not satisfied indicated a preference for in-person simulation and commented there were too many CJ prompts.

More participants indicated CJ prompts were understandable at the end of the semester, with mean scores increasing from 2.83 ± 1.1 to 3.02 ± 1.039 (possible score range 0 to 5). Participants wanted CJ prompts to be more specific to EM videos, and they felt some prompts were redundant.

Most participants viewed EM videos from a personal computer (n = 61), but a few observed from a smartphone (n = 1) or tablet (n = 1). Only two participants reported technical difficulties with the asynchronous learning activity; they indicated some lag in streaming and one sound issue they resolved independently. Four participants reported challenges with their internet connection.

Figure 5.1

Usabiility of Asynchronous Simulation and Written Reflections



Note: The first two bars represent the percent of participants satisfied with asynchronous simulation at the beginning and end of the semester. The last two bars represent participants' beliefs about understandability of CJ prompts at the beginning and end of the semester expressed as percentages.

Discussion

The LCJR has become the preferred measure of novice nurses' CJ in simulation and clinical activities. This is the first reliability study of the LCJR for scoring written reflections after asynchronous simulation with EM videos. Applying the LCJR in a new way allowed us to reliably measure 63 junior-level novice nurses' development of CJ over a semester. Our asynchronous simulation learning activity was feasible in terms of time required of participants and raters. Further, participants perceived written reflection prompts were understandable, and they reported satisfaction with the asynchronous learning activity.

The LCJR is a holistic rubric commonly used with asynchronous learning activities (e.g., to evaluate threaded discussion responses; Penny & Murphy, 2009). Rubrics help educators evaluate course and program outcomes (Davis & Kimble, 2011) and guide students' performance on a representative task in a given context with specific standards (Varvel, 2007). Holistic rubrics are efficient to track students' progress and provide consistent feedback over time (Lasater, 2007).

This was the first reliability study of the LCJR (Lasater, 2011) for scoring novice nurses' written reflections after asynchronous simulation. Our findings demonstrate nurse educators can reliably use the LCJR to score novice nurses' reflective journals after asynchronous simulation when raters have enough training. Like other previous studies, our raters required five training sessions before reaching a moderate level of agreement.

Based on our results, nurse educators would spend approximately 45 minutes scoring written responses to CJ prompts from one clinical group of ten novice nurses. Our study provides evidence of feasibility in terms of time required for raters to score written reflections; using a feasible measure allows nurse educators to track novice nurses' CJ trajectory and, importantly, identify at-risk novice nurses prior to graduation.

Our findings are similar to previous reliability studies using the LCJR with in-person simulation. Adamson et al. (2011) found the LCJR is very reliable when raters and simulation cases are stable (ICC (2,1) = 0.889). Gubrud-Howe (2008) reported more reliability with fewer raters (i.e., two versus 29). Further, Sideras (2007) reported less reliability with four raters scoring 13 pairs of simulation videos with the LCJR . Our simulation cases were stable owing to the EM videos, and we utilized two raters. We reached moderate reliability with kappa and substantial agreement on Gwet's AC statistic, but our 78 percent agreement was less than Gubrud-Howe's 92 percent agreement (2008).

Rater training likely explains differences in reliability. Gubrud-Howe (2008) used simulation recordings from previous students for rater training. Because our study evaluated a new asynchronous learning activity, we did not have previous students' written reflections to train raters. Instead, raters developed scenario-specific descriptors to match each LCJR item and level of performance. Despite this training, it was difficult for raters to score participants' written reflections after the first EM video. For the first two-thirds of data collections, raters discussed scoring post hoc, without changing scores, to increase future reliability. After performing five rater training sessions, we reached a good level of agreement in the last three EM videos (0.82 to 0.9) without training. It is imperative raters share a mental model when evaluating simulation performance (Holland et al., 2020).

The Lasater Clinical Judgment Rubric is the predominant tool nurse educators use to measure CJ. Though our cumulative alpha score was 0.668, we recommend nurse educators use the LCJR to track the trajectory of novice nurses' CJ before licensing exams and into their first years of practice. Monitoring CJ development is essential to closing the academic-practice gap (Dickison et al., 2019; Lasater et al., 2015). Our nursing licensing exams are changing to focus more on CJ, and our accreditation standards are changing too. The main issue for nurse educators right now is that we lack time to wait for tool development and for more improved CJ measures. As such, nurse educators prefer to use the LCJR. Our findings support using the LCJR to evaluate novice nurses' written responses after asynchronous simulation.

When designing new learning activities, it is prudent to consider time required of novice nurses and educators. Nurse educators' workload is a considerable barrier to implementing effective simulation (Acton et al., 2015; Al-Ghareeb & Cooper, 2016; Bray et al., 2009). Workload contributes to nurse educator shortages (Bittner & Bechtel, 2017); however, there is a paucity of evidence regarding workload in simulation (Blodgett et al., 2018). Nurse educators spend a great deal of time on simulation design and unfortunately less time evaluating simulation outcomes (Eisert & Geers, 2016). We know in-person simulation efficiently uses novice nurses' time (Sullivan et al., 2019). Our study provides new evidence that novice nurses complete asynchronous simulation learning activities in less-time than in-person simulation, and our findings align with modern calls to align the scope of synchronous and asynchronous learning activities with intended outcomes (Davidson, 2020).

Nurse educators' simulation workload is understudied, yet workload is a barrier to simulation utilization (Al-Ghareeb & Cooper, 2016). Lack of time challenges nurse educators' teaching effectiveness (Al-Ghareeb & Cooper, 2016). Therefore, it follows that simulation educators may not have time to evaluate participants' simulation performance or provide individual feedback. The literature around simulation workload fails to consider the time nurse educators spend evaluating simulation outside of class (Blodgett et al., 2018). Our findings demonstrate nurse educators can efficiently use the LCJR to score written reflections. Because measuring (Dickison et al., 2019) and providing feedback (Schuler, 2021) on CJ is so important, further research is needed to explore how nurse educators' simulation workload influence novice nurses' learning outcomes.

In our study, participants became more efficient at completing written reflections over the semester. While some participants commented on redundancy, novice nurses' CJ actually increased over time (see Chapter IV) even though participants spent gradually less time on written reflections once they were familiar with the learning activity.

We found asynchronous learning activities are usable. Participants reported satisfaction with asynchronous simulation and EM videos. Those participants who were not satisfied preferred in-person simulation. This might be explained in that many studies report participants prefer hands-on simulation (Guhde, 2011; Harder et al., 2013; Hober & Bonnel, 2014) with practice in a nursing role (e.g., not a family member; Harder et al., 2013; Thidemann & Söderhamn, 2013; Van Soeren et al., 2011).

Limitations

The first limitation of this study is that we measured participant times based on the amount of time Qualtrics reported a survey was in progress. It is possible participants completed the survey while observing the EM video or left a survey in progress while they stepped away from their computer. To overcome this limitation, we excluded outliers beyond three standard deviations away from the usual data. However, it is still possible that participant time may not accurately reflect time-on-task. Even with this limitation, time participants spent completing written reflections seemed reasonable, and it improved over the semester with repeated exposure to CJ prompts.

Second, we were unable to control the dose of our EM learning activity. We know repeated simulation exposure improves learning; therefore, dose may have unintentionally affected results. Few participants reported difficulty viewing EM videos suggesting interruptions due to technology did not occur. However, challenges with internet service could have impacted more participants than we realized.

Third, we did not measure participants' learning style preferences. Learning style preference may impact satisfaction with asynchronous learning activities and interfere with participants' response to written reflections. Related to measurement, it is also important to note we used a researcher-developed measure for usability, creating a limitation because this tool lacked validity and reliability evidence.

Finally, we selected a convenience sample from one liberal arts university. Using a homogenous sample limits generalizability of findings. Future studies should recruit diverse samples of novice nurses from multiple sites to confirm our results.

Conclusion

The LCJR is reliable for scoring novice nurses' written reflections after asynchronous simulation with EM videos. Asynchronous simulation was feasible in terms of time required from participants and raters. Overall, participants were satisfied with the asynchronous learning activity, and they reported CJ prompts were understandable. Nurse educators should be confident in using the LCJR with written reflections after asynchronous simulation.

References

Acton, R. D., Chipman, J. G., Lunden, M., & Schmitz, C. C. (2015). Unanticipated teaching demands rise with simulation training: Strategies for managing faculty workload. *Journal of Surgical Education*, *72*(3), 522–529. https://doi.org/10.1016/j.jsurg.2014.10.013

Adamson, Katie A., & Kardong-Edgren, S. (2012). A method and resources for assessing reliability of simulation evaluation instruments. *Nursing Education Perspectives*, *33*(5), 334–339. https://doi.org/10.5480/1536-5026-33.5.334

Adamson, Katie Anne, Kardong-Edgren, S., & Willhaus, J. (2013). An updated review of published simulation evaluation instruments. *Clinical Simulation in Nursing*, *9*(9). https://doi.org/10.1016/j.ecns.2012.09.004

Adamson, Katie Anne, Parsons, M. E., Hawkins, K., Manz, J. A., Todd, M., & Hercinger, M. (2011). Reliability and internal consistency findings from the C-SEI. *Journal of Nursing Education, 50*(10), 583–586. https://doi.org/10.3928/01484834-20110715-02

Al-Ghareeb, A. Z., & Cooper, S. J. (2016). Barriers and enablers to the use of high-fidelity patient simulation manikins in nurse education: an integrative review. *Nurse Education Today*, *36*, 281–286. https://doi.org/10.1016/j.nedt.2015.08.005

Al Sabei, S. D., & Lasater, K. (2016). Simulation debriefing for clinical judgment development: A concept analysis. *Nurse Education Today*, *45*, 42–47. https://doi.org/10.1016/j.nedt.2016.06.008

Albaqawi, H. (2018). Achieving clinical judgment of nursing students through simulation: A quasi-experimental study. *American Journal of Nursing Research*, *6*(3), 113–116. https://doi.org/10.12691/ajnr-6-3-5

Andrea, J., & Kotowski, P. (2017). Using standardized patients in an undergraduate nursing health assessment class. *Clinical Simulation in Nursing*, *13*(7), 309–313. https://doi.org/10.1016/j.ecns.2017.05.003

Ashcraft, A. S., Opton, L., Ruth Bridges, A. N. N., Caballero, S., Veesart, A., & Weaver, C. (2013). Simulation evaluation using a modified lasater clinical judgment rubric. *Nursing Education Perspectives*, *34*(2), 122–126. https://doi.org/10.5480/1536-5026-34.2.122

Bittner, N. P., & Bechtel, C. F. (2017). Identifying and describing nurse faculty workload issues: A looming faculty shortage. *Nursing Education Perspectives*, *38*(4), 171–176. https://doi.org/10.1097/01.NEP.0000000000000178

Blodgett, N. P., Blodgett, T., & Kardong-Edgren, S. E. (2018). A proposed model for simulation faculty workload determination. *Clinical Simulation in Nursing*, *18*, 20–27. https://doi.org/10.1016/j.ecns.2018.01.003

Blum, C. A., Borglund, S., & Parcells, D. (2010). High-fidelity nursing simulation: Impact on student self-confidence and clinical competence. *International Journal of Nursing Education Scholarship*, *7*(1). https://doi.org/10.2202/1548-923X.2035

Bray, B., Schwartz, C. R., Weeks, D. L., & Kardong-Edgren, S. (2009). Human patient simulation technology: perceptions from a multidisciplinary sample of health care educators. *Clinical Simulation in Nursing*, *5*(4). https://doi.org/10.1016/j.ecns.2009.02.002

Bussard, M. (2015). The nature of clinical judgment development in reflective journals. *Journal of Nursing Education*, *54*(8), 451–454. https://doi.org/10.3928/01484834-20150717-05

Bussard, M. E. (2018). Evaluation of clinical judgment in prelicensure nursing students. *Nurse Educator*, *43*(2), 106–108. https://doi.org/10.1097/NNE.0000000000000432

Cappelletti, A., Engel, J. K., & Prentice, D. (2014). Systematic review of clinical judgment and reasoning in nursing. *Journal of Nursing Education*, *53*(8), 453–458.

https://doi.org/10.3928/01484834-20140724-01

Cato, M. L., Lasater, K., & Peeples, A. (2009). Nursing students' self-assessment of their simulation experiences: EBSCOhost. *Nursing Education Perspectives*, *30*(2), 105–108.

Cazzell, M., & Anderson, M. (2016). The impact of critical thinking on clinical judgment during dimulation with senior nursing students. *Nursing Education Perspectives*, *37*(2), 83–90. https://doi.org/10.5480/15-1553

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, *20*, 37–46.

Coram, C. (2016). Expert role modeling effect on novice nursing students' clinical judgment. *Clinical Simulation in Nursing*, *12*(9), 385–391. https://doi.org/10.1016/j.ecns.2016.04.009

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297–334. https://doi.org/10.1007/BF02310555

Davidson, C. N. (2020). *Quantity is not rigor*. https://www.insidehighered.com/advice/2020/05/13/academics-should-rethink-way-they-assign-homework-opinion

Davis, A. H., & Kimble, L. P. (2011). Human patient simulation evaluation rubrics for nursing education: Measuring the essentials of baccalaureate education for professional nursing practice. *Journal of Nursing Education*, *50*(11), 605–611. https://doi.org/10.3928/01484834-20110715-01

Dickison, P., Haerling, K. A., & Lasater, K. (2019). Integrating the National Council of State Boards of Nursing Clinical Judgment Model into n nursing educational frameworks. *Journal of Nursing Education*, *58*(2), 72–78. https://doi.org/10.3928/01484834-20190122-03

Dillard, N., Sideras, S., Ryan, M., Carlton, K. H., Lasater, K., & Siktberg, L. (2009). A collaborative project to apply and evaluate the clinical judgment model t...: EBSCOhost. *Nursing Educaiton Perspectives*, *30*(2), 99–104.

Eisert, S., & Geers, J. (2016). Pilot-study exploring time for simulation in academic and hospital-based organizations. *Clinical Simulation in Nursing*, *12*(9), 361–367. https://doi.org/10.1016/j.ecns.2016.04.005

Fedko, A. S., & Dreifuerst, K. T. (2017). Examining the relationship between clinical judgment and nursing actions in prelicensure students. *Nurse Educator*, *42*(1), 47–50. https://doi.org/10.1097/NNE.0000000000000290

Feinstein, A. R., & Cicchetti, D. V. (1990). High agreement but low Kappa: I. the problems of two paradoxes. *Journal of Clinical Epidemiology*, *43*(6), 543–549. https://doi.org/10.1016/0895-4356(90)90158-L

Field, A. (2017). Discovering Statistics Using IBM SPSS Statistics: North American Edition, 5th Edition. In *ProtoView* (5th North, Issue 47). Sage Publicaitons.

Fisher, D., & King, L. (2013). An integrative literature review on preparing nursing students through simulation to recognize and respond to the deteriorating patient. *Journal of Advanced Nursing*, *69*(11), 2375–2388. https://doi.org/10.1111/jan.12174

Gubrud-Howe, P. (2008). *Development of clinical judgment in nursing students: A learning framework to use in designing and implementing simulated learning experiences (Unpublised dissertation)*.

Guhde, J. (2011). Nursing students' perceptions of the effect on critical thinking, assessment, and learner satisfaction in simple versus complex high-fidelity simulation scenarios. *Journal of Nursing Education*, *50*(2), 73–78. https://doi.org/10.3928/01484834-20101130-03

Gwet, K. L. (2008). Computing inter-rater reliability and its variance in the presence of high agreement. *British Journal of Mathematical and Statistical Psychology*, *61*(1), 29–48. https://doi.org/10.1348/000711006X126600

Hallin, K., Bäckström, B., Häggström, M., & Kristiansen, L. (2016). High-fidelity simulation: Assessment of student nurses' team achievements of clinical judgment. *Nurse Education in Practice*, *19*, 12–18. https://doi.org/10.1016/j.nepr.2016.03.010

Harder, N., Ross, C. J. M., & Paul, P. (2013). Student perspective of roles assignment in high-fidelity simulation: An ethnographic study. *Clinical Simulation in Nursing*, *9*(9), e329–e334. https://doi.org/10.1016/j.ecns.2012.09.003

Hayden, J., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Regulation Nursing*, *5*(2), S3–S40. https://doi.org/https://doi.org/10.1016/S2155-8256(15)30062-4

Hickerson, K. A., Taylor, L. A., & Terhaar, M. F. (2016). The preparation–practice gap: An integrative literature review. *Journal of Continuing Education in Nursing*, *47*(1), 17–23. https://doi.org/10.3928/00220124-20151230-06

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high-fidelity simulation. *Clinical Simulation in Nursing*, *10*(10), 507–514. https://doi.org/10.1016/j.ecns.2014.07.008

Holland, A. E., Tiffany, J., Blazovich, L., Bambini, D., & Schug, V. (2020). The effect of evaluator training on inter- and intrarater reliability in high-stakes assessment in simulation. *Nursing Education Perspectives*, *41*(4), 222–228. https://doi.org/10.1097/01.NEP.0000000000000619

Huun, K. (2018). Virtual simulations in online nursing education: Align with quality matters. *Clinical Simulation in Nursing*, *22,* 26–31. https://doi.org/10.1016/j.ecns.2018.07.002

INACSL. (2016). INACSL standards of best practice: SimulationSM debriefing. *Clinical Simulation in Nursing*, *12,* S21–S25. https://doi.org/10.1016/j.ecns.2016.09.008

James, J. T. (2013). A new, evidence-based estimate of patient harms associated with hospital care. *Journal of Patient Safety*, *9*(3), 122–128. https://doi.org/10.1097/PTS.0b013e3182948a69

Jensen, R. (2013). Clinical reasoning during simulation: Comparison of student and faculty ratings. *Nurse Education in Practice*, *13*(1), 23–28. https://doi.org/10.1016/j.nepr.2012.07.001

Johnson, E. A., Lasater, K., Hodson-Carlton, K., Siktberg, L., Sideras, S., & Dillard, N. (2012). Geriatrics in simulation: Role modeling and clinical judgment effect. *Nursing Education Perspectives*, *33*(3), 176–180. https://doi.org/10.5480/1536-5026-33.3.176

Kardong-Edgren, S., Adamson, K. A., & Fitzgerald, C. (2010). A review of currently published evaluation instruments for human patient simulation. *Clinical Simulation in Nursing*, *6*(1). https://doi.org/10.1016/j.ecns.2009.08.004

Kavanagh, J. M., & Szweda, C. (2017). A crisis in competency: The strategic and ethical imperative to assessing new graduate nurses’ clinical reasoning. *Nursing Education Perspectives*, *38*(2), 57–62. https://doi.org/10.1097/01.NEP.0000000000000112

Kenward, K., & Zhong, E. H. (2006). *Report of findings from the practice and professional issues survey fall 2004 National Council of State Boards of Nursing (NCSBN)*.

