SITUATION AWARENESS PREPARATION AND PREBRIEFING: FOSTERING THE COGNITIVE PROCESSES OF THINKING LIKE A NURSE IN SIMULATION

Amanda Lynn Potter

Marquette University

Follow this and additional works at: https://epublications.marquette.edu/dissertations_mu

Part of the Nursing Commons

Recommended Citation
https://epublications.marquette.edu/dissertations_mu/3237
SITUATION AWARENESS PREPARATION AND PREBRIEFING:
FOSTERING THE COGNITIVE PROCESSES OF THINKING
LIKE A NURSE IN SIMULATION

by

Amanda Potter, B.A., M.S.N.

A Dissertation submitted to the Faculty of the Graduate School,
Marquette University,
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

Milwaukee, Wisconsin

May 2024
ABSTRACT

SITUATION AWARENESS PREPARATION AND PREBRIEFING:
FOSTERING THE COGNITIVE PROCESSES OF THINKING LIKE A NURSE IN SIMULATION

Amanda Potter B.A., M.S.N.

Marquette University, 2024

Situation awareness (SA) is linked with actionable decision-making and clinical judgment in nursing practice. The cognitive processes used in developing SA, outlined in Endsley’s (1995) model, is the framework underpinning this study and are interwoven into the National Council of State Boards of Nursing Clinical Judgment Measurement Model (NCJMM). Cultivating these cognitive processes through prebriefing and simulation designed to intentionally develop SA, is a recommended practice currently seen in aviation and military training. There is a lack of vigorous research testing whether a specific intervention during clinical simulation can develop SA in nursing students. In addition, fostering SA in the preparation and prebriefing phase of simulation has not been studied.

The purpose of this study was to test the effectiveness of an intentional, structured prebriefing intervention designed to foster SA and implemented prior to high-fidelity manikin simulation. A quasi-experimental study was conducted with a convenience sample of 132 traditional baccalaureate prelicensure nursing students from a large Midwestern private university. SA was measured utilizing an objective, subjective, and performance SA measure. Group differences between the intervention and control group and associations between SA measures and prebriefing experience were examined.

The SA-focused preparation and prebriefing intervention group reported statistically significant difference in satisfaction compared to the control group. However, there were no significant differences in SA between the intervention and control group. Future research is needed to examine differences in a larger population that utilizes the SA-focused preparation and prebriefing for a longer duration. Since SA is inexorably linked with making good decisions informed by and resulting in clinical judgment in nursing practice, these results contribute to the further testing of SA interventions and implementation of preparation and prebriefing best practices to foster the cognitive processes needed in SA.
ACKNOWLEDGMENTS

Amanda Potter B.A., M.S.N.

I would like to acknowledge a few people who have contributed to the successful completion of my PhD program and dissertation. Dr Kristina Thomas Dreifuerst provided invaluable guidance, support, and insight throughout the entire dissertation process. I cannot thank you enough for your steady leadership and assistance at every stumbling block, including the ones I created.

An earnest thank you to my dissertation committee members, Anne Costello, Dr. Kyle Johnson, Dr. Aimee Woda, and Dr. Amber Young-Brice, for your time and assistance. Each of you has an area of expertise that I was able to benefit from during this journey, and I hope to someday achieve the level of excellence that you have attained in your work.

Thank you to the clinical simulation staff for faithfully adhering to the study protocol and accepting extra responsibilities during the study period. Also, I would like to acknowledge the nursing students who participated in this study. I really could not have done it without you.

Thank you to my parents, Leon and Linda Potter, who have always supported me throughout my lifelong pursuit of learning, no matter what meandering path it took.