Klenke-Borgmann, L., Cantrell, M. A., & Mariani, B. (2020). Nurse educators’ guide to clinical judgment: A review of conceptualization, measurement, and development. *Nursing*

Education Perspectives, *41*(4), 215–221. https://doi.org/10.1097/01.NEP.0000000000000669

Lasater, K. (2007). Clinical judgment development: Using simulation to create an assessment rubric. *Journal of Nursing Education*, *46*(11), 496–503. https://doi.org/10.3928/01484834-20071101-04

Lasater, K. (2011). Clinical judgment: The last frontier for evaluation. *Nurse Education in Practice*, *11*(2), 86–92. https://doi.org/10.1016/j.nepr.2010.11.013

Lasater, K., Johnson, E. A., Ravert, P., & Rink, D. (2014). Role modeling clinical judgment for an unfolding older adult simulation. *Journal of Nursing Education*, *53*(5), 257–264. https://doi.org/10.3928/01484834-20140414-01

Lasater, K., & Nielsen, A. (2009). Reflective journaling for clinical judgment development and evaluation. *Journal of Nursing Education*, *48*(1), 40–44. https://doi.org/10.3928/01484834-20090101-06

Lasater, K., Nielsen, A. E., Stock, M., & Ostrogorsky, T. L. (2015). Evaluating the clinical judgment of newly hired staff nurses. *Journal of Continuing Education in Nursing*, *46*(12), 563–571. https://doi.org/10.3928/00220124-20151112-09

Letcher, D. C., Roth, S. J., & Varenhorst, L. J. (2017). Simulation-based learning: Improving knowledge and clinical judgment within the NICU. *Clinical Simulation in Nursing*, *13*(6), 284–290. https://doi.org/10.1016/j.ecns.2017.03.001

Levett-Jones, T., & Lapkin, S. (2014). A systematic review of the effectiveness of simulation debriefing in health professional education. *Nurse Education Today*, *34*(6). https://doi.org/10.1016/j.nedt.2013.09.020

Lioce, L. (ed.), Downing, D., Chang, T. P., Robertson, J. M., Anderson, M., Diaz, D. A., Spain,

A. E. (Assoc. E. ., & Terminology and Concepts Working Group. (2020). *Healthcare simulation dictionary- 2nd edition*. https://doi.org/10.23970/simulationv2

Lioce, Lori, Meakim, C. H., Fey, M. K., Chmil, J. V., Mariani, B., & Alinier, G. (2015). Standards of best practice: Simulation standard IX: Simulation design. *Clinical Simulation in Nursing*, *11*(6), 309–315. https://doi.org/10.1016/j.ecns.2015.03.005

Makary, M. A., & Daniel, M. (2016). Medical error-the third leading cause of death in the US. *BMJ (Online)*, *353*. https://doi.org/10.1136/bmj.i2139

Mariani, B., Cantrell, M. A., Meakim, C., Prieto, P., & Dreifuerst, K. T. (2013). Structured debriefing and students' clinical judgment abilities in simulation. *Clinical Simulation in Nursing*, *9*(5). https://doi.org/10.1016/j.ecns.2011.11.009

NLN. (2020). *Descriptions of available instruments*. http://www.nln.org/professional-development-programs/research/tools-and-instruments/descriptions-of-available-instruments

O'Donnell, J. M., Decker, S., Howard, V., Levett-Jones, T., & Miller, C. W. (2014). NLN/Jeffries Simulation Framework state of the science project: Simulation learning outcomes. *Clinical Simulation in Nursing*, *10*(7), 373–382. https://doi.org/10.1016/j.ecns.2014.06.004

Penny, L., & Murphy, E. (2009). Rubrics for designing and evaluating online asynchronous discussions. *British Journal of Educational Technology*, *40*(5), 804–820. https://doi.org/10.1111/j.1467-8535.2008.00895.x

Reid, C. A., Ralph, J. L., El-Masri, M., & Ziefle, K. (2020). High-fidelity simulation and clinical judgment of nursing students in a maternal–newborn course. *Western Journal of Nursing Research*, *42*(10), 829–837. https://doi.org/10.1177/0193945920907395

Ruth-Sahd, L. A. (2003). Reflective practice: A critical analysis of data-based studies and implications for nursing education. *Journal of Nursing Education*, *42*(11), 488–497. https://doi.org/10.3928/0148-4834-20031101-07

Saintsing, D., Gibson, L. M., & Pennington, A. W. (2011). The novice nurse and clinical decision-making: How to avoid errors. *Journal of Nursing Management*, *19*(3), 354–359. https://doi.org/10.1111/j.1365-2834.2011.01248.x

Schlairet, M. C., & Fenster, M. J. (2012). Dose and sequence of simulation and direct care experiences among beginning nursing students: A pilot study. *Journal of Nursing Education*, *51*(12), 668–675. https://doi.org/10.3928/01484834-20121005-03

Schuler, M. S. (2021). The reflection, feedback, and restructuring model for role development in nursing education. *Nursing Science Quarterly*, *34*(2), 183–188. https://doi.org/10.1177/0894318420987165

Shin, H., & Kim, M. J. (2014). Evaluation of an Integrated Simulation Courseware in a Pediatric Nursing Practicum. *Journal of Nursing Education*, *53*(10), 589–594. https://doi.org/10.3928/01484834-20140922-05

Shinnick, M. A., & Cabrera-Mino, C. (2021). Predictors of nursing clinical judgment in simulation. *Nursing Education Perspectives*, *42*(2), 107–109. https://doi.org/10.1097/01.NEP.0000000000000604

Shinnick, M. A., & Woo, M. (2020). Comparison of simulation assessments: Can they identify novice/student nurses? *Clinical Simulation in Nursing*, *46*, 40–49. https://doi.org/10.1016/j.ecns.2020.04.002

Sideras, S. (2007). *An examination of the construct validity of a clinical judgment evaluation tool in the setting of high-fi delity simulation (Unpublished dissertation)*.

Strickland, H. P., Cheshire, M. H., & March, A. L. (2017). Clinical judgment during simulation: A comparison of student and faculty scores. *Nursing Education Perspectives*, *38*(2), 85–86. https://doi.org/10.1097/01.NEP.0000000000000109

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (Suzie). (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: A study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing*, *30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, *45*(6), 204–211. https://doi.org/10.3928/01484834-20060601-04

Thidemann, I. J., & Söderhamn, O. (2013). High-fidelity simulation among bachelor students in simulation groups and use of different roles. *Nurse Education Today*, *33*(12), 1599–1604. https://doi.org/10.1016/j.nedt.2012.12.004

Van Soeren, M., Devlin-Cop, S., MacMillan, K., Baker, L., Egan-Lee, E., & Reeves, S. (2011). Simulated interprofessional education: An analysis of teaching and learning processes. *Journal of Interprofessional Care*, *25*(6), 434–440. https://doi.org/10.3109/13561820.2011.592229

Varvel, V. E. (2007). *Master online teacher competencies*. https://www.westga.edu/~distance/ojdla/spring101/varvel101.pdf

Victor-Chmil, J., & Larew, C. (2013). Psychometric properties of the Lasater Clinical Judgment Rubric. *International Journal of Nursing Education Scholarship*, *10*(1), 30. https://doi.org/10.1515/ijnes-2012-0030

Victor, J., Ruppert, W., & Ballasy, S. (2017). Examining the relationships between clinical judgment, simulation performance, and clinical performance. *Nurse Educator*, *42*(5), 236–239. https://doi.org/10.1097/NNE.0000000000000359

Yang, F., Wang, Y., Yang, C., Zhou, M. H., Shu, J., Fu, B., & Hu, H. (2019). Improving clinical judgment by simulation: A randomized trial and validation of the Lasater clinical judgment rubric in Chinese. *BMC Medical Education*, *19*(1), 1–6. https://doi.org/10.1186/s12909-019-1454-9

Zec, S., Soriani, N., Comoretto, R., & Baldi, I. (2017). High agreement and high prevalence: The paradox of Cohen's kappa. *The Open Nursing Journal*, *11*(1), 211–218. https://doi.org/10.2174/1874434601711010211

Chapter VI- SUMMARY AND CONCLUSIONS

This chapter replaces the final chapter in a traditional dissertation. This chapter discusses the findings pertaining to each specific aim and expands the discussion on implications from the cumulative body of work.

Introduction

There is an urgent need to reduce the nursing shortage in the United States by preparing qualified nurses for practice (AACN, 2020). Recent estimates indicate there will be a shortage of 500,000 nurses by 2030 (Zhang et al., 2018). Nursing schools are unable to produce enough graduates to fill this need, despite a reported five percent increase in nursing school enrollments in 2019 (AACN, 2020). Associate degree and bachelor program directors reported they turned away 30 percent of qualified applicants in 2018 (NLN, 2021). Up to half of responding programs turned these students away due to a lack of available clinical placements (NLN, 2021). Experts predict we will have unsafe hospital conditions as a result of not producing enough graduates to meet the nursing shortage. Therefore, it is important to identify methods for increasing both nursing program capacity and clinical preparation without sacrificing the quality of graduates (AACN, 2020; Fisher & King, 2013; Kavanagh & Szweda, 2017).

To compound the impact of the nursing shortage, novice nurses have several known deficits after graduation, including challenges making-appropriate clinical judgments (CJ; Al-Dossary et al., 2014; Fisher & King, 2013; Kavanagh & Szweda, 2017). Clinical judgment is a complex cognitive skill that allows nurses to make "an interpretation or conclusion about a 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" (Tanner, 2006, p. 204). Employers report that only 23 percent of novice nurses can identify risks, assign urgency, prioritize appropriate interventions, communicate salient information, and anticipate medical orders due to lack of CJ (Kavanaugh & Szweda, 2017). Novice nurses lack CJ until one to three years into their independent practice as a Registered Nurse (Bratt & Felzer, 2011; Lasater et al., 2015).

Traditionally, nurses learn CJ skills for independent practice in clinical education (Ironside et al., 2014; Jayasekara et al., 2018). However, clinical experiences are limited by random access to learning opportunities, excessive downtime, insufficient faculty supervision, and clinical site shortages (Ironside et al., 2014; Shadadi et al., 2018; Sullivan et al., 2019). Replacing up to half of traditional clinical hours with high-quality simulation-based learning experiences (SBLE) overcomes known limitations and, importantly, achieves similar learning outcomes to clinical experiences (Bradley et al., 2019; Smiley, 2019). There is strong evidence from a meta-analysis of 26 controlled trials supporting SBLE and CJ learning outcomes. (Lee & Oh, 2015).

SBLEs expose novice nurses to actual or potential clinical situations with the purpose of developing clinical skills novice nurses need to respond in real situations (Lioce et al., 2020). SBLEs are useful for developing CJ because they provide guided, repetitive practice and individualized feedback in a safe environment (Fisher & King, 2013). Due to the effectiveness of SBLE, there is a growing demand for increasing simulation capacity (AACN, 2021; Hayden et al., 2014; Lee & Oh, 2015). As simulation programs seek ways to increase capacity, it is important to ensure that 1) simulation design maintains similar quality standards and 2) nurses achieve desired learning outcomes (Lioce et al., 2015).

Nurse educators assign multiple active and observer roles to increase simulation capacity (Rogers et al., 2020). Faculty assign active roles by delegating a portion of direct patient care or different leadership roles, with the assumption that decreasing the task load on any one individual leads to increased CJ development (Johnson, 2020). Faculty evaluate CJ by observing behaviors and listening to active participants describe their decisions underpinning behaviors (Cazzell & Anderson, 2016; Hallin et al., 2016; Fedko & Dreifuerst, 2017).

Without intentional focus on measuring novice nurses cognitive load (CL), it is difficult for researchers and educators to know how CL confounds behavior and decision-making in simulation or traditional clinical experiences (Rogers & Franklin, 2021). Novice nurses spend the majority of time in a simulation observer role (Hayden et al., 2014) and still achieve desired learning outcomes (Johnson, 2019; Rogers et al., 2020). We know observing prior to active participation results in increased CJ in similar subsequent simulations (Hallin et al., 2016), though observers may not be able to translate CJ when scenario details change (Livsey & Lavender-Stott, 2015). We also know observers utilize CJ differently than active participants (Price et al., 2017; Zulkosky et al., 2016). However, there is a dearth of evidence comparing CJ outcomes between active participants and observers.

Asynchronous simulations, including activities such as observing online video simulations or virtual reality, are delivered without faculty supervision, thus increasing simulation program capacity and reducing faculty workload (Huun, 2018). Educators use video simulations in the classroom to improve critical thinking (Sharpnack et al., 2013) and recognition of patient risks (Ferguson & Estis, 2018). Nurse educators also use video simulations to evaluate novice nurses' readiness for practice (Del Bueno, 2005). However, there is a dearth of evidence supporting asynchronous simulation learning outcomes.

The overarching purpose of this body of research was to describe the consequences of simulation design decisions that increase simulation capacity and to investigate the relationship between simulation participant characteristics and novice nurses' CJ. We aimed to: 1) describe what is known about learner outcomes in nurses assigned to the observer role during simulation, 2) summarize measurement approaches and synthesize what is known about nurses' cognitive load in simulation, 3) describe the trajectory of novice nurses' CJ after observing eight asynchronous expert modeling videos over a semester, and 4) describe the reliability, feasibility, and usability of the Lasater Clinical Judgment Rubric for scoring novice nurses' written reflection after asynchronous simulation. The author addressed each specific aim, generating new knowledge that fills gaps in existing nursing simulation literature. Implications drawn from this body of research support using asynchronous simulation to develop CJ. The purpose of this final chapter is to summarize principal findings, discuss the body of work, and make recommendations for future research and teaching practice.

Summary and Principal Findings

Simulation Observers' Learning Outcomes

To address the first specific aim, the author used scoping review methodology to describe the evidence from 28 articles and synthesize what is known about simulation observers' learning outcomes. There were two principal findings (see Table 6.1). First, simulation observers achieve desired knowledge, skills, and attitudes. Second, measurement problems plague the observer literature, especially reliability of measures. The scoping review provided a broad synthesis of the literature because it included a diverse sample without regard to level of evidence.

Table 6.1. Principal Findings: Specific Aim 1

Specific Aim 1: Describe what is known about learner outcomes in nurses assigned the observer role during simulation

Study	Principal Findings
Learning Outcomes of the Observer Role in Nursing: A Scoping Review	1) Eight categories of observer learning outcomes were identified: knowledge, clinical skills, clinical judgment, teamwork/ collaboration, confidence, critical thinking, insight, and conceptual thinking. 2) Most researchers measure learning outcomes through self-report surveys and examination performance.

Conclusions from the scoping review are significant because they synthesize simulation observers' learning outcomes. Previous literature identified how cognitive aids increase observer learning (O'Reagan et al., 2016). One challenge from previous literature reviews was limiting the search criteria to only include experimental designs (Delisle et al., 2019); because most educational research is quasi-experimental, it is prudent to synthesize the evidence from a diverse sample to understand simulation observers' learning outcomes. This review demonstrated that simulation observers achieve similar learning outcomes to active participants and further highlighted important gaps in the extant literature related to observers' CJ.

Based on this review, the authors recommend expanding the simulation observer literature to include more pediatric, maternity, and mental health scenarios and samples from novice nurses across pre-licensure levels. Next, it is appropriate for researchers to evaluate simulation observers' learning outcomes when the scenario involves care of multiple patients and priority setting, safety, and delegation competencies. Expanding the simulation observer literature to scenarios with desired learning outcomes related to attitude change and cultural awareness, cultural sensitivity, or empathy could advance our knowledge base. Finally, researchers should describe interprofessional simulation observers' learning outcomes and organize findings within and between professions.

Impact of Cognitive Load on Simulation Learning

The second specific aim of this body of work was to summarize measurement approaches and synthesize what is known about nurses' CL in simulation. To address this aim, the author performed an integrative review of 20 studies measuring nurses' CL. There were two principal findings (see Table 6.2). First, a variety of self-report and objective tools allow researchers to measure CL and its relationship to other variables. Second, simulation design and participant characteristics influence nurses' CL.

Table 6.2. Principal Findings: Specific Aim 2

Specific Aim 2: Summarize measurement approaches and synthesize what is known about nurses' cognitive load in simulation

Study	Principal Findings
Cognitive Load Experienced by Nurses in Simulation-based Learning Experiences: An Integrative Review	1) Subjective and objective cognitive load measures help researchers understand cognitive load and define its relationship with other variables. 2) Simulation fidelity, time pressure, dual-tasking, interruptions, task complexity, distractions, and mismatched simulation objectives to learner ability increase nurses' cognitive load. However, past experience, pre-briefing, repeated scenarios, and worked-out modeling optimize cognitive load.

This work provides further support for nurse educators to optimize CL with simulation design. Others have reviewed cognitive load and simulation design in medical literature (Fraser et al., 2015) and provided a theoretical overview of cognitive load in simulation (Josephsen, 2015); however, this review synthesizes evidence around factors that influence nurses' cognitive load and helps nurse educators understand simulation design implications. Past experience, pre-briefing, repeated simulation, and worked-out models optimize cognitive load. However, time pressure, fidelity, dual-tasking, interruptions, task complexity, distractions, and a mismatch of objectives to learner ability increase cognitive load. Furthermore, the authors provide recommendations about choosing a CL measure and deciding how to use it.

Based on these findings, the authors offered several simulation design recommendations to reduce CL. Specifically, educators should scaffold scenario complexity to match the level of the learner. Importantly, scaffolding requires educators to first discern which scenarios are most difficult for novice nurses and then sequence simple scenarios earlier in the simulation curriculum. Further, educators should provide repeated simulation exposure in complex scenarios to reduce CL. These recommendations informed the design of the studies in Chapters IV and V. Cognitive load is emerging in nursing education literature as a possible explanation for variation among simulation learning outcomes. Specific recommendations for future research are provided later in this chapter.

Observing EM Videos and Responding to CJ Prompts in Writing Increases CJ

The third aim of this body of work was to describe the trajectory of novice nurses' CJ after observing eight asynchronous expert modeling videos over a semester. To address this aim, the authors performed a longitudinal, descriptive, mixed methods study with 63 junior-level novice nurses. To describe CJ development, the authors used a one-way, repeated measures analysis of variance. Further, we grouped low, medium, and high-performing novice nurses by cumulative LCJR scores at the end of the semester. The author analyzed LCJR scores by performance group to describe the trajectory of CJ over time using three separate one-way, repeated measure analysis of variance. Next, we used multiple logistic regression to examine the association between CJ and demographic variables and personal characteristics. Finally, we used thematic analysis and the Framework Method to identify writing characteristics displayed by participants representing each level of CJ performance. The principal findings of each aim are presented in Table 6.3.

Table 6.3. Principal Findings: Specific Aim 3

Specific Aim 3: Describe the trajectory of novice nurses' CJ after observing eight asynchronous expert modeling videos over a semester

Study	Principal Findings
Describing Novice Nurses' Clinical Judgment Trajectory After Observing Expert Modeling Videos: A Mixed Methods Study	1) Observing eight expert modeling videos asynchronously resulted in a statistically significant increasing trend in CJ over time, $F(5.514, 341.858) = 24.18$, $p < .001$, $\eta_p^2 = 0.28$. 2) There was a statistical difference between CJ over time among low-performing participants F (4.083, 81.654) = 4.704, $p < .01$ $\eta_p^2 = 0.64$. 3) There was a statistical difference between CJ over time among medium-performing participants $F(7, 140) = 18.294$, $p < .001$ $\eta_p^2 = 0.90$. 4) There was a statistical difference between CJ over time among high-performing participants , $F(7, 140) = 8.417$, $p < .001$ $\eta_p^2 = .76$. 5) The increasing trends are similar among three performance groups. The medium-performing group has the greatest effect size, followed by high-performance group. 6) Framework analysis revealed writing samples from low, medium, and high-performing students highlight differences in nursing knowledge, thinking, and approach 7) The average time spent responding to CJ prompts significantly predicted performance group (e.g., high versus low-performing participants), $b = 2.45$, Wald $\chi2(1) = 6.94$ $p < .01$. Spending more than 30 minutes responding to CJ prompts increased the odds of being a high performer versus a low performer by 11.59 (95% CI: 1.87- 71.72).

Regardless of CJ ability, all novice nurses' CJ improved over the semester. Expert modeling videos had the largest effect on medium performers. Written reflections from each performance group displayed a characteristic knowledge, thinking, and approach to nursing care.

The average time spent responding to prompts significantly predicted the high-performing CJ performance group. Our findings indicate that asynchronous simulation with EM videos, paired with reflective journaling to CJ prompts, increased novice nurses' CJ over the semester.

This study provides an important first step in the literature to describe simulation observers' CJ trajectory. Asynchronous simulation experiences allow nurses to synthesize, analyze, and apply course material. Further, CJ prompts help novice nurses learn a cognitive framework (i.e., the Tanner Clinical Judgment Model) to approach clinical situations. Utilizing EM videos overcomes limitations of random access to traditional clinical experiences and increases cognitive learning beyond the knowledge level of Bloom's taxonomy. Our asynchronous simulation EM videos and related CJ outcomes align closely with current calls in the education literature to measure and improve novice nurses' CJ (Dickison et al., 2019) in order to increase novice nurses' readiness for licensing exams and independent practice.

Reliability of Measuring Clinical Judgment in Reflections and Feasibility/ Usability of Asynchronous Simulations

To address the fourth specific aim, a descriptive study helped authors quantify the reliability of the LCJR for scoring novice nurses' written reflections after asynchronous simulation. Furthermore, we determined the feasibility and usability of implementing asynchronous simulation. This aim grew out of the scoping review (see Chapter II) and the prevalence of measurement problems in extant literature. Previous literature related to observers' CJ was limited by use of instructor-developed rubrics without psychometric evidence for reliability and validity. This study aimed to investigate the feasibility and usability of implementing a reliable CJ measure in a new way. In this body of work, we used the LCJR after asynchronous simulation with expert modeling videos; this work was innovative because it captured simulation observers' CJ before debriefing. We measured interrater reliability with two independent raters who scored 50 out of 504 (10% random sample) written reflections with LCJR. We measured feasibility indirectly related to the time 63 participants and two raters spent completing study activities. Furthermore, we measured usability with participants' comments about satisfaction, understandability, and technical issues with asynchronous simulation. The study had four principal findings (see Table 6.4).

Table 6.4. Principal Findings: Specific Aim 4

Specific Aim 4: Describe the reliability, feasibility, and usability of the Lasater Clinical Judgment Rubric for scoring novice nurses' written reflections after asynchronous simulation with expert modeling videos

Study	Principal Findings
LCJR Reliability for Scoring Written Reflections After Asynchronous Simulation and Feasibility/Usability with Novice Nurses	1) Cronbach alpha at the level of total LCJR scores ranged from 0.51 to 0.72 over eight cases. Overall alpha (α) was 0.668 indicating low internal consistency. 2) As evidence of interrater reliability, kappa scores for the LCJR ranged from 0.34 to 0.86, with a cumulative κ 0.58. Gwet's AC ranged from 0.48 to 0.90, with a cumulative Gwet's AC of 0.74. After five sessions with rater training, two raters became more consistent, and they maintained a moderate level of agreement for the final three EM videos without additional training. 3) Participants spent on average 28.32 ± 12.99 minutes. Raters spent on average 4.85 ± 1.34 minutes. 4) Most novice nurses reported usability with the assignment. Novice nurses found satisfaction viewing EM videos, commented CJ prompts were understandable, and did not report large numbers of technical difficulties.

Using the total LCJR score provided for more internal consistency than using subscales independently. Participants and raters spent reasonable amounts of time completing study activities. Two raters reached moderate interrater reliability after scoring 50 written reflections.

After five rater training sessions, two raters became more consistent, and they maintained a moderate level of agreement for the final three EM videos without further training (Gwet AC= 0.82 to 0.89). This innovative use of the LCJR adds to a robust body of literature using the rubric to evaluate CJ after in-person simulation (Coram, 2016; Fedko & Dreifuerst, 2017; Fenske et al., 2013; Hallin et al., 2016; Shinnick & Woo, 2020) with active simulation participants (Bussard, 2015; Bussard, 2018). The LCJR has established validity (Victor-Chmil & Larew, 2013), reliability (Adamson & Kardong-Edgren, 2012; Adamson et al., 2012), sensitivity (Shinnick & Woo, 2020), and is free of bias (Adamson, 2016). This study was the first to quantify reliability of the LCJR to measure observer learning outcomes alongside feasibility and usability in asynchronous simulation.

This work has practical and research implications. First, this study supports the overarching goal to understand how simulation design and participant characteristics influence novice nurses' learning outcomes. It is imperative that nurse educators use reliable measures to quantify learning outcomes and that simulation activities do not overly strain faculty resources. Second, this study allows nurse researchers to use an existing measure in a new way. By using the LCJR with asynchronous simulation, nurse educators can identify at-risk novice nurses and provide early interventions to increase clinical judgment before graduation.

Continued Discussion on Research Supporting the NLN Jeffries Simulation Theory

Simulation Design

Future Research Related to Simulation Observers

There is increasing interest regarding the effectiveness of using observers to increase the capacity of simulation programs. This body of research added new knowledge to the literature that observers have increased CJ after in-person (see Chapter II; Rogers et al., 2020) and asynchronous simulation (see Chapter IV). Researchers often measure observers' CJ cross-sectionally in simulation with one patient (Alexander, 2020; Bonnel & Hober, 2016; Hallin et al., 2016; Hober & Bonnel, 2014). Price et al. (2017) and Zulkosky et al. (2016) measured CJ twice in the same scenario (i.e., before and after a change in patient status) and identified that observers have superior CJ in unfamiliar situations and rely less on intuition than active participants. Clinical judgment depends on both scenario context and participants' previous experience, and it develops over time (Cappelletti et al., 2014); therefore, future simulation research on observers' CJ should utilize longitudinal designs. This body of research was novel because it measured the effectiveness of observing asynchronous simulation on the trajectory of clinical judgment across eight diverse scenarios. We found that observers' CJ increased over time despite changes in scenario content and differences in observers' CJ performance. Future research is needed to explore how changes in patient status (e.g., urgent versus non-urgent situations) impact observers' CJ over time.

An inherent challenge of evaluating observers' learning is lack of behavioral performance. Because simulation observers do not display their knowledge during the scenario for faculty to see in action, it is difficult to predict how observers will transfer learning to future patients in simulation or traditional clinical settings. Asynchronous simulation followed by an in-person experience provides the best opportunity for faculty to evaluate how observers transfer learning. Novice nurses demonstrate more CJ than their peers who did not observe asynchronous simulation previously (Franklin & Lee, 2014); further, novice nurses demonstrate more CJ and transfer learning to a new scenario when the simulation they observe is complex (Hallin et al., 2016). Interestingly, observers may not administer key interventions more quickly than a control group of peers who do not observe simulation before active participation either when the observation simulation is the same as the subsequent simulation (LeFlore et al., 2007) or different (Livsey & Lavender-Stott, 2015). We know observers utilize CJ differently depending on the scenario context (Price et al., 2017; Zulkosky et al., 2016), but other observer-related variables may be at play to explain variation in how observers transfer learning. Theoretically, knowledge of the patient response and previous experience should improve CJ (Cappelletti et al., 2014; Tanner, 2006). It is possible that the differences in how observers transfer learning can be explained by CL (Rogers & Franklin, 2021) or situational awareness (Stubbings et al., 2012). There is a dearth of evidence triangulating CL and situational awareness with behavioral performance.

Future Research with Asynchronous Simulation

The American Association for the Colleges of Nursing (AACN) *Vision for Nursing Education* calls for transforming nursing education and shifting the focus from knowledge to competencies (AACN, 2021). Of particular note, CJ is a primary focus in the vision statement. AACN‘s shift from “knowing” to “doing” parallels Miller’s Pyramid of Clinical Competence (Miller, 1990) and echoes seminal challenges for nursing education innovation (Benner et al., 2009). AACN suggests nursing schools incorporate active teaching strategies, design activities for “priming” learning, and allow learning at a personalized pace to meet millennial learners’ needs, match the science of learning, and enhance nursing education. Theoretically, educational interventions develop CJ (Cappelletti et al., 2014). This body of research investigated the effectiveness of observing asynchronous simulation with EM videos and answering CJ prompts in written reflections. This research found the combination of teaching strategies significantly increased novice nurses’ CJ trajectory over time (see Chapter IV). This innovative transformation of simulation delivery has many implications for overcoming clinical site scarcity and increasing simulation capacity. Further, asynchronous simulation can also transform classroom experiences to increase novice nurses' CJ. Future studies should investigate asynchronous simulation learning outcomes in response to AACN's call for transforming nursing education to understand how video content and participant characteristics impact CJ.

Participant Characteristics

Future Research Related to Cognitive Load and Simulation Outcomes

Cognitive load may explain differences in learning outcomes between simulation observers and active participants. The medical literature is replete with studies investigating CL, but this concept is newly emerging in nursing simulation literature (see Chapter III; Rogers & Franklin, 2021). Only one previous study investigated the effect of observing EM videos prior to simulation, and researchers found no significant reduction in CL (Josephsen, 2018). We know CL impacts how novice nurses notice cues (Amster et al., 2015; Browning et al., 2016; Henneman et al., 2017; Shinnick, 2016), process cues (Al-Moteri et al., 2019; Blondon et al., 2017), and respond to clinical situations (Amster et al., 2015; Blondon et al., 2017; Henneman et al., 2017). The medical literature explains a parabolic relationship where when CL is too high, CJ is often low (Fraser et al., 2015). In our study, low performers missed salient clues, had knowledge gaps, and could not formulate an appropriate approach to clinical situations (see Chapter IV). Therefore, it follows that our low performers likely experienced either minimal CL and therefore lacked attention or too much CL which limited CJ (Fraser et al., 2015). An important future direction of this line of research is to triangulate CL with asynchronous simulation using EM videos to offer explanations for novice nurses' CJ differences. Potential impacts of this line of research include new approaches to simulation preparation to optimize CL (see Chapter III; Rogers & Franklin, 2021) and focus novice nurses' attention during observation (O'Reagan et al., 2016).

There are many tools available for measuring CL. Researchers use the NASA-TLX most often in nursing simulation research because it is easy to administer and has good reliability (Hoonakker et al., 2011). This tool is practical for comparing CL between simulation observers and active participants; researchers frequently administer the NASA-TLX after simulation and before debriefing. Adding data collection points during simulation and after debriefing could add depth to existing literature (see Chapter III; Rogers & Franklin, 2021).

There is an emerging body of literature measuring time-to-task as a proxy for CL (Cooper et al., 2010; Shinnick, 2016; Shinnick & Cabrera-Mino, 2021; White et al., 2021). Time-to-task describes how long nurses take to respond to cues. Time-to-task has promise with active simulation participants owing to the fact that increased CL slows nurses' response (Cooper et al., 2010; Shinnick, n.d.) and integration of new knowledge in simulation (White et al., 2021). Time-to-task may represent the intersection of CJ and CL. Therefore, future studies should include both CL and time-to-task with measures of novice nurses' CJ to add to simulation literature explaining novice nurses' characteristics and simulation outcomes.

Future Research Linking Nurses' Background to Simulation Outcomes

Because previous experience optimizes CL, it is important to consider how experience explains simulation outcomes. Expert nurses report less CL in simulation compared to novice nurses (see Chapter III; Rogers & Franklin, 2021). Theoretically, expert nurses use long-term memory to recognize salient information and respond appropriately (Cappelletti et al., 2014) with less mental effort in most situations (Fraser et al., 2015). There is mixed evidence in the literature about the impact of CL on CJ. Importantly, expert nurses make accurate CJs in non-urgent simulations (Cabrera-Mino et al., 2019; Shinnick, 2016) and perform skills under pressure with less CL (Kataoka et al., 2008; Kataoka et al., 2011). However, not all expert nurses demonstrate good CJ in simulation (Al-Moteri et al., 2019; Yang et al., 2012); elements of simulation design including fidelity may negatively impact expert nurses' simulation buy-in and explain poor CJ outcomes (see Chapter III; Rogers & Franklin, 2021). Our sample of novice nurses had minimal previous experience and yet demonstrated improved CJ (see Chapter IV). This body of research adds to the literature related to CJ outcomes after in-person simulation (Bussard, 2018). Future studies with diverse novice nurse samples are needed to understand how background experience impacts CL and CJ.

Participant Outcomes

Future Research with the Lasater Clinical Judgment Rubric

Simulation develops the cognitive learning domain (Cantrell et al., 2017; Lee & Oh, 2015). Novice nurses who observe simulation achieve desired cognitive learning objectives (see Chapters II and IV). As a result of this body of research, we can confidently use the LCJR to measure observers' CJ. To use the LCJR most effectively, it is important to individualize scenario-specific descriptors for each LCJR item and ability level. Novice nurses' written responses to CJ prompts allowed us to recognize their CJ and differentiate ability level. For example, high-performing novice nurses often wrote about communication strategies, standards of care, priority setting, and interventions. Qualitative analysis helped the authors explain novice nurses' CJ in terms of knowledge, thinking, and approach to nursing care. Low-performing novice nurses often revealed knowledge gaps, misconceptions, cognitive biases, and an inability to process multiple pieces of information in written responses. Future studies using mixed methods with the LCJR are needed to explore novice nurses' CJ in different contexts.

Clinical judgment requires nurses to notice salient cues, interpret their meaning, respond to cues appropriately, and reflect on the effectiveness of interventions. Novice nurses have difficulty noticing cues, determining relevance of cues, and setting priorities (Burbach & Thompson, 2014; Rogers & Franklin, 2020). Lack of previous experience (Cappelletti et al., 2014), simulation design (see Chapter III; Rogers & Franklin, 2020), role assignment (Price et al., 2017; Zulkosky et al., 2016) and CL (see Chapter III; Rogers & Franklin, 2020) impact the way novice nurses interpret cues. This body of research fills an important gap in the literature related to simulation observers' reflection abilities, which are critical to developing CJ (Cappelletti et al., 2014). We know observing simulation promotes vicarious learning (Bonnel & Hober, 2016) and knowledge development (Johnson, 2019). Using the LCJR helped us uncover how high-performing novice nurses *reflect-on-action* differently from their lower-performing peers. It is possible the novice nurses' reflection skills may differ in the context of observing flawed (i.e., student) verses near-flawless (i.e., expert) behavior. Future research comparing reflection-on-action in the context of flawed and near-flawless observation is needed to shape teaching strategies.

Towards Rigor in Measuring Clinical Judgment

This body of research fills a gap in CJ literature because we utilized a relatively large sample in which all participants were observers. Previous studies comparing active participants and observers often lack a large enough sample to analyze outcomes by performance groups. We know simulation observers and active participants gain similar knowledge of holistic nursing care (Fluharty et al., 2012; Kaplan et al., 2012) and that they have similar comprehension (Johnson, 2019; Nilsson et al., 2014; Scherer et al., 2016), and CJ (Bates et al., 2019). However, small sample sizes limit generalization of findings.

In terms of research design, it is common for researchers to manipulate observer versus active participant role assignment and its impact on CJ. Researchers who use the same scenario (e.g., observe first and then actively perform; Livsey & Lavender-Stott, 2015; Scherer et al., 2016) may unintentionally measure how novice nurses' mimic their peers instead of how they transfer learning. Researchers who use different scenarios likely capture how novice nurses transfer learning more accurately (Baxter et al., 2012; Hallin et al., 2016). The literature is not clear about whether observing first improves CJ (Baxter et al., 2012; Hallin et al., 2016; Livsey & Lavender-Stott, 2015; Scherer et al., 2016). Validity limitations make it difficult to explain conflicting results. Rigorous investigations with large samples and longitudinal designs will improve our understanding of observers' and active participants' learning outcomes.

Recommendations for Education

Include Observation Roles in Simulation Design

This research provides strong evidence that observation is an effective teaching strategy. Our findings confront assumptions that novice nurses must be active participants to learn. Importantly, novice nurses demonstrated more CJ regardless of performance group. Thus, our recommendation is that educators include observation roles to increase the capacity of simulation programs.

Consider Cognitive Load When Designing Simulations

Cognitive load is often overlooked as an explanation for difficulties in learning and simulation outcomes. Too often, nurse educators criticize novice nurses for not bringing forward knowledge from previous semesters. Furthermore, novice nurses are frequently unable to perform skills or implement plans of care independently in simulation or traditional clinical. Novice nurses often miss important clues or fail to perform key interventions, despite simulation preparation and pre-briefing. Cognitive load may explain performance gaps. Novice nurses are more susceptible to experiencing increased CL, thereby reducing their capacity for learning and processing information during simulation. We recommend nurse educators keep CL in mind when designing simulation experiences.

Utilize Asynchronous Expert Modeling Videos to Increase Clinical Judgment in Classroom, Clinical, and Simulation Settings

This research provided important first steps to quantify novice nurses' CJ after observing EM videos and before debriefing. Not only does this body of research add to simulation literature, but findings also apply to classroom and clinical experiences. Educators should use EM videos as a teaching strategy to provide novice nurses with opportunities to think at the application, analysis, and synthesis levels of Bloom's taxonomy. Furthermore, EM videos should help novice nurses respond more accurately to NCLEX-style questions. Used in clinical experiences, EM videos paired with reflective journals may allow nurse educators to evaluate how novice nurses meet clinical objectives. EM videos reduce random access to clinical experiences. Therefore, we recommend nurse educators design and record EM videos mapped to course objectives in classroom, clinical, and simulation settings.

Evaluate Novice Nurses' Clinical Judgment Trajectories

Finally, themes of this body of research relate to the importance of reliably monitoring simulation learning outcomes and evaluating CJ development over time. The LCJR is reliable when used with written reflections after asynchronous simulation. Further, asynchronous simulation is feasible in terms of time required by educators and novice nurses. It is important to evaluate CJ development to ensure novice nurses gain the necessary knowledge, skills, and attitudes for safe independent practice. Therefore, we recommend nurse educators track CJ progress throughout the curriculum to ensure novice nurses have appropriate CJ at graduation.

Conclusion

The purpose of this body of work was to describe the consequences of simulation design decisions that increase simulation capacity and investigate the relationship between simulation participant characteristics and novice nurses' CJ. Findings from this body of work provide evidence that simulation observers' CJ increases over time. This work adds to the literature related to simulation design and participant learning outcomes. By synthesizing the literature on nurses' CL in simulation, this work also adds to the literature related to participant characteristics and learning outcomes. Further, our findings about observers' knowledge, thinking, and approach to nursing care inform everyday simulation teaching and lay a foundation for asynchronous EM videos to increase simulation program capacity. Finally, this work supports use of the LCJR to score written reflections after asynchronous simulation. Together, this body of work informs nurse educators' simulation design decisions and increases simulation opportunities in classroom, clinical, and simulation settings.

References

AACN. (2020). *AACN Fact Sheet - Nursing Shortage*. https://www.aacnnursing.org/news-information/fact-sheets/nursing-shortage

AACN. (2021). *AACN's Vision for Nursing Education*. https://www.aacnnursing.org/News-Information/Position-Statements-White-Papers/Vision-for-Nursing-Education

Adamson, K. (2016). Rater bias in simulation performance assessment: examining the effect of participant race/ethnicity. *Nursing Education Perspectives*, *37*(2), 78–82. https://doi.org/10.5480/15-1626

Adamson, Katie A., & Kardong-Edgren, S. (2012). A method and resources for assessing reliability of simulation evaluation instruments. *Nursing Education Perspectives*, *33*(5), 334–339. https://doi.org/10.5480/1536-5026-33.5.334

Adamson, Katie Anne, Gubrud, P., Sideras, S., & Lasater, K. (2012). Assessing the reliability, validity, and use of the Lasater Clinical Judgment Rubric: Three approaches. *Journal of Nursing Education*, *51*(2), 66–73. https://doi.org/10.3928/01484834-20111130-03

Al-Dossary, R., Kitsantas, P., & Maddox, P. J. (2014). The impact of residency programs on new nurse graduates' clinical decision-making and leadership skills: A systematic review. *Nurse Education Today*, *34*(6), 1024–1028. https://doi.org/10.1016/j.nedt.2013.10.006

Al-Moteri, M., Cooper, S., Symmons, M., & Plummer, V. (2019). Nurses' cognitive and perceptual bias in the identification of clinical deterioration cues. *Australian Critical Care: Official Journal Of The Confederation Of Australian Critical Care Nurses*. https://doi.org/10.1016/j.aucc.2019.08.006

Alexander, E. (2020). Purposeful simulation role assignment. *Clinical Simulation in Nursing*, *48*, 1–7. https://doi.org/10.1016/j.ecns.2020.07.008

Amster, B., Marquard, J., Henneman, E., & Fisher, D. (2015). Using an eye tracker during medication administration to identify gaps in nursing students' contextual knowledge. *Nurse Educator*, *40*(2), 83–86. https://doi.org/10.1097/NNE.0000000000000097

Bates, T. A., Moore, L. C., Greene, D., & Cranford, J. S. (2019). Comparing outcomes of active student and observer roles in nursing simulation. *Nurse Educator*, *44*(4), 216–221. https://doi.org/10.1097/NNE.0000000000000603

Baxter, P., Akhtar-Danesh, N., Landeen, J., & Norman, G. (2012). Teaching critical management skills to senior nursing students: Videotaped or interactive hands-on instruction? *Nursing Education Perspectives*, *33*(2), 106–110. https://doi.org/10.5480/1536-5026-33.2.106

Benner, P., Sutphen, M., Leonard, V., & Day, L. (2009). *Educating nurses : A call for radical transformation* (1st ed.). Josey-Bass.