Finally, completing my PhD program and dissertation would not have been possible without the inspiration provided by my son and daughter. Benjamin and Ellison, I love you so much and I thank you for your patience and understanding when mom had "school stuff" to do.
TABLE OF CONTENTS

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER

I. INTRODUCTION
   A. Background of the Problem
   B. Statement of the Problem
   C. Purpose of the Study
   D. Significance of the Study
   E. Definition of Terms
   F. Theoretical Framework
   G. Research Questions
   H. Substruction
   I. Assumptions
   J. Conclusion

II. REVIEW OF THE LITERATURE
   A. Introduction
   B. Literature Review
   C. Situation Awareness
   D. Simulation in Nursing
   E. Prebriefing
F. Conclusion 54

III. METHODOLOGY 56
  A. Introduction 56
  B. Research Design 57
  C. Research Questions 57
  D. Participants 58
  E. Recruitment 59
  F. Intervention 59
  G. Protection of Human Participants 63
  H. Instrumentation 65
  I. Data Collection 73
  J. Data Analysis 75
  K. Conclusion 78

IV. FINDINGS 80
  A. Introduction 80
  B. Demographics 80
  C. Testing the Research Questions 84
  D. Summary 96

V. DISCUSSION 98
  A. Introduction 98
  B. Discussion of the Findings 99
  C. Limitations 108
  D. Implications for Nursing Education and Practice 111
  E. Recommendations Further Research 114
  F. Conclusion 115
LIST OF TABLES

Table 1: Situation Awareness Global Assessment Technique Example: Levels of Situation Awareness (SA) and Associated Queries……………………………………………………………67

Table 2: Relationship Between Situation Awareness Rating Technique Domains, Dimensions, and Scoring Category………………………………………………………………………70

Table 3: Relationship between Research Questions, Instruments, and Analysis…………79

Table 4: Demographic Characteristics of Participants………………………………………………81

Table 5: Number of Participants by Simulation and Role…………………………………………82

Table 6: Descriptive Data for Healthcare Employment…………………………………………82

Table 7: Descriptive Data for Simulation Attitudes………………………………………………83

Table 8: Means and Standard Deviations of Selected Demographic Variables………………84

Table 9: Tests of Normality for Situation Awareness Global Assessment Technique……86

Table 10: Differences in Situation Awareness in Intervention and Control Group by Measure……………………………………………………………………………………………………86

Table 11: Independent Samples T-tests for Situation Awareness Rating Technique by Role……………………………………………………………………………………………………93

Table 12: Independent Samples T-tests for Prebriefing Experience Scale Scores by Group………………………………………………………………………………………………………95

Table 13: Pearson Correlations for Main Study Variables………………………………………96
### TABLE OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relationships Between Situation Awareness and Clinical Judgment in Simulation</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>Theoretical Substruction</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>Boxplot of Outlier Data Points in Situation Awareness Rating Technique Scores by Group</td>
<td>87</td>
</tr>
<tr>
<td>4</td>
<td>Boxplot of Outlier Data Points in Second Lasater Clinical Judgment Rubric Scores by Group</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>Boxplot of Outlier Data Points in Situation Awareness Rating Technique Scores by Role</td>
<td>92</td>
</tr>
</tbody>
</table>
CHAPTER ONE

INTRODUCTION

Background of the Problem

Students learn to become nurses through didactic and clinical experiences in their prelicensure program. The healthcare environment of today’s nurses is more complex and demands higher cognitive and clinical skills than any other time in history (Clemett & Raleigh, 2021). With fewer opportunities for students to learn in traditional clinical environments such as hospitals and medical offices, nurse educators have created expansive learning experiences using simulation. Simulation is an opportunity for nursing students to use the higher order thinking skills such as situation awareness (SA), analyzing assessment data, and prioritizing planned patient care as well as implementing nursing interventions and evaluating the results (Alshehri et al., 2023).

Healthcare simulation can occur on a spectrum from low fidelity experiences with task trainers that simulate a specific task, such as placing a peripheral intravenous catheter in a vein, to sophisticated environments which incorporate rooms that appear like an acute care hospital, with manikins that replicate the physiologic responses of human beings as patients. Clinical learning in nursing education aims to allow nursing students to practice acting and thinking like a nurse while demonstrating clinical judgment and reasoning. These cognitive concepts involve developing SA in a highly complex and dynamic healthcare environment. Despite these opportunities, research has suggested that nursing graduates are ill-prepared for the complexities of nursing work and demonstrate insufficient clinical judgment and reasoning in practice (del Bueno, 2005; Jessee, 2021; Kavanagh & Sharpnack, 2021). As a result, novice nurses are at higher risk for common errors such as inability to recognize the implications of
changes in assessment findings, medication administration errors, and failure to rescue incidents.