Blondon, K. S., Maître, F., Muller-Juge, V., Bochatay, N., Cullati, S., Hudelson, P., Vu, N. V, Savoldelli, G. L., & Nendaz, M. R. (2017). Interprofessional collaborative reasoning by residents and nurses in internal medicine: Evidence from a simulation study. *Medical Teacher, 39*(4), 360–367. https://doi.org/10.1080/0142159X.2017.1286309

Bonnel, W., & Hober, C. (2016). Optimizing the reflective observer role in high-fidelity patient simulation. *Journal of Nursing Education*, *55*(6), 353–356. https://doi.org/10.3928/01484834-20160516-10

Bradley, C. S., Johnson, B. K., Dreifuerst, K. T., White, P., Conde, S. K., Meakim, C. H., Curry-Lourenco, K., & Childress, R. M. (2019). Regulation of simulation use in United States prelicensure nursing programs. *Clinical Simulation In Nursing*, *33*, 17–25. https://doi.org/10.1016/j.ecns.2019.04.004

Bratt, M. M., & Felzer, H. M. (2011). Perceptions of professional practice and work environment of new graduates in a nurse residency program. *Journal of Continuing Education in Nursing*, *42*(12), 559–568. https://doi.org/10.3928/00220124-20110516-03

Browning, M., Cooper, S., Cant, R., Sparkes, L., Bogossian, F., Williams, B., O'Meara, P., Ross, L., Munro, G., & Black, B. (2016). The use and limits of eye-tracking in high-fidelity clinical scenarios: A pilot study. *International Emergency Nursing*, *25*, 43–47. https://doi.org/10.1016/j.ienj.2015.08.002

Burbach, B. E., & Thompson, S. A. (2014). Cue recognition by undergraduate nursing students: an integrative review. *The Journal of Nursing Education*, *53*(9), S73–S81. https://doi.org/10.3928/01484834-20140806-07

Bussard, M. (2015). The nature of clinical judgment development in reflective journals. *Journal of Nursing Education*, *54*(8), 451–454. https://doi.org/10.3928/01484834-20150717-05

Bussard, M. E. (2018). Evaluation of clinical judgment in prelicensure nursing students. *Nurse Educator*, *43*(2), 106–108. https://doi.org/10.1097/NNE.0000000000000432

Cabrera-Mino, C., Shinnick, M. A., & Moye, S. (2019). Task-Evoked Pupillary Responses in Nursing Simulation as an Indicator of Stress and Cognitive Load. *Clinical Simulation in Nursing*, *31*, 21–27. https://doi.org/10.1016/j.ecns.2019.03.009

Cantrell, M. A., Franklin, A., Leighton, K., & Carlson, A. (2017). The evidence in simulation-based learning experiences in nursing education and practice: An umbrella review. *Clinical Simulation in Nursing*, *13*(12). https://doi.org/10.1016/j.ecns.2017.08.004

Cappelletti, A., Engel, J. K., & Prentice, D. (2014). Systematic review of clinical judgment and reasoning in nursing. *Journal of Nursing Education*, *53*(8), 453–458. https://doi.org/10.3928/01484834-20140724-01

Cazzell, M., & Anderson, M. (2016). The Impact of Critical Thinking on Clinical Judgment

During Simulation With Senior Nursing Students. *Nursing Education Perspectives*, *37*(2), 83–90. https://doi.org/10.5480/15-1553

Cooper, S., Kinsman, L., Buykx, P., McConnell-Henry, T., Endacott, R., & Scholes, J. (2010). Managing the deteriorating patient in a simulated environment: Nursing students' knowledge, skill and situation awareness. *Journal of Clinical Nursing*, *19*(15–16), 2309–2318. https://doi.org/10.1111/j.1365-2702.2009.03164.x

Coram, C. (2016). Expert role modeling effect on novice nursing students' clinical judgment. *Clinical Simulation in Nursing*, *12*(9), 385–391. https://doi.org/10.1016/j.ecns.2016.04.009

Del Bueno, D. (2005). A crisis in critical thinking. *Nursing Education Perspectives*, *26*(5), 278–282.

Delisle, M., Ward, M. A. R., Pradarelli, J. C., Panda, N., Howard, J. D., & Hannenberg, A. A. (2019). Comparing the learning effectiveness of healthcare simulation in the observer versus active role: Systematic review and meta-analysis. *Simulation in Healthcare*, *14*(5). https://doi.org/10.1097/SIH.0000000000000377

Dickison, P., Haerling, K. A., & Lasater, K. (2019). Integrating the National Council of State Boards of Nursing Clinical Judgment Model into n nursing educational frameworks. *Journal of Nursing Education*, *58*(2), 72–78. https://doi.org/10.3928/01484834-20190122-03

Fedko, A. S., & Dreifuerst, K. T. (2017). Examining the relationship between clinical judgment and nursing actions in prelicensure students. *Nurse Educator*, *42*(1), 47–50. https://doi.org/10.1097/NNE.0000000000000290

Fenske, C. L., Harris, M. A., Aebersold, M. L., & Hartman, L. S. (2013). Perception versus reality: A comparative study of the clinical judgment skills of nurses during a simulated activity. *Journal of Continuing Education in Nursing*, *44*(9), 399–405. https://doi.org/10.3928/00220124-20130701-67

Ferguson, N. F., & Estis, J. M. (2018). Training students to evaluate preterm infant feeding safety using a video-recorded patient simulation approach. *American Journal of Speech-Language Pathology*, *27*(2), 566–573. https://doi.org/10.1044/2017_AJSLP-16-0107

Fisher, D., & King, L. (2013). An integrative literature review on preparing nursing students through simulation to recognize and respond to the deteriorating patient. *Journal of Advanced Nursing*, *69*(11), 2375–2388. https://doi.org/10.1111/jan.12174

Fluharty, L., Hayes, A. S., Milgrom, L., Malarney, K., Smith, D., Reklau, M. A., Jeffries, P., & McNelis, A. M. (2012). A multisite, multi-academic track evaluation of end-of-life simulation for nursing education. *Clinical Simulation in Nursing*, *8*(4). https://doi.org/10.1016/j.ecns.2010.08.003

Franklin, A. E., & Lee, C. S. (2014). Effectiveness of simulation for improvement in self-efficacy among novice nurses: A meta-analysis. *Journal of Nursing Education*, *53*(11), 607–614. https://doi.org/10.3928/01484834-20141023-03

Fraser, K. L., Ayres, P., & Sweller, J. (2015). Cognitive Load Theory for the design of medical simulations. *Simulation in Healthcare*, *10*(5). https://doi.org/10.1097/SIH.0000000000000097

Hallin, K., Bäckström, B., Häggström, M., & Kristiansen, L. (2016). High-fidelity simulation: Assessment of student nurses’ team achievements of clinical judgment. *Nurse Education in Practice*, *19*, 12–18. https://doi.org/10.1016/j.nepr.2016.03.010

Hayden, J., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Regulation Nursing*, *5*(2), S3–S40. https://doi.org/https://doi.org/10.1016/S2155-8256(15)30062-4

Henneman, E. A., Gawlinski, A., Nicholas, C., McAfee, K., Marquard, J. L., & Jr.Andrzejewski, C. (2017). Identification of transfusion-associated circulatory overload: An eye-tracking study. *Clinical Simulation in Nursing*, *13*(12), 675–679. https://doi.org/10.1016/j.ecns.2017.05.004

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high-fidelity simulation. *Clinical Simulation in Nursing*, *10*(10), 507–514. https://doi.org/10.1016/j.ecns.2014.07.008

Hoonakker, P., Carayon, P., Gurses, A., Brown, R., McGuire, K., Khunlertkit, A., & Walker, J. M. (2011). Measuring workload of ICU nurss with a questionnaire survey: The NASA Task Load Index (TLX). *IIE Transactions on Healthcare Systems Engineering*, *1*(2), 131–143. https://doi.org/10.1080/19488300.2011.609524

Huun, K. (2018). Virtual simulations in online nursing education: Align with quality matters. *Clinical Simulation in Nursing*, *22*, 26–31. https://doi.org/10.1016/j.ecns.2018.07.002

Ironside, P. M., McNelis, A. M., & Ebright, P. (2014). Clinical education in nursing: Rethinking learning in practice settings. *Nursing Outlook*, *62*(3), 185–191. https://doi.org/10.1016/j.outlook.2013.12.004

Jayasekara, R., Smith, C., Hall, C., Rankin, E., Smith, M., Visvanathan, V., & Friebe, T. R. (2018). The effectiveness of clinical education models for undergraduate nursing programs: A systematic review. *Nurse Education in Practice*, *29*, 116–126. https://doi.org/10.1016/j.nepr.2017.12.006

Johnson, B. K. (2019). Simulation observers learn the same as participants: The evidence.

Clinical Simulation In Nursing, *33*, 26–34. https://doi.org/10.1016/j.ecns.2019.04.006

Johnson, B. K. (2020). Observational experiential learning: Theoretical support for observer roles in health care simulation. *The Journal of Nursing Education*, *59*(1), 7–14. https://doi.org/10.3928/01484834-20191223-03

Josephsen, J. (2015). Cognitive load theory and nursing simulation: An integrative review. *Clinical Simulation in Nursing*, *11*(5), 259–267. https://doi.org/10.1016/j.ecns.2015.02.004

Josephsen, J. (2018). Cognitive load measurement, worked-out modeling, and simulation. *Clinical Simulation in Nursing*, *23*, 10–15. https://doi.org/10.1016/j.ecns.2018.07.004

Kaplan, B. G., Abraham, C., & Gary, R. (2012). Effects of participation vs. observation of a simulation experience on testing outcomes: Implications for logistical planning for a school of nursing. *International Journal of Nursing Education Scholarship*, *9*(1). https://doi.org/10.1515/1548-923X.14

Kataoka, J, Sasaki, M., & Kanda, K. (2008). Visual behavior differences by clinical experience and alarming sound during infusion pump operation. *Japan Journal of Nursing Science*, *5*(2), 123–129. https://doi.org/10.1111/j.1742-7924.2010.00158.x

Kataoka, Jun, Sasaki, M., & Kanda, K. (2011). Effects of mental workload on nurses' visual behaviors during infusion pump operation. *Japan Journal of Nursing Science*, *8*(1), 47–56. https://doi.org/10.1111/j.1742-7924.2010.00158.x

Kavanagh, J. M., & Szweda, C. (2017). A crisis in competency: The strategic and ethical imperative to assessing new graduate nurses' clinical reasoning. *Nursing Education Perspectives*, *38*(2), 57–62. https://doi.org/10.1097/01.NEP.0000000000000112

Lasater, K., Nielsen, A. E., Stock, M., & Ostrogorsky, T. L. (2015). Evaluating the clinical judgment of newly hired staff nurses. *Journal of Continuing Education in Nursing*, *46*(12), 563–571. https://doi.org/10.3928/00220124-20151112-09

Lee, J., & Oh, P. J. (2015). Effects of the use of high-fidelity human simulation in nursing education: A meta-analysis. *Journal of Nursing Education*, *54*(9), 501–507. https://doi.org/10.3928/01484834-20150814-04

LeFlore, J. L., Anderson, M., Michael, J. L., Engle, W. D., & Anderson, J. D. (2007). Comparison of self-directed learning versus instructor-modeled learning during a simulated clinical experience. *Simulation in Healthcare*, *2*(3), 170–177. https://doi.org/10.1097/SIH.0b013e31812dfb46

Lioce, L. (ed.), Downing, D., Chang, T. P., Robertson, J. M., Anderson, M., Diaz, D. A., Spain, A. E. (Assoc. E. ., & Terminology and Concepts Working Group. (2020). *Healthcare simulation dictionary- 2nd edition*. https://doi.org/10.23970/simulationv2

Lioce, Lori, Meakim, C. H., Fey, M. K., Chmil, J. V., Mariani, B., & Alinier, G. (2015). Standards of best practice: Simulation standard IX: Simulation design. *Clinical Simulation in Nursing*, *11*(6), 309–315. https://doi.org/10.1016/j.ecns.2015.03.005

Livsey, K., & Lavender-Stott, E. (2015). Impact of vicarious learning through peer observation during simulation on student behavioural measures. *Focus on Health Professional Education: A Multi-Professional Journal*, *16*(4), 64. https://doi.org/10.11157/fohpe.v16i4.99

Miller, G. E. (1990). The assessment of clinical skills/competence/performance. *Academic Medicine*, *65*(9), S63–S67. https://doi.org/10.1097/00001888-199009000-00045

Nilsson, C., Sørensen, B. L., & Sørensen, J. L. (2014). Comparing hands-on and video training for postpartum hemorrhage management. *Acta Obstetricia et Gynecologica Scandinavica*, *93*(5), 517–520. https://doi.org/10.1111/aogs.12372

NLN. (2021). *Biennial Survey of Schools of Nursing, Academic Year 2017-2018*.

O'Regan, S., Molloy, E., Watterson, L., & Nestel, D. (2016). Observer roles that optimise learning in healthcare simulation education: a systematic review. *Advances in Simulation*, *1*(1), 1–10. https://doi.org/10.1186/s41077-015-0004-8

Price, A., Zulkosky, K., White, K., & Pretz, J. (2017). Accuracy of intuition in clinical decision-making among novice clinicians. *Journal of Advanced Nursing*, *73*(5), 1147–1157. https://doi.org/10.1111/jan.13202

Rogers, B. A., & Franklin, A. E. (2021). Cognitive load experienced by nurses in simulation-based learning experiences: An integrative review. *Nurse Education Today*, *In press*. https://doi.org/10.1016/j.nedt.2021.104815

Rogers, B., Baker, K. A., & Franklin, A. E. (2020). Learning outcomes of the observer role in nursing simulation: A scoping review. *Clinical Simulation in Nursing*, *49*, 81–89. https://doi.org/10.1016/j.ecns.2020.06.003

Scherer, Y. K., Foltz-Ramos, K., Fabry, D., & Chao, Y. Y. (2016). Evaluating simulation methodologies to determine best strategies to maximize student learning. *Journal of Professional Nursing*, *32*(5), 349–357. https://doi.org/10.1016/j.profnurs.2016.01.003

Shadadi, H., Sheyback, M., Balouchi, A., & Shoorvazi, M. (2018). The barriers of clinical education in nursing: A systematic review. *Biomedical Research (India)*, *29*(19), 3616–3623. https://doi.org/10.4066/biomedicalresearch.29-18-1064

Sharpnack, P. A., Goliat, L., Baker, J. R., Rogers, K., & Shockey, P. (2013). Thinking like a nurse: Using video simulation to rehearse for professional practice. *Clinical Simulation in Nursing*, *9*(12), e571–e577. https://doi.org/10.1016/j.ecns.2013.05.004

Shinnick, M. A. (n.d.). Time-to-task validation in sequential simulations as a component of nursing student competency. *Nurse Educator, In press*. https://doi.org/10.1097/nne.0000000000000898

Shinnick, M. A. (2016). Validating eye tracking as an objective assessment tool in simulation. *Clinical Simulation in Nursing*, *12*(10), 438–446. https://doi.org/10.1016/j.ecns.2016.06.001

Shinnick, M. A., & Cabrera-Mino, C. (2021). Predictors of nursing clinical judgment in simulation. *Nursing Education Perspectives*, *42*(2), 107–109. https://doi.org/10.1097/01.NEP.0000000000000604

Shinnick, M. A., & Woo, M. (2020). Comparison of simulation assessments: Can they identify novice/student nurses? *Clinical Simulation in Nursing*, *46*, 40–49. https://doi.org/10.1016/j.ecns.2020.04.002

Smiley, R. A. (2019). Survey of simulation use in prelicensure nursing programs: changes and advancements, 2010- 2017. *Journal of Nursing Regulation*, *9*(4), 48–61. https://doi.org/10.1016/S2155-8256(19)30016-X

Stubbings, L., Chaboyer, W., & McMurray, A. (2012). Nurses' use of situation awareness in decision-making: An integrative review. *Journal of Advanced Nursing*, *68*(7), 1443–1453. https://doi.org/10.1111/j.1365-2648.2012.05989.x

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (Suzie). (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: A study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing*, *30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, *45*(6), 204–211. https://doi.org/10.3928/01484834-

20060601-04

Victor-Chmil, J., & Larew, C. (2013). Psychometric properties of the Lasater Clinical Judgment Rubric. *International Journal of Nursing Education Scholarship*, *10*(1), 30. https://doi.org/10.1515/ijnes-2012-0030

White, A., Maguire, M. B. R., Brannan, J., & Brown, A. (2021). Situational awareness in acute patient deterioration. *Nurse Educator*, *46*(2). https://doi.org/10.1097/nne.0000000000000968

Yang, H., Thompson, C., & Bland, M. (2012). The effect of clinical experience, judgment task difficulty and time pressure on nurses' confidence calibration in a high fidelity clinical simulation. *BMC Medical Informatics & Decision Making*, *12*(1), 113. https://doi.org/10.1186/1472-6947-12-113

Zhang, X., Tai, D., Pforsich, H., & Lin, V. W. (2018). United States Registered Nurse Workforce Report Card and Shortage Forecast: A Revisit. *American Journal of Medical Quality*, *33*(3), 229–236. https://doi.org/10.1177/1062860617738328

Zulkosky, K. D., White, K. A., Price, A. L., & Pretz, J. E. (2016). Effect of simulation role on clinical decision-making accuracy. *Clinical Simulation in Nursing*, *12*(3), 98–106. https://doi.org/10.1016/j.ecns.2016.01.007

Appendix A

Key Elements to Report in Simulation Research as defined by Cheng et al. (2016)

Elements	**Sub-elements**	**Descriptor**
Participant orientation	Orientation to simulator	Students participated in a virtual group orientation at the start of the semester and were oriented on how to access the online videos.
	Orientation to the environment	Faculty provided orientation to the learning management system and Qualtrics platform for answering clinical judgment prompts.
Simulator type	Simulation make and model	Five scenarios involved a high-fidelity Gaumard manikin. Three scenarios involved an embedded participant.
	Simulator functionality	High-fidelity manikins have palpable pulses, heart sounds, lung sounds, bowel sounds, chest rise, eye blinking, wireless streaming audio, blinking, and a touchscreen vital signs monitor.
Simulation environment	Location	Videos were filmed in our simulation center with double patient rooms, a separate medication room, and central control room
	Equipment	Electronic health record, medication room stocked with supplies for students to choose from, Pyxis medication dispense system, simulation phone system, Alaris IV pumps, AV system
	External stimuli	It is possible that students had to deal with environmental noise dependent upon where they observed the EM videos. In the simulation room, external stimuli come from the sequential compression device (SCD), IV pump, and the patient voice.
Simulation event/scenario	Event description	Students read simulation preparation materials prior to watching EM videos (e.g., patient summary, provider orders, policy and procedures, and related articles). There was no pre-briefing prior to watching the videos. After watching each video, students responded to 11 clinical judgment prompts in Qualtrics (see Table 4.1). There were eight EM videos:

		1. Care of a manikin patient on a med/surg floor who is diabetic and experiences a clot in the popliteal artery and has ulcerations of the foot. He reports a high pain level and needs pain medicine. The patient is scheduled for a femoral-popliteal bypass surgery, and the nurse discovers the patient does not fully understand his procedure. 2. Care of an embedded participant on a med/surg floor who recently attempted suicide by overdosing on acetaminophen. The patient experiences nausea and is unable to keep PO N-acetylcysteine down. The scenario also requires decisions about insulin administration. 3. Care of a manikin patient on a med/surg floor who has appendicitis who recently had an emergency appendectomy. The patient experiences pain and receives IV antibiotics. 4. Care of an embedded participant in a long-term care facility who has Crohn's Disease after a bowel resection. The patient also has bipolar disorder and has not been receiving her mood stabilizer medications due to a miscommunication during transfer between facilities. The patient experiences a manic episode and requires rescue medications. 5. Care of an embedded participant in a home health setting. The patient experiences a congestive heart failure exacerbation related to medication non-adherence in the setting of depression after death of their spouse. The nurse plans medication teaching and changes priorities to safety after discovering the patient is suicidal. 6. Care of a manikin transgender patient on a med/surg floor who has an embedded participant plays the role of a family member. The patient experiences hypoxia, requires IV antibiotics, and needs a testosterone injection. 7. Care of a manikin patient on a med/surg floor who has a congestive heart failure exacerbation. The patient requires oxygen titration, IV medications, and education.