As a practice discipline, nursing has traditionally relied on mentored experiential learning in the clinical environment to develop higher order thinking such as clinical judgment and reasoning. However, these cognitive processes are notoriously difficult to teach because of the complexity and time it takes to build experience that allows for reflection and anticipation (Dreifuerst, 2009; Schön, 1983; Thompson & Stapely, 2011). To meet the challenges of the dynamic healthcare environment, a more deliberate approach to teaching SA in nursing is needed. Simulation offers a predictable clinical environment and structured pedagogy to foster the development of cognitive processes associated with SA and clinical judgment and reasoning.

**Situation Awareness**

The concept of SA originated in aviation and has since been studied in diverse fields, including business, psychology, and medicine. At the simplest, Mica Endsley (1995) defined SA as “knowing what is going on” (p.36). Endsley’s (1995) Model of SA explains that SA is a portion of an individual’s knowledge specifically attuned to the dynamic environment which influences decision-making and eventual action. SA develops across three hierarchal phases or levels: perception, comprehension, and projection. Perception is noticing elements in the environment that are relevant to the situation. This is followed by comprehension of the perceived elements, which encompasses understanding the significance or insignificance of the elements based on the goal of the situation (Endsley, 1995). Finally, the third and highest level of SA is projection which is making predictions about future events within the system. Perception and comprehension must occur for valuable projections about the state of elements in the environment to be helpful in decision-making.
When used in aviation, SA describes the influences on cognition that inform how pilots and other aviation team members make decisions. SA theory helped explain decision failure and how the complexity and dynamic nature of the environment impact human decision-making and action (Singh et al., 2006). Endsley (1995) observed fighter pilots during their work to identify the three levels of SA that are linked to decision-making and action: perception, comprehension, and projection. Similarly, the individual factors influencing SA were related to the knowledge, skills, and abilities needed as a pilot. The task, or system, factors such as system capabilities, complexity, automation, human-machine interfaces, stress, and workload were also categorized from the aviation environment (Endsley, 1995).

The goal of SA in aviation is to provide an understanding of what is currently happening in an environment of many ever-changing variables and predict what may happen next based on those variables (Salmon et al., 2009). Although aviation was the impetus for the original work, SA is pertinent in all complex, dynamic settings where humans make crucial decisions (Stubbings et al., 2012). SA principles provide a mechanism for humans to develop a sense of meta-cognition about the processes they use to make decisions during complex and dynamic situations like aviation and healthcare.

SA is an essential skill for all healthcare professionals as they manage increasingly complex patient care within intricate systems in dynamic, uncertain environments (Gaba et al., 1995; Ivziku et al., 2022; Weston, 2022). For example, SA has been embraced in the operating room (OR), where decisions are made rapidly within a complex environment under stressful conditions (McIlvaine, 2007). In the OR, SA is categorized as a non-technical or cognitive and social skill that complements technical psychomotor skills (Flin et al., 2008). Other non-technical skills include decision-making, teamwork, communication, leadership, and managing stress and
fatigue all impact task execution (Mitchell & Flin, 2008). Behavioral-based rating tools to assess performance were developed to measure these skills objectively, including SA, in physicians within the OR, trauma, and ICU settings (Fletcher et al., 2004; Yule et al., 2006; Reader et al., 2011). Using these tools, and identifying the resulting skill taxonomies for each setting, course, and training, to improve non-technical skills are included in the education of the human operators in critical care settings (Mitchell & Flin, 2008). Despite this work with healthcare professionals, the impact of SA on nurses has not been widely studied.

Nurses spend the most time with patients within the acute care environment. They are often responsible for maintaining a constant state of attention to many clinical cues that are interdependent on computers, equipment, sophisticated technology, and human decision-makers (Sitterding et al., 2012). The SA levels of perception and comprehension are known as crucial starting points for thinking-in-action in nursing (Benner et al., 2011; Schon, 1983). Utilizing a hybrid concept analysis approach, Sitterding et al. (2012) developed a nursing-specific definition of SA as “a dynamic process in which a nurse perceives each clinical cue relevant to the patient and his or her environment; comprehends and assigns meaning to those cues resulting in a patient-centric sense of salience; and projects or anticipates required interventions based on those cues. This projection then influences the nurse’s cognitive stacking and nursing care actions” (p. 89).