		8. Care of a manikin patient on a med/surg floor who has anaphylaxis related to IV antibiotics. Shortly after the scenario begins, the patient experiences shortness of breath, wheezing, decreased O2 saturation, swelling of the tongue, and hives. The nurse stops the antibiotics and receives orders for Benadryl, epinephrine, fluid bolus, albuterol treatment, and methylprednisolone.
	Learning objectives	Scenario 1: 1. Conduct a focused assessment of a pre-operative patient 2. Respond to patient-specific physical and emotional needs related to surgical procedure 3. Provide pain management 4. Conduct pre-op teaching 5. Notify surgeon of additional teaching needs Scenario 2: 1. Complete vital signs and focused physical/emotional assessment 2. Assess safety/suicide risk 3. Develop a client-family centered plan of care 4. Engage in therapeutic communication 5. Advocate for nausea control with medication other than ondansetron 6. Administer medications following institutional policies & procedures Scenario 3: 1. Implement Post-op Standard of Care 2. Identify need for pain assessment and management 3. Administer medications following institutional policies & procedures 4. Address patient's concerns with emotional support and/or teaching 5. Begin discharge teaching (early mobilization, pain control, bowel routine, caution lifting>10 lbs or straining, incision care) Scenario 4:

		1. Recognize urgency in management of manic behavior, including safety issues 2. Call for help (e.g., charge nurse, another nurse/tech for safety) 3. Communicate with patient in a therapeutic manner 4. Address medication reconciliation gap using SBAR 5. Determine future plan and interprofessional resources needed (e.g., SW, OT, PT, pharmacy) Scenario 5: 1. Assess environmental safety 2. Notice patient's demeanor and respond appropriately to develop rapport and ensure safety 3. Assess vital signs and respiratory status 4. Investigate gaps in services 5. Develop a client-family centered plan of care in terms of suicide-ideation response Scenario 6: 1. Complete vital signs and ~~a~~ focused physical assessment 2. Treat oxygen desaturation either non-pharmacologically or pharmacologically 3. Demonstrate appropriate culturally competent care and communication related to gender transition 4. Apply principles of isolation precautions to client care 5. Assess client understanding about pneumonia, smoking, and lung disease Scenario 7: 1. Perform focused assessment of respiratory and cardiac systems 2. Identify symptoms of dyspnea and fluid volume overload 3. Consider appropriateness of continuous IV fluid orders 4. Administer medications following institutional policies & procedures

		Scenario 8: 1. Prioritize focused physical assessment on respiratory symptoms 2. Identify signs and symptoms of allergic reaction 3. Stop antibiotics, 4. Use SBAR to communicate allergic reaction symptoms on the phone 5. Provide safe patient care 6. Administer medications following institutional policies & procedures
	Group versus individual	There is one nurse in each EM video.
	Use of adjuncts	Scenario 1: Patient had a moulage saline lock IV site. The right leg had small ulcers, edema, dusky appearance, and a larger ulcer on his heel. No dressings required. Scenario 2: Patient had a moulage IV site with IV fluids running at 50 mL/hr. The embedded participant wore a gown with charcoal (dark makeup) on her cheek and hand. The scenario began with the patient laying in a dark room with a blanket and pillow over her face. The patient did not make eye contact when speaking with the nurse. Scenario 3: Patient had a moulage IV site with IV fluids running at 100 mL/hr, Moulage included a 3-inch horizontal incision on the abdomen with sutures in RLQ covered by a dressing. There was a JP drain with 30 mL of serosanguinous drainage. The patient had a Foley catheter with 100 mL yellow urine. Scenario 4: The room was an acute care simulation room, but the bed was flat. There was a bedside commode, and a walker tipped over. The patient monitor was not used for vital signs. Instead, a Dynamap was available to

		gather vitals. The scenario began with the embedded participant sitting on the side of the bed swinging her legs vigorously, flipping through a magazine quickly, with rapid, flighty speech. Scenario 5: The nurse brought a home health kit with a pulse ox monitor, thermometer, and manual blood pressure cuff. There was a half empty alcohol bottle on the coffee. There were pictures of a couple from the 1950s and pictures of grandkids too. The room was disheveled, and there were lots of salty food wrappers, fast food wrappers, and medication bottles throughout the room. The patient used an oxygen E-tank on wheels with extended nasal cannula tubing that was tangled on the floor. The room had a rug with a corner turned over that could be a fall hazard. Scenario 6: Patient had a moulage IV site with IV fluids running at 100 mL/hr. Moulage included male facial hair/shadow. There was a "Droplet Precautions" sign on the monitor and an isolation cart outside of the patient room. Scenario 7: Patient had a moulage saline lock IV site. Purewick catheter on perineum with mesh panties on. Catheter comes out top of underwear and gets hooked to suction. Stain the "lower perineum/buttocks" area of the underwear with a few yellow/ dark tea colored spots. The nasal canula was on the forehead. The patient also had salty food wrappers on their bedside table. Scenario 8: Patient had a moulage IV site with IV fluids running at 125 mL/hr. Cefotaxime infusion was running. Patient had hives on chest.

	Facilitator/operator characteristics	One simulation technician with multiple years of experience ~~will~~ operated the manikin and served as the patient voice.
	Pilot testing	The simulation scenarios have been piloted over many years and used for over 5 years. However, the PI reviewed study procedures with all faculty and simulation technicians.
	Simulated patients	For five scenarios, the simulated patient was a high-fidelity manikin. For three scenarios, the nurse interacted with an embedded participant.
Instructional design or exposure	Duration	Each EM video lasted between 15 and 20 minutes.
	Timing	The intervention of interest is observing expert model videos. Students received orientation to the learning management system at the start of the semester. Students were simulation naive. Early in the semester, students watched the first two EM videos before participating in any simulation. Students observed two EM videos and responded to 11 clinical judgment prompts about each video before each simulation day. Students worked in teams of 2-3 to provide care for a simulation patient on each simulation day. The simulation patient was a different clinical context than the EM videos. Faculty facilitated debriefing immediately following in-person simulation. Faculty also facilitated an additional scripted debriefing via Zoom to discuss the EM videos and make connections to live simulation patients. Simulations were designed to support content introduced in concurrent didactic lectures.
	Frequency/repetitions	Students watched two EM videos approximately every two weeks prior to participating in a team simulation. The study occurred over approximately eight weeks of instruction.
	Clinical variation	All students would have participated in the same simulation scenarios in the nursing program. The investigator gathered demographic data to determine if the students have any other previous clinical exposure.

	Assessment	One rater scored students' responses to clinical judgment prompts (see Table 4.1) responses using the Lasater Clinical Judgment Rubric (Appendix D). A second rater scored ten percent of the sample, and the PI calculated inter-rater reliability.
	Range of difficulty	The simulation scenarios were scaffolded to match students' ability. The scenarios involved caring for patients in non-urgent situations early in the semester and then urgent scenarios later in the semester.
	Non-simulation interventions and adjuncts	Students received a large group orientation to the class and simulation environment at the beginning of the semester. Students have multiple simulation orientation videos they watch which introduce use of the patient monitor, preparing medications in the medication room, assessing a patient, and performing ~~of~~ safety checks. They also receive simulation preparation materials on the learning management system.
	Integration	Students lacked previous simulation experience.
Feedback and/or debriefing	Source	No direct feedback was offered to students on clinical judgment prompts. Faculty provided feedback on simulation performance in writing after simulation. Faculty facilitated a scripted Zoom debriefing after simulation to make connections between content from EM videos and team simulation. Zoom debriefing compared and contrasted EM videos with team simulation.
	Duration	In-person debriefing after the team simulation lasted 25 minutes. The scripted Zoom debriefing lasted 45 minutes.
	Facilitator presence	No facilitator was present while students observed EM videos. During ~~the~~ team simulation, the facilitator viewed the scenario remotely by live feed in the control room. During debriefing, the facilitator was present with students.
	Facilitator characteristics	Nurse educators with five or more years of experience in clinical and simulation setting.

	Content	Faculty guided debriefing for EM videos using a scripted to help students achieve learning objectives.
	Structure	Faculty used Socratic questions from a script to guide debriefing for EM videos. The script detailed key learning points and guided students through the stages of reacting, gathering, analyzing, and summarizing the video.
	Timing	Debriefing for EM videos occurred between 4 hours to 7 days after in person simulation.
	Video	Debriefing did not include review of recorded simulation performance.
	Scripting	Scripted feedback prompts are included in Appendix C

Appendix B

Permission to Use LCJR and CJ Prompts

From: Kathie Lasater <lasaterk@ohsu.edu>
Sent: Wednesday, July 15, 2020 10:42 AM
To: Rogers, Beth
Subject: Re: Request of Permission to use the Lasater Clinical Judgment Rubric

Hi Beth,

Thanks for reaching out. I love your idea for observations, which has expanded beyond the Noticing-Interpreting aspects from other studies I've done. You have my permission to follow through on your modified version. Please be sure there is attribution to the original LCJR, such as "Adapted from..."

Just to be clear, the 'making sense of the data' part of Interpreting is trying to get at evidence that supports interpreting. So intuition is certainly one potential, patient evidence is another (I call it 'little e' evidence), research is a third ('big e' evidence). Nothing wrong with the question as you've written it. I suppose one could offer options or combinations of options to students--it depends on how you've taught evidence, clinical judgment, and the Tanner model, I suspect.

Best to you, Kathie

Kathie Lasater, EdD, RN, ANEF, FAAN
Professor Emerita, OHSU School of Nursing
Visiting Professor, Edinburgh Napier University

Kathie Lasater is also Assistant Editor of Nurse Education Today
http://www.nurseeducationtoday.com

From: Rogers, Beth <b.a.rogers@tcu.edu>
Sent: Monday, July 13, 2020 1:55:20 PM
To: Kathie Lasater
Subject: Request of Permission to use the Lasater Clinical Judgment Rubric

Dear Dr. Lasater,

I hope you are having a nice week and staying well. Please accept the attached letter as a request to use the Lasater Clinical Judgment Rubric in my doctoral dissertation research study. The letter contains our intended study idea, a brief overview of our research and the intent for use. I welcome any feedback you have on the study idea. Thank you in advance for your time and consideration.

Thank you,
Beth Rogers

Dear Dr. Lasater,

I hope you are having a nice day and staying well. I am a PhD candidate at Texas Christian University and have enjoyed reading your work on nursing clinical judgment. I have the privilege of working with my mentor, Dr. Ashley Franklin, who is a previous colleague of yours from Oregon Health & Science University. Dr. Franklin and I are currently planning my dissertation study. I am interested in studying the clinical judgment outcomes of pre-licensure nursing students participating in team simulations. More specifically, I want to investigate the feasibility of measuring clinical judgment learning outcomes of students who are placed in the observer role.

To accomplish this investigation, I plan to have nursing students in their first simulation course watch eight expert modeling videos on four different simulation days as part of the simulation prep work. The expert modeling videos were created by the TCU simulation faculty and represent a change in our curriculum to accommodate for physical distancing due to Covid-19. All 70 students in the simulation course will view each expert model video, then observers will type responses to an online clinical judgment quiz, using the 11 open-ended questions you suggested in "*Clinical Judgment: The Last Frontier for Evaluation,*" with slight modifications in wording to reflect observing another nurse's performance (Table 1).

Table 1. Modification of Suggested Open-ended Questions

	Original Question	Modification for Observers
Notice	What did you first notice about the patient?	No Change
	What was different than you expected? Have you seen this before in other patients?	No Change
	What other information would be helpful? How can you get that information?	No Change
Interpret	How did you prioritize the patient information/data? In other words, what was most important for this patient now?	No Change
	On what did you base choice of intervention? If intuition, what kinds of data might offer evidence to support your gut feeling?	How do you think the nurse based her intervention? If intuition, what kinds of data might offer evidence to support a gut feeling?

Respond	What was your approach with the patient? How comfortable did you feel?	What was the nurse's approach with the patient? How comfortable would you be in this situation?
	How do you think you gained the patient's trust? What did you say to the patient? to the family member(s)?	How did the nurse gain the patient's trust? What did she say to the patient? To the family member(s)?
	What factors, including patient feedback, impacted the treatment plan?	No Change
	How did your skill compare to nursing standards of care?	How did the nurse's skill compare to nursing standards of care?
Reflect	What went well? What didn't go as smoothly as you planned? Why or why not?	What went well? What didn't go as smoothly? Why or why not?
	What would you do differently if you had the opportunity?	No Change

To determine feasibility, we will measure how long this process would take as well as determine if we can reliably grade the responses to the questions using the Lasater Clinical Judgment Rubric (LCJR). We plan to use the LCJR in its entirety and do not plan to alter it in any way. Dr. Franklin and I will rate the clinical judgment quiz responses and measure interrater reliability on ten percent of the quizzes. We have already completed some training for the scoring by listening to your podcast describing the LCJR design and development and have also read over 40 articles using the LCJR tool.

If this measurement method is feasible, we will perform an analysis on the clinical judgment scores to describe the trajectory of clinical judgment of observers in team simulations. Furthermore, we plan to investigate the relationship between the clinical judgment scores and individual simulation benchmark performance, as well as other academic, experience, and demographic variables. Finally, we hope to describe the clinical judgment findings by performing thematic analysis of the clinical judgment quiz responses. We hope to begin this work in the Fall of 2020 and have the study completed before May 2021.

This study is innovative because it uses the LCJR in a novel way. The potential impact is that nurse educators might use short answer prompts to help students understand and evaluate their clinical judgment over time. A broader impact of this work is that our potential findings can help nurse educators quantify simulation observers cognitive learning outcomes.

Therefore, I am writing to ask your permission for use of the LCJR for my dissertation study as well as reproduce the instrument in the appendix for publication. Furthermore, I welcome any feedback you may have on my dissertation study idea. Thank you for your time and consideration.

Sincerely,
Beth Rogers, MSN, RN
TCU Nursing PhD Candidate in Health Sciences

Appendix C

Scripted Debriefing Guides

Diabetes Zoom Debriefing Discussion Prompts

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
1	Remember in our live scenario Mr. Davis was a newly diagnosed Type 2 diabetic who was admitted to the hospital for pneumonia. During debriefing, we talked about the importance of checking pulses related to his diabetes. We also said it was important to assess cough and sputum related to his chief complaint.	**Tell me what you think is important to include in a focused assessment for a diabetic.**	○ *BG* ○ *Lungs* ○ *Cardiac* ○ *peripheral circulation* ○ *skin* ○ *GI- diet*	It is important to relate the focused assessment to PMH and chief complaint. Explain how a focused assessment can be a way to prioritize and triage areas most likely to be a concern.
2	Mr. Smith and Mr. Davis both had Type 2 diabetes. I noticed neither had insulin listed as a home medication, but were receiving insulin in the hospital.	**Tell me why do you think this medication was ordered for them?** **How does this affect your patient teaching before giving these medications?**	○ *given to control BG and help healing* ○ *Infection increases BG values* ○ *Won't take them at home, may not know as much about the medications, need to teach major side effects*	When looking at medication list it is important to understand why a patient is receiving the medication so you can teach the patient correctly.
3	I'd like to talk about knowledge of patient lab values. I know we encouraged you to include labs in the SBAR pre-briefing worksheet before simulation.	**Mr. Davis' Hgb A1C was 8.9% what does that lab value tell you**	○ *Long-term (90 day) BG level* ○ *Goal level is 7 for Type 2 Diabetes* ○ *Risk for complications (retinopathy, blood vessel damage, heart disease, kidney, nerves)*	It's important to review lab work and understand how these values guide your decisions.

		How does information from a BG differ from a Hgb A1C?	○ *Fingerstick tells immediate level and helps make decisions about insulin doses* ○ *Hbg A1C tells the effectiveness of treatment therapies and diet management*	
4	I want to redirect our conversation to Ms. Roland. Remember she was a 32-year-old female who attempted suicide by ingesting citalopram and acetaminophen. She had a past medical history of Type 1 Diabetes. In her context the most important labs to notice were the liver enzymes, acetaminophen level, and blood glucose.	**For Ms. Roland, how do her acetaminophen levels and liver enzymes help you prioritize her medications?**	○ *Acetaminophen level (6-= low risk category)* ○ *Roland's acetaminophen level was WNL but her liver enzymes were slightly elevated which tells us that it is important to administer NAC (Mucomyst) to prevent further liver damage and increasing acetaminophen levels*	In some patient care contexts, Blood glucose is not always the most important lab value, you must also consider the chief complaint.
5		**Tell me how you would prioritize Ms. Roland's medications (Her med list includes, Aspart Insulin, NPH Insulin, NAC, Citalopram, Ondansetron, Promethazine)**	Prioritized Problem list ○ *<u>Nausea</u> (Gateway drug to keep NAC down)- Promethazine and Ondansetron* ○ *<u>Safety</u>- NAC for acetaminophen* ○ *<u>Safety-</u> Citalopram* ○ *<u>Glucose Metabolism</u> (because she's not eating)- Insulins- special precaution with long acting NPH)*	
6	I'd like to talk more about interpreting glucose levels and making insulin decisions.	**Ms. Roland was ordered 1 unit of Aspart Insulin by sliding scale. Her Blood sugar was 179.**	○ *Yes- but ok not to rush to give it right now because she's not eating. May be best to wait and see if she can eat.*	Aspart is a rapid insulin and peaks quickly so it is important to consider

		Should the nurse give the Novolog? **She also had 15 Units of NPH Insulin ordered before breakfast. She told the nurse she was nauseous. Should we give the NPH?**	○ *No*	ability to eat within ten minutes of the dose.
7	I'd like to talk about anticipating blood glucose values. When you're considering taking care of several patients with Diabetes it's helpful to anticipate which ones are at the highest risk of hypoglycemia. Remember Mr. Davis was taking Metformin, Mr. Shaw was taking Aspart, and Ms. Roland was taking Aspart and NPH.	**After each patient has had their morning medications, who do you think is at the biggest risk for hypoglycemia?** **What symptoms of hypoglycemia would you watch for?**	Prioritized risk for hypoglycemia 1. *Roland (highest)* 2. *Smith* 3. *Davis (lowest)*	

			Cold, shaky, headache, confusion, shaky, irritable, decreased level of consciousness *"Cold and clammy need some candy, warm and dry sugar high"*	
8	I'm going to change gears and talk about patient teaching. We talked about Hbg A1C earlier in terms of lab values, I want to extend that here to help us think about individualizing patient teaching.	**Tell me the most important things to tach a patient with Type 2 Diabetes?**	○ *Exercise* ▪ *Skin* ▪ *Shoes* ○ *Meds* ○ *Diet* ○ ***Follow up with Hgb A1c every 90 days to evaluate trends***	
9	Mr Smith has had Type 2 Diabetes for 20 years, and we know he's talked about his wife was involved in his care. Unfortunately, his wife is not in the hospital with him.	**How could you assess Mr. Smith's knowledge related to his Diabetes?**	○ *Suggest questions like: "Tell me what a day looks like for you at home". "Tell me what you know about your Diabetes"*	It's important to perform a baseline assessment of knowledge.
10	One challenge nurses face in the hospital is having enough time to do everything the patient needs. This is why prioritization is important and I want you to know it applies to all aspects of the nursing role with making treatment decisions, giving medication, and patient teaching. Prior to the simulation, the nurse anticipated that Diabetes teaching was a priority.	**In the video, the nurse prioritized pre-op teaching for Mr. Smith, do you agree with that decision? Why?**	○ *His knowledge deficit of the surgery was an ethical and safety consideration because surgery was happening the next day.*	The priorities you anticipate may change based on the information a patient gives you.