The first step in achieving SA in nursing practice is to perceive clinical cues such as changes in assessment findings like a decreased pulse oximetry reading, shallow respirations, or cyanosis in the fingertips within all the rest of the stimuli in the clinical environment. Sometimes, the nurse notices these elements, but no other cognitive processing occurs (Sculli & Sine, 2011). Comprehension, the second step of SA, occurs when the nurse forms a picture of the entire situation by understanding the relationships
between interrelated clinical cues. For example, decreased pulse oximetry, shallow respirations, and cyanosis may indicate respiratory failure due to an opioid overdose in a patient who is using patient-controlled analgesia. In the third step of SA, the nurse then hypothesizes and projects future actions and decides how to act. In the respiratory depression example, the nurse anticipates supporting the airway and breathing while administering a reversal agent but also forecasts the loss of pain control. These cognitive processes can be applied throughout nurses’ varied practice settings and are critical skills for nursing students to be taught.

In Endsley’s model, the process of developing SA is affected by features of each specific situation, including individual characteristics of the human decision-makers and system or task factors. The human abilities of pre-attentive processing, attention, perception, memory, automaticity, and goal setting influence SA development (Endsley, 1995). Task and system factors affect an individual’s ability to develop SA. Interestingly, the original task and system factors identified within aircraft systems to affect SA also closely match issues in the healthcare systems (Wright & Endsley, 2008). System design, interface design, stress, workload, complexity, and automation potentially affect SA. These variables can act as facilitators or limits to SA development in the healthcare environment.

**Individual Factors.** Individuals have different information processing abilities, but the basic underlying processes involve sensing information from the environment, moving that information into short-term memory, sensemaking, and long-term storage and learning (Souza, 2022). Cue salience, or the importance that an individual assigns to the stimuli in the environment, is a crucial step in developing SA (Endsley, 1995). The brain’s thalamus and reticular activating system filter incoming sensory information by importance based on survival instinct and experience, although the individual is largely unaware of this perceptual processing (Souza, 2022). This initial processing is essential
in Level 1 SA perception. Watson and Rebair (2014) described nurses’ sensing with patients as carefully attentive to even the smallest detail guided by past experience, formal learning, and patient patterns.

Likewise, in the Tanner Clinical Judgment Model (Tanner, 2006), noticing is the foundational first step in which the nurse’s perceptual grasp of the patient’s situation is shaped by their clinical experience, knowledge, and values. Expert nurses perceive clinical situations through the lens of their experience and knowledge, and the salient features “immediately and directly” stand out (Benner et al., 1992, p. 25). Considering nursing students who have very little knowledge and clinical experience upon which to draw, the perception of nursing situations is often less than ideal (Benner et al., 1992; Lasater et al., 2019; Poledna et al., 2022; Rooney & Boud, 2019; Tanner, 2006).

Once information is perceived, it is moved into the working memory where most active processing, comprehension, and projection, occurs (Endsley, 1995). Two primary processing functions are assigning sense and meaning to perceived information which correlates with comprehension and projection. The working memory has a functional limit, which can be influenced by the type and amount of information being processed and individual differences such as age and differences in attention. Long-term memory aides like schemata and mental models provide frameworks for understanding complex systems and providing potential outcomes of those systems even with insufficient information (Endsley, 1995). Experience and training are paramount in developing these models to assist in the development of SA (Endsley, 1995). In a recent literature review, nurse experience was a prevalent factor that affected overall SA and individual levels (Avalos et al., 2021).

Endsley (1995) also identified goals as an individual factor that affects SA. Goals related to the specific situation drive what information is sought, and it becomes more meaningful when comprehended considering the goals. Projection, decision-making, and
action then occur based on goal-directed system comprehension. In a dynamic system, SA may force individuals to change their goals because of patterns that are perceived and comprehended in the environment (Endsley, 1995). Goals help individuals select their mental models for assistance in processing complex systems. When the models match the events closely, SA perception, comprehension, and projection occur fluidly. However, when parameters are different, or circumstances do not fit mental models, it is a signal to change goals or revise or switch models.

Task or System Factors. Endsley (1995) identified several factors influencing an individual’s ability to develop SA, including system design, interface design, stress, workload, and complexity. Although many of these same factors have been identified in disparate environments, this is not an exhaustive list of potential influences. In fact, nurses encounter many technologic systems during their work with human beings including assessment tools, electronic health records, and other forms of technology (Krick et al., 2019). Encompassing system and interface design, in their literature review, Avalos et al. (2021) identified integrated displays as one of the most studied influences on nurse SA. Integrated displays place related clinical information within close proximity to each other on one large display unit. Studies incorporated into that review found that integrated displays could improve nurse SA (Avalos et al., 2021). Similarly, Schmidt and colleagues (2016) found that employed color coding of individual patient data increased SA.

The most common finding regarding SA under stress, is that individuals narrow their focus to only a few key aspects of a situation (Endsley, 1995). When certain aspects of a situation are ignored in favor of preoccupation with others, the individual may not comprehend the situation well. Therefore, projections and predictions may not be accurate, resulting in faulty decision-making and actions thereby supporting the importance of SA within the practice of nursing.
Nurses in acute care settings experience high stress related to excess workload, professional conflicts, leadership style, shift work, lack of reward, workplace aggression, and emotional labor (Lim et al., 2010). Nursing students also report stress at a higher level than other university students (Bartlett et al., 2016). A high mental workload is often tied to stress in complex environments when there is high cognitive demand (Endsley, 1995). Mental workload does not have one conclusive definition. Still, a generally accepted definition is a limitation to human cognitive resources when performing a task, including receiving, understanding, speculation, clinical decision-making, communication, and memory recall (Young et al., 2015).

A recent review and meta-analysis revealed that worldwide, nurses experience a high mental workload (Yuan et al., 2023). Some workplace factors that increase mental workload in nurses are higher demand for care, long working hours, and insufficient staffing (Falguera et al., 2021). Simulation pedagogy is one method used in nursing education to prepare students to respond to strenuous physical, psychological, and mental requirements within practice. However, while simulation has shown an effect on reducing anxiety, data are inconclusive for reducing stress (Silva et al., 2022). These findings suggest that even when mental workload is reduced by training and education, stress may impact SA and performance.

Complexity is a major challenge for SA and can affect the cognitive workload required in a situation. This is especially relevant in the healthcare environment because it involves many system components, including technology, human decision-making, complexity of care and the care environment and rapidly changing situations. When the demand exceeds human capabilities, SA will suffer, likely affecting decision-making and performance (Endsley, 1995). Automation of systems and processes may help reduce mental workload and complexity as intended, but automated systems have also been associated with a lack of SA (Endsley, 1995). The automation of nursing decision
support systems has resulted in mixed results, often with challenges sustaining initial improvements (Akbar et al., 2021).

**Errors in SA.** Breakdowns in SA can occur at the level of perception, comprehension, projection, or a combination, usually resulting in poorer decision-making (Endsley, 1995). Incomplete SA occurs when only some of the elements of a situation are known, and inaccurate SA arises when there is flawed information about the elements of a situation (Endsley, 1995). All of these errors are possible in the healthcare environment, and illustrations from nursing work will be provided.

Level 1: SA Perception can be affected when a human fails to recognize an essential characteristic for SA in a situation (Endsley, 1995). This can happen because the signal is hard to detect or discriminate from other environmental stimuli or because the information is simply unavailable to the human. Moreover, incomplete SA ensues when cues are available but are not correctly perceived. Many system and task factors may result in this type of SA error. For instance, this error could occur in a critical care nursing environment if a user-interface allows the nurse to indefinitely silence a low oxygen alarm. As a result, the nurse no longer perceives this cue that their patient’s oxygen is low until they show late physiological signs of hypoxemia like cyanosis. Inaccurate SA can also happen at the perception level because humans may misperceive a signal, despite their best efforts. This error could transpire if a nurse misread an intravenous drip rate as 88 instead of 33 due to low lighting or a bad angle. This type of error is susceptible to the effects of false expectations. For instance, the nurse expected to see 88ml/hr on the IV pump, so doesn’t thoroughly investigate the display screen, just glancing across a dim room because there is no awareness that something is not as it should be.