11	The reason we were changing our priorities for Mr. Shaw was that he didn't understand his surgical procedure. I want us to talk about the concept of consent and how it applies to peri-op	**Explain the nurse's role in the process of obtaining informed consent.** **Tell me how you would respond if you determined a patient did not understand their procedure.**	○ *Assess understanding and reinforce teaching/ understanding but we cannot obtain informed consent* ○ *Call the physician to come back and obtain a new surgical consent*	
12	Let's talk about patient safety in the acute care setting. Mr. Smith and Ms. Roland both had safety risks. The nurse was considering. Mr. Smith was receiving narcotics with decreased mobility while Ms. Roland had recently attempted suicide.	**How could we advocate for each patient's safety?** 1. Mr. Davis? 2. Mr. Smith? 3. Ms. Roland?	○ *Davis continuous pulse ox, BG AC HS,* ○ *Smith- fall risk signs, teaching about mobility/ fall related narcotics; continuous pulse ox for morphine,* ○ *Roland- suicide precautions, 1:1 sitter,* ***asking specifically if the patient has thoughts of suicide***	
13	The last thing we are going to talk about is helping patients cope with long term Diabetes management.	**Who do you think is/ is not coping well with their Diabetes?** **Tell me some strategies you saw that helped**	○ *Coping- smith has support system* ○ *Not coping- Roland and Davis is in denial* ○ *Patient teaching including implementing small changes (Baby steps)*	

		patients cope with Diabetes? **What resources would you use to help promote coping?**	○ *Diabetes educator, social worker, community support group, therapist, dietician*	

Peri-operative Zoom Debriefing Discussion Prompts

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
1	I'd like to talk about assessing a patient's risk for complications after surgery. It is important to anticipate potential complications our post-op patients may experience and then create an individualized plan of care to prevent these complications.	**Tell me some common complications patients experience following surgery.** **In post-operative patients like Mr. Hughes and Anderson, we are most worried about respiratory complications. What should you include in your focused assessment to catch respiratory complications?**	○ *Pneumonia* ○ *Clots* ○ *Bleeding* ○ *Dehydration (from vomiting)* ○ *Surgical infection* ○ *Falls* ○ *Lung sounds* ○ *Cough* ○ *Sputum* ○ *CXR* ○ *Shortness of breath* ○ *Spo2* ○ *IS ability (how far the ball goes up)* ○ *Turn cough deep berthing ability* ○ *Independence with ADL's (mobility)*	It is important to relate the focused assessment to PMH and chief complaint. A focused assessment can be a way to prioritize and triage areas most likely to be a concern and develop time management. In a post-op patient it is important to assess heart and lungs and then add assessments related to the surgical procedure.
2	We agreed that Mr. Anderson was at risk for pneumonia related to having abdominal surgery. Mr. Hughes was also at risk for pneumonia related to decreased mobility.	**How can we help prevent post-op patients from developing pneumonia?**	○ *Early ambulation* ○ *Antibiotics* ○ *IS* ○ *Pain control* ○ *Following chest x rays* ○ *Watching oxygen saturations* ○ *Listening to breath sounds*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		Why does the incentive spirometer help prevent pneumonia?	○ *IS encourages patients to take deep breaths, which opens up small alveoli and stimulates coughing to expel sputum*	
3	Remember in our live scenario Mr. Hughes was a post-op day 2 patient who had an ORIF of the femur to repair a fracture from a motor vehicle accident.	**Tell me what red flags did you notice in Mr. Hughes that told us he was having a PE?** **What treatments do you remember were key to treatment of PE?**	○ *Acute chest pain* ○ *Decreased saturation* ○ *Increased heart rate* ○ *No response to oxygen* ○ ○ *Anticoagulant (Heparain drip, not TPA)* ○ *Oxygen* ○ *Positioning- bed rest until anticoagulated, increased head of bed* ○ *Pain medicine*	There are many respiratory complications, the most common being pneumonia and PE, but the treatments and red flags are not identical, so you have to apply your clinical judgment to determine how you can advocate for your patient and individualize their plan of care.
4	I'd like to talk about calling for help in urgent situations. Mr. Hughes experienced a rapid deterioration in his status.	**What is the role of the rapid response team to help manage urgent situations?**	○ *Rapid response comes when any employee/family member is concerned* ○ *Designed to be an early intervention to prevent code blue* ○ *Nurses should also notify the charge nurse* ○ *Bedside nurse stays involved because you know the most about the patent*	RRT brings extra hands and standing orders to enable a team to react quickly and prevent a code On RRT, you get Respiratory Therapist ICU charge nurse +/- House Supervisor

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
			○ *Be flexible to help in roles where needed*	
5	There are times when a nurse must complete a focused assessment and other times require a head to toe assessment. The focused assessment helps the nurse establish the priority needs so they can intervene early before patient complications fully develop. Performing focused assessment is also a time management strategy. I know you are practicing head to toes in clinical. Remember in Mr. Anderson/s scenario, he had just arrived from PACU and the nurse performed a head-to toe assessment.	**Tell me the guidelines for a 15-minute post op assessment. What is your understanding of the rationale?** **What are your immediate post-op assessment priorities?**	○ *Perform head to toe assessment* ○ *Focus is looking for immediate anesthesia/surgical complications, respiratory status, and safety* ○ *Temp (Both high and low)* ○ *Vitals* ○ *Sats/ Respiratory rate* ○ *Level of consciousness q 2h except wih PCA q1h* ○ *Lung sounds* ○ *Skin Color- blood loss* ○ *Fluid status* ○ *Incision/drainage* ○ *Pain* ○ *Bowel sounds*	It is important to consider how recent the patient had surgery to know the guidelines for choosing a head to toe vs a focused assessment.
6	I'd like to talk about pain as a complication of surgery. Mr. Anderson and Mr. Hughes both reported post-operative pain.	**How did the nurse gather information about the patient's pain.** **I'm concerned that Mr. Anderson's pain may limit the way he participates in post-op care. Tell me what you**	○ *OLDCART* ○ *Trajectory over time* ○ *Pain goal* ○ *Decreased mobility (lead to atelectasis and pneumonia)* ○ *Pain with deep breaths* ○ *Pain with coughing*	Want to assess pain thoroughly and quickly. Thoroughly OLDCART (at least 3 areas) Trajectory Goal Pain level Quickly

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		think are some consequences of uncontrolled pain.		Pain assessment with safety checks because if patient has pain they aren't going to participate in any care or teaching
7	I'd like to talk about pain medication. I remember that Mr. Anderson was admitted to the med-surg floor from the PACU, but Mr. Hughes was post op day 2. They both were experiencing pain.	**Compare and contrast pain medication for Mr. Hughes and Mr. Anderson in terms of:** **1. Type of pain meds** **2. Route of pain medicine** **3. Timing of pain medicine** **Think back to pharm class, what are contraindications to giving opiate pain medications**	○ *Type of meds- Hughes needed stronger medication due to severity of the pain* ○ *Route of meds- Hughes needed IV so it would work quickly and because the pain was severe* ○ *Hughes last pain medication was long time ago; but Mr. Anderson should be discharged tomorrow* ○ *LOC* ○ *Respiratory status (decreased respiratory rate)* ○ *Last pain medication*	
8	Mr Anderson had a simple surgical procedure and we anticipate that he will be discharged the next day. The nurse in the video decided to give pain pills instead of IV medication.	**For Mr. Anderson, tell me why a nurse might choose to give oral pain medications over IV.**	○ *The nurse wanted to give oral medications because he can't go home on IV* ○ *Taking medications on a scheduled basis for the first few days, then taking as needed*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
			○ *Administering pain medications prior to procedures that may hurt (dressing changes, mobilization)*	
9	I'd like to talk about patient teaching. Providing patient teaching is one of the main objectives for our CRIS course. I heard the nurse talk to Mr. Anderson about lifting restrictions. I'm concerned that his job as a UPS driver may interfere with lifting restrictions.	**Tell me what you are thinking about potential harm and complications with Mr. Anderson's job at UPS.** **What are the top three things we want Mr. Anderson to know about preventing surgical complications?**	○ *Hernia at surgical site from lifting too much* ○ *Poor incision healing from lifting* ○ *Increased pain at site from lifting* ○ *Driving while taking pain medications* ○ *Lifting restrictions- don't lift over 10 pounds for 10-14 days* ○ *Splinting while coughing to reduce strain on incision* ○ *Incision care to prevent infection* ○ *Encourage use of IS* ○ *Encouraging fluids and hydration* ○ *Encouraging ambulation*	It is important to include **individualized** patient teaching in post-op patients. It's not too nosy to ask about our patient's work or home lives as long as it relates to the patient's plan of care.
10	I'd like to talk about some patient characteristics that may influence the care they receive. In our live scenario, Mr. Hughes was very anxious and abrupt. In clinical, the staff may try to protect you from anxious,	**How did Mr. Hughes' personality impact the care he received?**	○ *Non-compliance led to complication* ○ *Difficult personality led to not taking pain medication for an extended time period*	When in charge of making assignments, it is important to consider how patient characteristics may

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
	dissatisfied, or mean patients and families, but it’s important that you have good coping skills so that the se patients don’t burn you out or impact the quality of care you provide.	**Tell me some strategies we could use to help improve therapeutic communication?**	○ *Talking at eye level, pull up a chair* ○ *Acknowledge his feelings* ○ *Offer choices (Would you like to wear your SCD’s now or after breakfast?)*	influence teamwork. Rotating nursing assignments is important sometimes to prevent caregiver fatigue.
11	I know early in the semester in behavioral health you focus a lot on communication. Ms. Kabin’s scenario is an opportunity to use therapeutic communication especially because she had such mania that her thinking and communication was not rationale. During the scenario with Ms. Kabins, the patient was not cooperating with vital signs, assessments, or taking medications.	**What symptoms of mania did you notice?** **How did you observe the nurse use therapeutic communication with Ms. Kabins?**	○ *Flight of ideas* ○ *Poor judgement and impulsivity (maxing out credit cards)* ○ *Hyperverbal, Rapid, pressured speech* ○ *Elevated mood* ○ *Increase in goal directed behavior* ○ *Restlessness* ○ *Delusions (grandeur)* ○ *No insight into manic symptoms* ○ *Lack of sleep* ○ *Decreased appetite/intake* ○ *Establish rapport* ○ *Use calm, firm approach* ○ *Use short, simple sentences* ○ *Present reasonable doubt regarding delusions while still being caring* ○ *Didn’t feed into delusions-*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		What assessment red flags helped the nurse know to call and orders for additional medications? **Did you really need vital signs (would you do anything new with that info)?**	○ *Remain neutral and avoid power struggles* ○ *Reinforce/reorient to reality* ○ *Decrease stimulation- turn TV/radio off if in use* ○ *Redirect/focus* ○ *Refusing treatments/ assessments* ○ *Risk to self* ○ *Not redirectable* ○ *No insight into decisions/ behavior* ○ *Delusions* ○ *Not sleeping/poor intake* ○ *No- her vital signs don't add anything to the other mania symptoms; her refusal is the assessment finding*	
12	During the scenario, the nurse called the provider to request medications. She used the following SBAR: ○ S- I am calling because Ms. Kabins is exhibiting manic behaviors ○ B- She was admitted three days ago and did not have her Carbamazepime restarted ○ A- She is unable to focus, refusing medications, is not redirectable, and has maxed out her credit cards	**What will the lorazepam/olanzepine do?** **Would it have been Ok for Dr. Smertka to only restart the carbamazepine? Why?**	○ *Quick acting medications to help keep Ms. Kabins safe until Carbemazepine levels return to therapeutic* ○ *Olanzapine = antipsychotic* ○ *No it would not have been OK because it takes many days for the Carbemazepime to become therapeutic*	It is important to understand the rationale for medication orders.

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
	○ R- I would like to recommend that we resume her Carbamazepime and give her some Olanzepine			
13	Earlier we talked about calling an RRT for Mr. Hughes in a situation where his respiratory status was changing rapidly. I want to talk about this in the behavioral health setting too.	**What do you know about responding to emergencies in a behavioral health setting? How could having more people in the room help keep Ms. Kabins safe?**	○ *First point is clear explanations to patients* ○ *Minimize stimuli* ○ *Remove harmful objects* ○ *If needed show of concern- may help reduce aggressive behavior* ○ *If physical restraint is needed each person can be in charge of holding an extremity*	
14	Ms. Kabins has refused vital signs, assessments, and other treatments. Now we have orders to give her an IM injection.	**Can Ms. Kabins refuse the medication?** **Tell me some strategies you could use to administer an IM injection to a patient who is unable to consent these medications.**	○ *This is tricky; in psych, they need a forced med order (judge); for it to be an emergency, there has to be imminent threat of injury-harm to self or others* ○ *Risk for fall or injury related to recent surgery (evisceration, herniation, dehisence)* ○ *Definite tension between autonomy and safety* ○ *Explain what you are doing before you do it "we are going to give you an injection in your right leg on the count of 3 This medication will help you relax*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
			○ *Mix medications in one syringe- Olanzapine and Lorazepam are compatible* ○ *Choose easiest injection site (leg)and large muscle that can absorb the amount given* ○ *Restraint as absolute last resort (least invasive to most invasive)*	
15	Medication reconciliation- Remember in Ms. Kabin's history she had transferred between long-term care facilities and hospitals on multiple occasions.	**How do you think Mr. Kabins' scenario relates to transitions between facilities?** **When should medication reconciliation happen? By whom?**	○ *Multiple providers* ○ *Stopping medications temporarily after surgery and then they never get reconciled with home medication list* ○ *Obtain list of home meds upon admission* ○ *Compare home medication list upon discharge* ○ *Make sure patient has medication for all diagnoses listed- if patient has history of bipolar… same as if patient has a history of hypertension or diabetes and there are no orders addressing these dx's* ○ *Nurse responsibility*	Ms. Kabins scenario is an important reminder of how the nurse must consider medications in the assessment. We should anticipate that a patient with a history of bipolar disorder would be on a mood stabilizer or antipsychotic. She did not have this on her medication list. Sometimes medications not being on a patent's list are just as important as the ones ordered.

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
			Point out prednisolone Ms. Kabins is receiving likely further induces her mania.	

Respiratory Zoom Debriefing Discussion Prompts

	Introduction Prompt for Instructor to read	**Ask to Students**	**Expected answer**	**Key point**
Knowledge of pneumonia/ incentive spirometer	Pneumonia is a common respiratory condition that can lead to hospitalization. Both Mr. Jones and Mr. Vaughn were admitted for pneumonia. To refresh your memory, Mr. Vaughn was recently admitted from the ED with pneumonia and was transitioning from female to male. Mr. Jones was supposed to be discharged to a shelter after being hospitalized for pneumonia.	**Tell me how you might educate a patient on the pathophysiology of pneumonia.**	○ *Pneumonia is an infection in the lungs* ○ *Causes coughing and trouble breathing* ○ *Mucus builds up in alveoli* ○ *Importance of using easy-to understand words*	When teaching patients, it's important to use simple terms and use this knowledge to help patients understand the importance of interventions.
Assessment	I'd like to talk about assessment findings in respiratory patients. Many of our patients had OSA scores on the prep sheet.	**How can the OSA score inform your decisions with respiratory conditions?**	○ *If a patient is at risk for sleep apnea it places them at higher risk for other diseases* ○ *Need to consider getting CPAP machine* ○ *If they have a home CPAP, can they bring it to the hospital?*	OSA STOP-BANG questionnaire done on hospital admit. 1 point for each yes - Snore loudly? Tired during the day? Been observed stopped breathing or choking during sleep? High blood pressure? Body mass > 35? Age over 50? Neck size? (males 17in/ 43cm or larger) (females 16in/ 41cm or larger), Male? 0-2 - Low Risk 3-4 - Intermediate Risk

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
				5-8 - High Risk
Response to desaturation in Mr. Vaughn- safety checks	Mr. Vaughn was recently admitted for pneumonia and was experiencing a low oxygen saturation when we first met him.	**How did the nurse figure out the cause of the low oxygen saturations with Mr. Vaughn?** **What put Mr. Vaughn at risk for his oxygen not being connected?** **How did you see the nurse use the concept of safety checks in the home setting with Ms. Dumond?**	○ *Started at the patient and checked to make sure oxygen is in the nose and then traced tubing to wall to ensure it was connected.* ○ *She could have found the error in safety check/tube check even before looking at SpO2.* ○ *Transfer from one unit to another* ○ *Transfers are a high-risk time, especially when the nurse doesn't accompany the patient* ○ *Checked the oxygen tank fullness* ○ *Checked the flow rate* ○ *Assessed safety of tubing* ○ *Looked for other safety risks like trip hazards*	It's very important to remember to check the oxygen flow and physical connection when performing safety checks. This is especially important after any admission or transfer from one department to another. It is very easy for oxygen and other devices to not get hooked up during patient transfers. We should also consider safety in the home setting.
Isolation precautions	I'd like to talk about isolation precautions. During our sims we cared for two patients with pneumonia. Mr. Jones was not in isolation precautions, but Mr. Vaughn was.	**Tell me the reasoning for placing Mr. Vaughn in isolation precautions** **Why was Mr. Jones not placed in isolation?**	○ *Unidentified respiratory infection* ○ *Cultures pending* ○ *No antibiotics yet*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
			○ *We knew the causative agent, and he had been on antibiotics for several days*	
Smoking cessation	When patients are identified as smokers, it is important to offer smoking cessation education.	**How does smoking cessation teaching differ for Mr. Vaughn vs Mr. Jones?**	○ *For Mr. Jones smoking was warmth, community, and appetite suppressant, and possibly an addiction therefore we may only encourage reducing the amount and not likely to quit* ○ *Mr. Vaughn was receptive to the thought of quitting and had a support system.*	
Medication administration	I'd like to talk now about medication administration. During the scenario with Mr. Vaughn, he mentioned needing to take his T.	**What do you think about patients taking their own medications in the hospital?** **What risks might there be if a patient takes medication from home?** **Who should the nurse discuss the situation of use of home medication with?**	○ *Home medications require safety screening, but can be approved through the correct process* ○ *Wrong medication/difficult to identify* ○ *Infection from previous contamination* ○ *Physician for order* ○ *Pharmacist if you are going to administer home supply of meds (re: drug trial, non-formulary)*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		Would it be OK for Lisa, or a family member to administer the testosterone shot to Gabe? Why or why not?	○ *Yes, but should be observed* ○ *It's a good way to evaluate the technique and home routine* ○ *Errors in practice can be corrected*	
Culturally competent care	It is always important to consider the patient's culture. You knew going into the patient interaction that Mr. Vaughn was a transgender patient, but his legal name is still female. This is common in real practice because there's so much red tape a transgender patient has to go through to get their name and gender changed. In transgender patients, name and gender are elements of the patient's culture. Mr. Vaughn was a transgender patient who delayed coming to the hospital even though he was sick.	**During the video I heard Mr. Vaughn state he didn't want to come to the hospital. Why do you think that is?** **Lisa also revealed a difficult situation with the staff in the Emergency department. Tell me some ways the nurse could address his concern.** **How could we prevent another culturally insensitive situation from happening again?**	○ *Fear of mistreatment/ stigma* ○ *Hospital would not help* ○ *Incident report* ○ *Ask house supervisor/patient advocate to come talk to patient* ○ *(HEART - hear, emphasize, apologize, refer, thank)* ○ *Ensure to reinforce pronouns preference in report* ○ *Patient info screen example from THR* ○ *Ask them to correct you when you're wrong* ○ *Use preferred name*	Nurses must develop ways to deliver culturally sensitive care. We learned through Mr. Vaughn that being sensitive to use of the correct pronouns was important. For Mr. Jones, it was important to avoid the word home when delivering discharge teaching. It is important for nurses to be sensitive and carefully consider each client's needs.