Level 2: SA Errors occur at the comprehension level when the individual is unable to integrate or understand the situation data with their goals (Endsley, 1995).
Novices are particularly at risk for these types of errors because they lack accurate experiential mental models that help them understand and prioritize all the perceived information. Mental models may also contribute to inaccurate SA if the wrong framework is selected, and situation data is incorrectly interpreted through this perceptual lens. In this instance, a novice nurse may notice that their patient, who had several seizures the previous shift, is now lethargic and attribute this to the post-ictal state. As a result, the nurse does very little assessment because the patient is sleeping and recovering. However, they may miss the development of life-threatening oversedation and central nervous system depression due to the multiple benzodiazepine medications given to stop the seizure activity by overreliance on the post-ictal explanation. Another example of this error that often befalls novice nurses is not worrying about respiratory problems in patients displaying various signs and symptoms of respiratory distress until the learned value of a pulse oximetry reading of <90% is detected.

Level 3: SA Projection may be lacking or incorrect. A lack of good mental models or minimal experience predicting future states can lead to errors at this level (Endsley, 1995). Individual differences in attention, memory, and the ability to mentally forecast future events may impact this level of SA. In a novel, unexpected circumstance like a wound dehiscence, a nurse may not be able to project the possible outcomes of this startling occurrence because they have no experience from which to reflect or anticipate on and don’t remember the brief information devoted to this topic in their nursing curriculum.

Although SA likely develops over time and with experience, some methods have been used to develop and enhance SA. Simulation-based SA training allows the practice of awareness skills in a realistic scenario. Simulations can be computer-based or high-fidelity in an authentic environment. Simulation-based SA training allows a safe and controlled environment for experiencing perception, comprehension, and projection in
complex situations without real-world consequences (Endsley & Garland, 2000). Some cognitive training programs consist of exercises to improve the individual cognitive processes and associated skills like perception, attention, and memory involved in SA. Other programs focus more on the team SA component that is present in many real-world situations.

Team SA training focuses on developing shared mental models and SA by improving communication and collaboration through team-based scenarios (Salas et al., 1995). Additionally, feedback and debriefing have been used to enhance SA after simulation and training since the earliest days of the concepts introduced into human performance evaluation. Debriefing sessions allow for reflection and in-depth analysis of decision-making and planning for future experiences. These methods have been applied to several disciplines to improve SA and the decision-making and actions of humans working within complex environments. In healthcare, SA educational interventions have focused on simulation-based experiences, and there is some evidence that these are more effective than training methods without simulation (Walshe et al., 2019). In nursing, SA is often measured in tandem with other outcomes of sound decision-making and correct actions, such as clinical judgment, because these outcomes impact patients optimally.

**Clinical Judgment**

Clinical judgment has been recently defined as the “observed outcome of critical thinking and decision-making (National Council of State Boards of Nursing (NCSBN), 2019, p. 1). It is an interactive process that uses nursing knowledge to observe and assess presenting situations, identify a prioritized client concern, and generate best possible evidence-based solutions in order to deliver safe client care” (Betts et al., 2019, p. 23). Tanner (2006) influenced modern day thinking about clinical judgment by creating the Clinical Judgment Model which included a four-aspect process of noticing,
interpreting, responding, and reflecting; expanding the description of the cognitive work of nurses. Connor et al. (2023) distinguished “knowing the situation” as an important antecedent of clinical judgment (p. 3333). They described knowing the situation as relationship building with the patient, family, and healthcare team as well as an appreciation of the workplace environment to facilitate a deep understanding of the clinical picture (Connor et al., 2023).

Furthermore, NCSBN research has identified that clinical judgment is affected by contextual factors which likely distinguish it from clinical knowledge (Muntean, 2012). Clinical judgment directly impacts patient outcomes because nurses who can use critical thinking, assessment of vast amounts of patient data, and evidence-based practice, can better prioritize and plan care for optimal patient outcomes (Shalviri et al., 2017; Sitterding et al., 2012). Furthermore, the ability to identify potential risks in a complex environment, and implement interventions to prevent adverse reactions, positively impacts patient safety (Billings, 2019).