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
			○ *Ask for legal name when identifying for med admin*	
Understanding of Discharge teaching	During the online videos, we met Ms. Dumond who had recently been discharged from the hospital. She had recently lost her husband who was the primary caregiver of the family and she had multiple medications to take daily.	**How well did Ms. Dumond understand her medications? Remember she was admitted with hyperkalemia. She had both furosemide and potassium on her scheduled home meds. How did you she ended up with hyperkalemia?** **What are some complications of patients not taking their medications correctly?**	○ *Poor understanding* ○ *Multiple medications to manage* ○ *She likely stopped taking furosemide but continued to take the potassium pills* ○ *Could have been to prevent getting up at night* ○ ○ *Hospitalization* ○ *Overdose* ○ *Underdose* ○ *Death*	When teaching patients about medications it is important to assess their understanding and advocate for assistance if needed.
Depression	Last, I'd like to talk about Ms. Dumond's depression.	**Ms. Dumond mentioned her drinking during the video. I'm worried her alcohol use may be excessive and show she is not coping well How can we assess her drinking status?**	○ *you can ask if she drinks large volumes so patients don't feel ashamed to report* ○ *Nurse in video asked if family members thought she drank too much or if she ever woke up the next morning regretting drinking the night before* ○ *Self-medication,* ○ *Normal vs not normal grief*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		I heard Ms. Dumond talk a lot about her husband Mark and I think she may be depressed. Would you consider advocating to put Ms. Dumond on anti-depressant? Why?	○ *Not as the only intervention for today* ○ *takes time to work* ○ *Beer's list of drugs to avoid in elderly*	
Safety of environment (suicide in home health setting)		**During the video Ms. Dumond made a statement about wanting to be with her husband. How should the nurse respond to this statement?** **What is your role as the RN to ask about depression and suicide?** **I remember we talked about safety with Ms. Roland during Diabetes day and implementing suicide**	○ *Ask specifically if he has a plan to kill herself.* ○ *Call to get more help in community setting* ○ *Explore social support/family resources and consider calling family if patient allows* ○ *Mandatory reporter* ○ *Ask about plan* ○ *Access to carry out the plan* ○ *Do not leave alone* ○ *Suicide hotline,* ○ *Non-emergency 911-type responders*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		precautions. What strategies could we use to keep Ms. Dumond safe in the home health setting? **Ms. Dumond seems to have a good relationship with her neighbor. Could we involve her in Ms. Dumond's care? Why or why not?**	○ *other nurses- charge nurse at home health agency* ○ *Primary care* ○ *Home health attending physician* ○ *If Ms. Dumond gave permission* ○ *Otherwise HIPAA violation*	

F&E Zoom Debriefing Discussion Prompts

	Introduction Prompt for Instructor to read	**Ask to Students**	**Expected answer**	**Key point**
Knowledge of fluid status	Patients with fluid problems often present with two extremes: too little or too much fluid. We learned about signs and symptoms of too little fluid with Ms. Newman, a cancer patient who was admitted for refractory nausea and vomiting.	**What assessment findings indicate that a patient has too little fluid?** **What are common risk factors for fluid loss?** **Describe the main treatment for patients who are experiencing significant fluid loss.**	○ *Tachycardia* ○ *Thirst* ○ *Low blood pressure* ○ *Low urine output* ○ *Change in skin color* ○ *Change in consciousness* ○ *Nausea/vomiting* ○ *Exposure* ○ *Diarrhea* ○ *Hemorrhage* ○ *Fluid replacement* ○ *Monitor I/O* ○ *Prevent loss of fluid*	Treatment of patients with fluid and electrolyte disturbances involves identification of fluid status and then promoting balance. If the patient has lost too much fluid, the treatment is to replace, however if the patient has too much fluid then we work on getting rid of sources of extra fluid.
Assessment/ identify symptoms of fluid overload	Conversely, in the videos Ms. Romero was admitted for heart failure and was receiving supplemental oxygen.	**What red flags did you notice about her heart failure?** **Explain why she has crackles**	○ *Edema* ○ *Crackles* ○ *2-3 word sentences* ○ *low SpO2* ○ *Fluid buildup in alveoli*	
Labs and diagnostics	When caring for patients with fluid and electrolyte disorders there are many labs and diagnostics which can help us determine the patient's fluid status.	**Ms. Romero had an order for an echocardiogram. What doe this test tell us?**	○ *used to estimate left ventricular function.* ○ *Normal ejection fraction is 60-65%.* ○ *Extreme heart failure may have ejection fraction in 15-20% range.*	Labs and diagnostics can provide helpful information to the treatment and management of fluid disorders. These labs can also be used to identify trends to

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		Explain what each of the lab values tell us about Ms. Romero: **BNP 500** **CK 98** **CKMB 18** **Troponin <0.2**	○ *poor ejection fraction means heart cannot meet demands of increased O2 with activity* ○ *Nml BNP is <100, the higher it is the more the patient is experiencing fluid overload* ○ *Nml CK is 30-200 (it's a generic marker for muscle break down anywhere in the body, peak is 18-24 hours after injury)* ○ *Nml CKMB is < 24 (the myoglobin is the first marker for muscle break down anywhere in the body, peak is 10 hours after injury)* ○ *Nml Troponin is <0.2 (it's the long term marker and is the only one specific to cardiac injury, peak is around 24 hours, but it will last for up to 10 days)*	ensure that patients are responding to treatments.
Titration of oxygen	I'd like to talk about oxygen administration. At the beginning of Ms. Romero's video, she was receiving oxygen via nasal canula at 4 liters per minute.	**The nurse discovered her SpO2 was low. What did she do about it?**	○ *Elevated the HOB* ○ *Titrated up the oxygen* ○ *Patient was on 4L NC, increased to 6L,* ○ *next step is face mask (flow rate to 8-10 LPM)* ○ *Increase to non-rebreather mask (flow to 15 LPM)*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		She had an order for Albuterol prn inhaler. Do you think it would help? Why or why not?	○ *No inhalers help prevent/treat bronchoconstriction. We needed to get fluid out of her lungs*	
Med admin Furosemide	I'd like to talk about medication administration. Ms. Romero was taking many medications to treat her heart failure. She had the following medication orders: Enalapril, Carvedilol, and furosemide	**What do you think was the priority medication to administer? Why?**	○ *Furosemide-* ○ *because this will get rid of fluid*	
Appropriateness of IV fluid orders	You stated that we were giving furosemide to pull of fluid. Then we also have an order to administer maintenance IV fluid.	**Tell me what some consequences of combining furosemide and maintenance IV fluid.**	○ *Patient will continue to experience fluid overload*	
Identification of resources	We know Mrs. Romero was taking furosemide as a home medication to help prevent and maintain her congestive heart failure.	**How do you think Ms. Romero got to the point of fluid overload?** **Heart failure is a common re-admission diagnosis. What are the key points for patient teaching to prevent readmission?**	○ *not taking meds,* ○ *may relate to cost* ○ *non-compliance with diet* ○ *can talk about Medicare Part D/Walmart $4 list* ○ *daily weights* ○ *take her diuretics* ○ *limit salt* ○ *do not drink excessive amounts of fluid*	
Physical assessment respiratory	Let's switch gears and talk about Ms. Bauer. Ms. Bauer was an 18-year-old college student who was admitted for pyelonephritis and was receiving IV antibiotics.	**Knowing she's an 18-year-old college student, how do you think she got pyelonephritis?**	○ *Not knowing hygiene after sexual intercourse* ○ *Untreated UTI maybe due to access to healthcare? No insurance?*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
		Why was Ms. Bauer at high risk for an allergic reaction?	○ *First time receiving IV antibiotics* ○ *History of asthma-can put at risk for other allergies*	
Identify S/S/ of allergic reaction	At the beginning of the video for Ms. Bauer, the previous nurse had just hung the first dose of IV antibiotics.	**How was Ms. Bauer's assessment different than what you expected based on her history?**	○ *Itchy* ○ *Trouble breathing* ○ *Wheezing* ○ *talk about GU symptoms and what you anticipate patient would look like - contrast to allergic reaction*	It's important to look at trends in vital signs to help differentiate the causes of clinical problems.
		You identified respiratory distress, what do you think are some potential causes?	○ *Asthma* ○ *Allergic reaction* ○ *Sepsis*	
		How can we differentiate between asthma and allergy to antibiotics?	○ *Hives* ○ *Vital signs give big clue- no drop in sats; drop in blood pressure*	
		Can anyone explain why her BP was dropping? What is going on from a patho standpoint?	○ *Vasodilation due to histamine reaction*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
Admin multiple meds	During the scenario, the nurse received multiple medication orders.	**Describe how you would prioritize the medication orders for Ms. Bauer: Medications Ordered: Epinephrine, Diphenhydramine, albuterol, Stop antibiotics, 500 mL Normal saline over 15 minutes, methylprednisolone**	○ *Stop antibiotics-Prevents more exposure to allergen* ○ *Albuterol nebulizer treatment (Airway) bronchospasm; RT to preform* ○ *Epinephrine (Circulation)Immediately constricts blood vessel to increase blood pressure* ○ *Diphenhydramine (Circulation) Immediately blocks histamine production and vasodilation* ○ *IV Normal Saline 500mL (Circulation) Fills up dilated blood vessel* ○ *Methylprednisolone Slower acting reduction of swelling*	
Respond to Allergic reaction	I'd like to talk about the treatment of allergic reactions. We have established that we think Ms. Bauer is reacting to the antibiotics. Now she needs treatment.	**What do you remember from pharm about the actions of Epi on the airway and circulatory system?** **How long will the effect of Epi last?**	○ *Causes vasoconstriction and increased heart rate* ○ *Short acting*	

	Introduction Prompt for Instructor to read	Ask to Students	Expected answer	Key point
Team collaboration		**Tell me about the urgency of the situation.** **What are some strategies you could use to get extra help in the room during this situation**	○ *Emergent- pt is experiencing anaphylactic shock- life threatening* ○ *Rapid response* ○ *Call for help* ○ *Call charge nurse*	
Prevention	In the video, the nurses were able to stabilize the patient and administer the medications.	**How might we prevent this from happening in the future?** **Would you give another dose of the Cefotaxime?**	○ *Avoid penicillin, carbapenem, cephalosporin* ○ *Allergy bracelet* ○ *Stay with a patient who is at high risk for allergic reaction* ○ *Educate on S/S of reaction after hanging IV antibiotic* ○ *No- this medication should be discontinued*	

Appendix D

Lasater Clinical Judgment Rubric (Lasater, 2011)

Table 1
Lasater Clinical Judgment Rubric.

Effective Noticing involves:	Exemplary	Accomplished	Developing	Beginning
Focused observation	Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information	Regularly observes/monitors a variety of data, including both subjective and objective; most useful information is noticed, may miss the most subtle signs	Attempts to monitor a variety of subjective and objective data, but is overwhelmed by the array of data; focuses on the most obvious data, missing some important information	Confused by the clinical situation and the amount/type of data; observation is not organized and important data is missed, and/or assessment errors are made
Recognizing deviations from expected patterns	Recognizes subtle patterns and deviations from expected patterns in data and uses these to guide the assessment	Recognizes most obvious patterns and deviations in data and uses these to continually assess	Identifies obvious patterns and deviations, missing some important information; unsure how to continue the assessment	Focuses on one thing at a time and misses most patterns/deviations from expectations; misses opportunities to refine the assessment
Information seeking	Assertively seeks information to plan intervention: carefully collects useful subjective data from observing the client and from interacting with the client and family	Actively seeks subjective information about the client's situation from the client and family to support planning interventions; occasionally does not pursue important leads	Makes limited efforts to seek additional information from the client/family; often seems not to know what information to seek and/or pursues unrelated information	Is ineffective in seeking information; relies mostly on objective data; has difficulty interacting with the client and family and fails to collect important subjective data
Effective Interpreting involves:	Exemplary	Accomplished	Developing	Beginning
Prioritizing data	Focuses on the most relevant and important data useful for explaining the client's condition	Generally focuses on the most important data and seeks further relevant information, but also may try to attend to less pertinent data	Makes an effort to prioritize data and focus on the most important, but also attends to less relevant/useful data	Has difficulty focusing and appears not to know which data are most important to the diagnosis; attempts to attend to all available data
Making sense of data	Even when facing complex, conflicting or confusing data, is able to (1) note and make sense of patterns in the client's data, (2) compare these with known patterns (from the nursing knowledge base, research, personal experience, and intuition), and (3) develop plans for interventions that can be justified in terms of their likelihood of success	In most situations, interprets the client's data patterns and compares with known patterns to develop an intervention plan and accompanying rationale; the exceptions are rare or complicated cases where it is appropriate to seek the guidance of a specialist or more experienced nurse	In simple or common/familiar situations, is able to compare the client's data patterns with those known and to develop/explain intervention plans; has difficulty, however, with even moderately difficult data/situations that are within the expectations for students, inappropriately requires advice or assistance	Even in simple of familiar/common situations has difficulty interpreting or making sense of data; has trouble distinguishing among competing explanations and appropriate interventions, requiring assistance both in diagnosing the problem and in developing an intervention
Effective Responding involves:	Exemplary	Accomplished	Developing	Beginning
Calm, confident manner	Assumes responsibility: delegates team assignments, assess the client and reassures them and their families	Generally displays leadership and confidence, and is able to control/calm most situations; may show stress in particularly difficult or complex situations	Is tentative in the leader's role; reassures clients/families in routine and relatively simple situations, but becomes stressed and disorganized easily	Except in simple and routine situations, is stressed and disorganized, lacks control, making clients and families anxious/less able to cooperate
Clear communication	Communicates effectively; explains interventions; calms/reassures clients and families; directs and involves team members, explaining and giving directions; checks for understanding	Generally communicates well; explains carefully to clients, gives clear directions to team; could be more effective in establishing rapport	Shows some communication ability (e.g., giving directions); communication with clients/families/team members is only partly successful; displays caring but not competence	Has difficulty communicating; explanations are confusing, directions are unclear or contradictory, and clients/families are made confused/anxious, not reassured
Well-planned intervention/flexibility	Interventions are tailored for the individual client; monitors client progress closely and is able to adjust treatment as indicated by the client response	Develops interventions based on relevant patient data; monitors progress regularly but does not expect to have to change treatments	Develops interventions based on the most obvious data; monitors progress, but is unable to make adjustments based on the patient response	Focuses on developing a single intervention addressing a likely solution, but it may be vague, confusing, and/or incomplete; some monitoring may occur
Being skillful	Shows mastery of necessary nursing skills	Displays proficiency in the use of most nursing skills; could improve speed or accuracy	Is hesitant or ineffective in utilizing nursing skills	Is unable to select and/or perform the nursing skills
Effective Reflecting involves:	Exemplary	Accomplished	Developing	Beginning
Evaluation/self-analysis	Independently evaluates/analyzes personal clinical performance, noting decision points, elaborating alternatives and accurately evaluating choices against alternatives	Evaluates/analyzes personal clinical performance with minimal prompting, primarily major events/decisions; key decision points are 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/choices without evaluating them
Commitment to improvement	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/weaknesses; could be more systematic in evaluating weaknesses	Demonstrates awareness of the need for ongoing improvement and makes some effort to learn from experience and improve performance but tends to state the obvious, and needs external evaluation	Appears uninterested in improving performance or unable to do so; rarely reflects; is uncritical of him/herself, or overly critical (given level of development); is unable to see flaws or need for improvement

K. Lasater / Nurse Education in Practice 11 (2011) 86–92

Appendix E

Creighton Simulation Evaluation Instrument *(C-EI™)*

			0	1
Focused Assessment	**Assessment**			
	Obtains pertinent subjective data ***Anytime*** ***Need 5 of 6 pain, plus***	Pain number scale Pain location Pain duration Pain characteristics Pain relieving factors Pain treatment Cough and Sputum		
	Obtains pertinent objective data ***Did they try to assess?*** ***Have to do all of these***	Heart sounds Lung sounds Bowel sounds Lower extremity pulses		
	Performs follow-up assessments as needed ***Comparative***	"Is your pain better than it was last night?"		
	Assess in a systematic and orderly manner using the correct technique ***Have to do all of these***	Heart sounds Lung sounds – 6 Anat spots on ant/lat; if they do post, have to do 8 Auscultate bowel sounds first (if they palpate) Palpate lower extremity pulses		
Communication	**Communication** Communicates effectively with patient (verbal, nonverbal, teaching)	Introduce self		
	Documentation	Scans medications prior to administering them		
	Responds to abnormal findings appropriately	Questions pt about normal AM CBG levels and/or symptoms of hypoglycemia		
	Promotes realism/professionalism	Asks patient, "What is acceptable pain level?"		
Priority Setting	**Critical Thinking** Interprets VS	To pt, acknowledges Temp/Tylenol available		
	Interprets salient subjective/objective data	Asks about shortness of breath AND if pt uses CPAP at home		
	Formulates measurable priority outcomes	"I don't want you to have pain, because I want you to be able to get up and do PT later this morning"		
	Performs outcome-driven interventions ***Have to do all of these***	Administers NPH, and Holds Novolog		
	Provides specific rationale for interventions	"CBG is not high enough to need Novolog, but NPH will last you all day"		
	Evaluates interventions and outcomes	Anticipates pt needs breakfast with insulin		
Safety Checks Med Admin	**Technical Skills** Uses patient identifiers	ID patient name/DOB on first time in room		
	Utilizes Standard Precautions and hand washing ***On at least 2 trips to pt room***	Wash in/ Wash out consecutively ☐ ☐ ☐ ☐		
	Administers medications safely ***Have to do all of these***	Administers Morphine over at least 2 min IVP; Must do flush after (SAS), pinches primary IV line to ensure Morphine reaches patient, At least 1 mL of second flush at same rate/volume as Morphine Verifies insulin dose with second RN		
	Manages equipment, tubes & drains therapeutically ***Have to do all of these***	O2 flow rate to face IV site (pain or R, S, D) IV Fluid type and pump rate Incision site check		
	Performs procedures correctly ***Score only what meds they give. They have to check allergies one time during scenario, but need to ID patient right before meds***	TRAMP on all meds at BS NPH T R A M P. allergies Pain med T R A M P Tylenol. T R A. M. P		
		Total score out of 19 points		

Appendix F

Analytical Framework

		Code	Knowledge	Thinking	Approach	Definition
Noticing	Focused Observation	Process many data		✓		Notices and processes many assessment clues/ information at one time
		Catch subtle cues		✓		Finds assessment data that is not easily recognized (e.g., a patient was short of breath because they say a few words at one time)
		Family dynamics		✓		Includes family members, friends, or partners in care
		Identify risks		✓		Identifies background data or assessments that are risk factors for other problems
		Interpret significance		✓		Describes what finding means to them (e.g. messy clothes and hair made me think patient was depressed)
		Organize assessments by a pattern		✓		Groups assessment findings in a logical manner (e.g., by body system, problem, concepts)
		Patient appearance		✓		Highlights how the patient looks related to patient clothing, hair, personal care
		Patient reaction/behavior		✓		Highlights patient personality characteristics or mannerisms displayed
		Recognize trends		✓		Compares an assessment finding to an earlier report
		Simulation environment		✓		Recognizes moulage, staging, manikin position, props, or equipment located in the patient care areas during the simulation environment
		Vitals		✓		Lists ~~the~~ heart rate, blood pressure, oxygen saturation, or respiratory rate
		Assumption/ bias		✓		Makes a supposition about assessment as if it is true without proof or interjects personal attitudes or beliefs
		Focus on unrelated information		✓		Discusses impertinent information to the most important problem
		List all observations		✓		Lists multiple strings of assessment data in no particular organized fashioned
		Miss subtle or non-subtle cues		✓		Misses obvious clues or does not identify clues that are more difficult to notice (e.g., things requiring expertise to recognize)
		Notice one thing		✓		Discusses only one clue or multiple clues all associated with the same problem
		Regurgitate cues		✓		Restates findings the expert model discusses with the patient or restates patient history/ information provided in simulation preparation materials

		Code	Knowledge	Thinking	Approach	Definition
		Uses medical diagnosis		✓		Describes patient behavior or problem using a medical diagnosis instead of descriptive details (e.g., patient was manic)
	Recognizing Deviations from expected	Catch obvious deviations			✓	Identifies obvious problems in a scenario (e.g., patient was wearing oxygen on forehead)
		Expectation			✓	Describes what they anticipated may happen according to patient background
		Medication reaction	✓			Describes clues from the scenario about patient's response to medications
		Relate to previous Knowledge/ experience	✓			Describes how they utilized knowledge from class, readings, or simulation preparation. They may also relate this scenario to previous clinical, simulation, or personal experience
		Demonstrate premature closure			✓	Indicates that they have already made a conclusion about the assessment finding which is incorrect or will prevent them from reaching the correct solution
		Inaccurate expectation			✓	Anticipates assessment findings incorrectly based on the patient's background
		Lack of experience	✓			No related clinical, classroom, simulation, personal, or work experience
		Misconception			✓	Personal attitudes/ beliefs about the patient's background, history, or preferences
		Miss obvious patterns			✓	Unable to recognize how the most obvious clinical findings relate
		No expectation			✓	Unable to anticipate possible assessment findings/ problems
	Information seeking	Assess knowledge/ establish a baseline	✓			Seeks the patient's baseline understanding of the current condition or event. May also seek assessment findings/ vitals as a baseline to compare to later
		Identify complication/ risk factors of a disease	✓			Seeks information about potential attribute which may complicate the current clinical scenario or have put them at high risk for disease
		Incorporate simulation preparation	✓			Discusses needing knowledge or information they gained from reading simulation preparation materials
		Know what to do next to gather assessments	✓			Demonstrates knowing how to gather related important information from the problems identified
		Seek information from electronic heath record	✓			Indicates they would look for the information they desire in the electronic health record
		Seeks information from family/patient	✓			Looks for the information they desire from the patient or family member
		Seek information to understand why	✓			Seeks to gather information for the purpose of determining why the patient is experiencing the current situation or problem
		Seek objective data	✓			Wants lab findings, further physical assessments, vital signs, or measurements
		Seek subjective data/ experience with disease	✓			Indicates plan to ask the patient questions to gather information related to the clinical problem or the patient's experience with the condition

		Code	Knowledge	Thinking	Approach	Definition
		Refer to other healthcare providers	✓			Indicates desire to get information from other providers or get another provider to obtain the information needed
		Seek unimportant information	✓			Seeks information which will not help their clinical judgment or is not related to the current situation. May also relate to items found in everyday conversation
		Unable to identify next steps	✓			Unable to determine further assessments or interventions
Interpreting	Prioritizing data	Most relevant priority		✓		Identifies the critical or highest priority problem to address
		Prioritizing strategy		✓		Articulates a prioritization technique to reach their decision
		Explain rationale		✓		Provides correct reasoning or textual support for-prioritizing a problem
		List all available data		✓		Lists multiple problems, assessment findings, or clues in no particular order
		Prevent complications		✓		Describes reducing the risk for complication or worsening condition
		One problem		✓		Focusses on one problem or piece of data identified in the scenario
		Incorrect prioritization		✓		Incorrectly identifies the order problems should be addressed (i.e., focuses on unimportant priorities or misses most important priority)
		Incorrect rationale		✓		Provides incorrect reasoning, logical, or textual support for the prioritizing a problem identified
		Interprets data incorrectly		✓		Assigns incorrect meaning to an assessment finding, clue, patient response, or patient behavior
		Recognize priorities, but unimportant tasks reach list (at bottom)		✓		Attends to multiple problems all at one time and includes unimportant priorities at the bottom of the list
	Making sense of the data	Base rationale on assessment			✓	Indicates nurse behavior related to an assessment finding (e.g., O2 saturation was low, so nurse sat the head of bed up)
		Key intervention	✓			Recognizes priority interventions for the patient based on the scenario
		Incorporate simulation preparation			✓	Recognizes nurse using simulation preparation material in the scenario or uses preparation materials as a rationale for intervention
		Offer correct rationale for intervention		✓		Explains appropriate reason for a nursing intervention using an understanding of pathophysiology, evidence-based practice, or principle
		Patient teaching		✓		Describes appropriate patient education needs
		Relate to previous experience/ knowledge			✓	Relates scenario to previous clinical, work, or personal experience or knowledge gained from a class, instructor, preceptor, or individual
		Gut feeling	✓			Explains that nurse instinctively knew what interventions to implement
		Nurse response			✓	Describes nursing behaviors or personality characteristics in vague terms

		Code	**Knowledge**	**Thinking**	**Approach**	**Definition**
		Nursing process		✓		Articulates steps in nursing process (e.g., assessing, analyzing, implementing and evaluating)
		Summarize events		✓		Offers a synopsis of the simulation ~~scenario~~ and retells the story
		Incorrect rationale/ Unable to make sense		✓		Offers no rationale for interventions, or the rationale is incorrect. Student is unable to correctly explain why events happened
Responding	**Calm, confident manner**	Confident after practice		✓		Indicates they need more exposure to a similar situation before being confident
		Demonstrate self-confidence/calm		✓		Articulates they feel certain they would be able to respond to the simulation scenario or approach in a confident manner
		Previous experience	✓			Relates scenario to past patient encounters
		Nurse behavior/ response	✓			Describes actions or interventions taken by the nurse to gain the patient's trust
		Recognize significance	✓			Relates how an intervention, behavior, or response correlated with patient outcomes or describes why they are important
		Speed		✓		Recognizes ways nurse delivered care in an efficient, quick or organized fashion
		Nervous/Anxiety		✓		Expresses feeling nervous, anxious, or fearful if they were placed in a similar situation
		Defer responsibility to other providers	✓			Discusses placing another healthcare provider or team member in charge of an intervention they could not handle
		Low self-confidence		✓		Questions their ability to respond in the same manner the expert model did
		Describe or blame patient personality	✓			Recalls aspects of the patient personality or behaviors which affected the patient encounter in a negative way (e.g., non-compliant, not listening, etc.)
		Discuss from patient perspective	✓			Discusses how they would have felt if they were the patient instead of answering how comfortable they would fell delivering nursing care
		Lack of experience		✓		Indicates discomfort in the situation relates to not being exposed to a similar patient or scenario in the past
		Mimic nurse		✓		Indicates a desire to react or respond in the same way as the nurse
		Seek assistance		✓		Asks for help from another team member, nurse, charge nurse, family member, or healthcare provider
		Summarize events	✓			Recalls the sequence of events in the video without great details to answer the prompt
		Unsure what to do	✓			Unable to identify how the nurse should respond

	Code	Knowledge	Thinking	Approach	Definition
Clear communication	Provide quote examples			✓	Describes specific quotes representing salient communication points
Clear communication	Incorporate family			✓	Includes family members in conversation, patient teaching, or plan of care~~, etc.~~
Clear communication	Patient-centered			✓	Tailors interventions or conversation to the specific needs of the patient based on their background, medical problem, or needs
Clear communication	Recognize non-verbal communication			✓	Demonstrates recognizing how nurse used eye contact, posture, therapeutic touch, facial expressions, etc.
Clear communication	Therapeutic communication			✓	Identifies specific therapeutic communication tools used (e.g., paraphrasing, summarizing, silence, seeking clarification~~, etc.~~)
Clear communication	Strategies/ interventions			✓	Describes actions or interventions taken by the nurse to gain the patient's trust
Clear communication	Translate to own practice			✓	Indicates desire to use techniques learned in the future or compares to what they currently do now
Clear communication	Patient request/ hospitality			✓	Indicates that the nurse was responding to patient requests or offering common hospitality (e.g., entertainment, food, comfort, customer service)
Clear communication	Unable to explain how nurse gained trust			✓	Unable to articulate how the nurse gained the patient's trust or may state that nurse did not gain patient's trust
Well planned intervention	Communication impact		✓		Indicates how communication or patient teaching relates to outcomes
Well planned intervention	Change in priorities		✓		Recognizes the nurse shifting the priority focus in response to an event
Well planned intervention	Evaluate response		✓		Determines if intervention led to patient improvement or not
Well planned intervention	Multiple decisions		✓		Writes about more than one decision the nurse made
Well planned intervention	Individualizes care		✓		Recognizes how characteristics in the patient background, medical problem, or specific needs led the nurse to include specific interventions/ communication/ teaching or individualize the plan of care
Well planned intervention	Match assessment data to interventions		✓		Relates nursing interventions as a response to assessment findings
Well planned intervention	Relate actions to patient outcomes		✓		Identifies how actions the nurse took or omitted relate to the outcome of care
Well planned intervention	Identify safety risks		✓		Discusses risk factors or complications that could lead to unsafe conditions; states how the nurse addressed safety concerns
Well planned intervention	Does not describe change in priorities		✓		Response lacks a description of how the nurse shifted her priority focus in response to an event

	Code	Knowledge	Thinking	Approach	Definition
	One decision		✓		Discusses only one decision the nurse made in the scenario
	Guessing		✓		Student demonstrates that they are unsure of their answer and uses words like "maybe" or "it's possible"
	Medical Diagnosis/ intervention		✓		States that a medical diagnosis, procedure, or surgical intervention affected the treatment plan
	Respond to patient request		✓		Articulates that nursing actions most often come in response to patient requests as opposed to nurses using their own clinical judgment
	Regurgitate events		✓		Summarizes nurse behaviors verbatim or in chronological order
	Relate to treatment decisions		✓		Discusses how specific treatments, medical orders, medications, or therapies impacted the treatment plan
	Task oriented		✓		Focuses on things nurses completed for all patients (e.g., vitals, performed assessment, washed hands, gave meds)
	Blames patient		✓		Assigns blame to the patient's choices, attitudes, beliefs, background, resources, behavior, or personality as negatively impacting the care delivered
	List abnormal assessment data		✓		Lists any abnormal assessment data which led to nursing interventions
Being skillful	Collaboration	✓			Indicates a desire to include other member of the healthcare team to assist the patient
	Describe key intervention	✓			Describes the most important intervention that should be done based on the clinical scenario
	Describe standards of care	✓			Incorporates evidence-based practice guidelines, clinical care bundles, best practices, or big picture concepts (i.e., safety, infection control, confidentiality, scope of practice)
	Therapeutic communication	✓			Recognizes how the nurse demonstrated therapeutic communication skills and may provide examples (e.g., rephrasing, paraphrasing, etc.)
	Offer a summary	✓			Offers an account of the main points or details of the nurses' actions in the video
	Complete role clarity worksheet tasks	✓			Recognizes how the nurse was completing tasks assigned on the role clarity worksheet
	Describe tasks achieved/ task oriented	✓			Focusses solely on which orders, tasks, or interventions were completed (e.g. gave meds, got new orders)
	Generic statements about standards of care	✓			Unable to specify how the nurse demonstrated standards of care. Instead they may say "met standards" or "upheld good practice"

		Code	Knowledge	Thinking	Approach	Definition
Reflecting	Evaluation/ self-analysis	Offer a critique	✓			Evaluates a nursing behavior or intervention that needed correction
		Offer suggestions to improve patient outcomes	✓			Recognizes how nursing or patient actions could relate to future patient consequences
		Plus/delta (nurse activity)	✓			Evaluates things the nurse did well as well as identifies areas for improvement. These suggestions must relate to nursing actions
		Unable to critique	✓			Unable to identify any flaws in the nurse's decisions, actions, or events in simulation scenario
		Offer praise	✓			Focusses on how the nursing decisions, actions, or events were positive and applauds how well the nurse did
		Task completed	✓			Lists every intervention the nurse completed during the patient encounter
	Commitment	Offer accurate solution	✓			Describes an accurate alternative solution to the flawed decision, task, or actions
		Offer inaccurate solution	✓			Describes an inaccurate alternative solution to the flawed decision, task, or actions of the nurse in the scenario
		Unable to offer a solution	✓			Not able to describe an accurate alternative solution to the flawed decision, task, or actions of the nurse in the scenario

Appendix G

Usability Questionnaire

Please indicate the degree to which you agree with these statements:

1. I am satisfied with viewing simulation videos.
   1 Strongly Disagree   2 Disagree   3 Moderate   4 Agree   5 Strongly Agree
2. The prompts questions were easy to understand.
   1 Strongly Disagree   2 Disagree   3 Moderate   4 Agree   5 Strongly Agree

3. Please provide an explanation for any rating below 5. ______________

Please answer the following questions:

1. What web browser do you use?
   a. Safari
   b. Firefox
   c. Internet Explorer
   d. Microsoft Edge
   e. Other (Please list) ________________
2. Where did you watch the video?
   a. Phone
   b. iPad or tablet
   c. personal computer
   d. Other (Please list) ________________
3. Did you have difficulties viewing the videos?
   a. No
   b. Yes (Explain) ____
4. Did you experience any trouble with your internet connection?
   a. No

Yes (Explain) ____

Appendix H

Internal Review Board Approval

Institutional Review Board
3101 Sadler Hall
Fort Worth, Texas 76129

DATE: 22-August-2020

TO: Ashley Franklin

FROM: TCU Institutional Review Board

RE: Approval of Amendment to Protocol 1920-263-AM1

Dear Dr Franklin:

In accordance with applicable federal law governing the use of human subjects in research, the TCU Institutional Review Board has reviewed and approved your proposed amendment to the project entitled "Describing the Feasibility, Usability, and Reliability of Measuring Clinical Judgment in Pre-Licensure Nursing Simulation Observers". Your study continues to be considered minimal risk and was reviewed through the expedited process, category 7.

Remember that you are responsible for ensuring that your study is conducted in an ethical manner and in accordance with applicable law and TCU policies and procedures. Approval of this amendment does not change due dates for Annual Check-in/Continuing Review Reports, if any. Also, please remember that you are required to promptly report unanticipated problems and adverse events.

Please contact Research Compliance at research@tcu.edu or 817-257-5070, if you need any additional information.

Sincerely,
TCU Institutional Review Board

Appendix I

Consent Form for Human Subjects Research

Texas Christian University
Fort Worth, Texas

CONSENT TO PARTICIPATE IN RESEARCH

Title of Research: Describing the Feasibility, Usability, and Reliability of Measuring Clinical Judgment in Pre-Licensure Nursing Simulation Observers

Funding Agency/Sponsor: None

Principal Investigator: Beth Rogers and Ashley Franklin

Co-investigators: Kathy Baker and Yan Zhang

You are invited to participate in a research study. In order to participate, you must be enrolled in NURS 30671. Taking part in this research project is voluntary.

A summary of things you should know:

- This is a research study involving human subjects that has been approved by TCU Institutional Review Board.
- The purpose of the study is to describe nursing students' clinical judgment after observing expert modeling videos. If you choose to participate, you will be asked to allow the researchers to analyze your responses to the simulation assignments in NURS 30671. This will not take any additional time beyond the simulation classwork. We anticipate that it will take approximately 15-20 minutes to respond to the quiz assignments.
- There is little risk to participating in this study. The risks to participants include potential unpleasant feelings, such as embarrassment, emotional upset, frustration, and anxiety. Risks of participation include tiredness from participating in simulation, anxiety about performance in simulation, and worry about loss of confidentiality/privacy. If participation in simulation makes you very upset, Investigators will help you find a counselor.
- There are no particular benefits to you for participating in this study, except that the simulation may be educational. You may or may not benefit from being in this study. However, by serving as a participant, you may help us learn how to benefit nursing students in the future.
- Taking part in this research project is voluntary. You don't have to participate, and you can stop at any time.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

Revised 5/20/2019

1920-263-AM1
Approved August 22, 2020

What is the purpose of the research? The purpose of this study is to describe nursing student's clinical judgment (CJ) after observing expert models in high-fidelity simulation (HFS). We want to determine the feasibility, usability and reliability of scoring nursing students' CJ quizzes using the Lasater Clinical Judgment Rubric (LCJR). If the findings of the feasibility, usability, and reliability of measurement are favorable, then we will further describe the trajectory of simulation observers' clinical judgment development over the course of a semester.

How many people will participate in this study?
If you decide to be in this study, you will be one of up to 73 participants in this research study.

What is my involvement for participating in this study?
If you agree to be in the study, we will ask you to do the following things**:** First, we will ask you to fill out a brief demographic questionnaire. Then all other activities will take place in your simulation class time. Prior to each of the four simulation days, you are required to watch two expert-modeled simulation videos and then respond to 11 questions that ask about your clinical judgment. This quiz will be given as a link to a Qualtrics online survey and should take you between 15- 20 minutes to complete. Your simulation instructors will use these prompts to debrief the simulation experience each week.

If you consent, we will retrieve information about your academic performance from the TCU Nursing office (e.g. ATI standardized test scores, GPA, and simulation formative evaluation scores).

How long am I expected to be in this study for and how much of my time is required? You will complete all of the study activities are part of your normal coursework in simulation (NURS 30671). The total length of participation is one academic semesters.

What are the risks to me for participating in this study and how will they be minimized? There is little risk to participants in this study. The risks to participants include potential unpleasant feelings, such as embarrassment, emotional upset, frustration, and anxiety. Risks of participation include tiredness from participating in simulation, anxiety about performance in simulation, and worry about loss of confidentiality/privacy. If participation in simulation makes you very upset, Investigators will help you find a counselor.

Although there are steps the investigators have taken to protect your identity, there is a small risk of loss of confidentiality. **The following steps will be taken to protect your personal information:**

- Documents completed as part of the study by faculty are immediately de-identified and coded with a unique code that does not contain health or student information.

- Data will be kept in a password-protected and encrypted electronic files. Paper copies will be kept in a locked cabinet in a locked investigator's office (Franklin). Electronic files will contain no personal identifiers.
- Investigators will maintain one file that contains personal information and study codes (name, email address, and phone number) to follow up with participants during data collection. This file will be double password-protected. Only two investigators (Franklin and Rogers) will have access to the file. The file will be destroyed at the conclusion of the study.
- All information will be stored for 7 years after completion of the study in a locked file cabinet in a locked investigator's office (Franklin) in a secure building; only the investigators will have access to those files. After 7 years, paper files will be shredded and electronic files will be deleted.
- The only Information retained longer than 7 years will be in a data repository for use in possible future research if you indicate agreement with a separate signature at the end of this consent document.

What are the benefits for participating in this study?
There are no particular benefits to you for participating in this study, except that the simulation may be educational. You may or may not benefit from being in this study. However, by serving as a participant, you may help us learn how to benefit nursing students in the future.

Will I be compensated for participating in this study?
Participants will not be compensated time spent completing study activities, owing to the fact that all study activities are required for nursing coursework.

What is an alternative procedure(s) that I can choose instead of participating in this study?
There are no known alternatives available to you other than not taking part in this study. You can decide not to participate in this study. Students who do not participate will not have any penalties in your coursework. Students who decide not to participate will complete the same simulation activities as research participants, but their data will not be included in analysis. Participation in this study does not affect your course grade.

How will my confidentiality be protected? We plan to publish the results of this study. Efforts will be made to limit the use and disclosure of your personal information, including research study records, to people who have a need to review this information. We cannot promise complete secrecy. Your records may be reviewed by authorized University or other individuals who will be bound by the same provisions of confidentiality. Investigators take special precautions to prevent breaches of privacy: 1) Documents completed as part of this study are immediately de-identified and coded. This means that Investigators immediately remove any identifying information and label the documents with unique codes that do not contain any personal identifiers. De-identified documents are kept in double password-protected and encrypted electronic files, and information from the surveys is entered into a password-protected, encrypted database containing no personal identifiers. 2) Investigators maintain one file that contains personal information and study codes (your name and email address) so that they can follow up with you during your participation in this study. This file is double password-protected and encrypted. 3) Information will only be placed in a data repository for use in possible future research if you indicate your agreement at the end of this document.

What will happen to the information collected about me after the study is over?

We will keep your research data to use for future research with your permission. Your name and other information that can directly identify you will be kept secure and stored separately from the research data collected as part of the project. We will not share your research data with other investigators.

Is my participation voluntary?
It is totally up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you decide to withdraw before this study is completed, please contact the primary investigator, Beth Rogers by phone (469-231-4529) or email (B.Rogers@tcu.edu).

The participation of students in research is completely voluntary, and you are free to choose not to serve as a research participant in this protocol for any reason. If you do elect to participate in this study, you may withdraw from this study at any time without affecting your relationship with the investigators, the nursing department, faculty, or your grade in any course.

Your request will be effective as of the date Mrs. Rogers receives it. However, information collected before your request is received may continue to be used and disclosed to the extent described based on your authorization of this consent document.

You may be removed from the study if the investigators or sponsor stops the study, you do not follow study instructions, if investigators cannot reach you be phone or email, or at the discretion of the primary investigator.

Who should I contact if I have questions regarding the study?
You can contact Beth Rogers at any time by phone (469-231-4529) or email (B.Rogers@tcu.edu) with any questions that you have about the study.

Who should I contact if I have concerns regarding my rights as a study participant?
Dr. Dru Riddle, Chair, TCU Institutional Review Board, (817) 257-6811, d.riddle@tcu.edu; or Dr. Floyd Wormley, Associate Provost of Research, research.tcu.edu

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. A copy also will be kept with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study.

____
Printed Subject Name

____
Signature Date

____
Printed Name of person obtaining consent

____
Signature Date

Consent to Use Data for Future Research

I agree that my information may be shared with other researchers for future research studies that may be similar to this study or may be completely different. The information shared with other researchers will not include any information that can directly identify me. Researchers will not contact me for additional permission to use this information.

Yes ________ No __________

____
Signature Date

Consent to be Contacted for Participation in Future Research

I give the researchers permission to keep my contact information and to contact me for future projects. Yes ________ No __________

____
Signature Date

Revised 5/20/2019

1920-263-AM1
Approved August 22, 2020