When nurses lack clinical judgment, there are potential implications for patient care and outcomes. Using good clinical judgment assists nurses to recognize and respond to changing patient conditions. Without the skills associated with clinical judgment, patient safety and outcomes are compromised, when nurses may fail to notice subtle signs of deterioration or misinterpret assessment findings leading to delayed or inappropriate interventions (Kavanagh & Sharpnack, 2021; Murray et al., 2019). Similarly, without clinical judgment, nurses are more prone to errors throughout the nursing process (Treiber & Jones, 2018). Patient experience and satisfaction can also be affected by poor clinical judgment when nurses fail to assess patient needs and provide appropriate interventions (Kajander-Unkuri et al., 2014).

For example, care coordination, which involves synthesizing information, setting priorities, and coordinating with the patient and healthcare team, suffers if the nurse has
poor clinical judgment leading to fragmented care (Nahm et al., 2023). One study found that although new graduates had passed the NCLEX-RN, only 23% could demonstrate beginning level competencies (Kavanagh & Szweda, 2017). Unfortunately, even more recent data has demonstrated a decline in this number with only 9% of newly graduated registered nurses demonstrating acceptable competencies (Kavanagh & Sharpnack, 2021).

Concerned about the issue of poor clinical judgment in new nursing graduates, the NCSBN overhauled the NCLEX-RN to better measure the competencies needed by new nurses. The NCSBN Clinical Judgment Measurement Model (CJMM) was created to help guide the development of new item types for measuring clinical judgment on future exams (Dickison et al., 2019). The CJMM has four layers with layers three and four representing the cognitive processes that nurses use to make decisions in layer two (Dickison et al., 2019). In layer two, a nurse uses responses from the patient and their environment to potentially reason through layer three and four. The entirety of this process represents the clinical judgment responding to client needs.

The CJMM captures the complexity of nursing work and the various cognitive skills (layer 3) needed to develop effective clinical judgment. It also emphasizes the contextual factors (layer 4) that are at the center of real-world clinical situations. By identifying this complexity, the CJMM can be used to construct educational opportunities that develop clinical judgment skills more effective and assessments that measure the individual steps of the clinical judgment in realistic formats (Dickison et al., 2019). Clinical scenarios, case studies, and simulations are all effective methods for teaching clinical judgment (Hensel, 2020).

A focus on experiential learning contextually situated within the healthcare environment that new nurses will encounter upon graduation, is needed to develop stronger clinical judgment skills (Klenke-Borgmann et al. 2020). Immersive experiences
such as high fidelity (Ayed et al., 2022; Bussard, 2018; Cantrell et al., 2017; Klenke-Borgmann et al., 2020); and virtual reality simulation (Jans et al., 2023; Martin & Tyndall, 2022; Pardue et al., 2023) have been shown to increase the development of clinical judgment in nursing students.

Measuring clinical judgment is important for evaluating the outcomes of educational interventions poised to improve the performance of nursing students and newly graduated registered nurses. There are few assessment and evaluation methods for clinical judgment with the most prominent being the Lasater Clinical Judgment Rubric (LCJR) which was originally developed for use in nursing simulation (Dickison et al., 2019; Klenke-Borgmann et al., 2020; Lasater, 2007). The LCJR has been psychometrically tested and translated into several other languages and used in research evaluating the effectiveness of simulation on clinical judgment (Adamson, 2011; Adamson et al., 2012; Lasater, 2007). Therefore, the CJMM focuses on the cognitive skills involved in clinical judgment that may be assessed beyond direct observation in clinical practice. However, traditional clinical environments and simulation remain the prevalent pedagogy where this learning occurs.

**Prep Work and Prebriefing in Simulation**

When using simulation to teach clinical judgment and its associated cognitive processes, one of the goals is “make student’s thinking processes visible” (Hensel & Billings, 2019, p.129). Much of this work has been focused on the debriefing phase of simulation and it is accepted that the reflective thinking promoted by debriefing enhances learning, understanding, and supports the transfer of knowledge, skills, and attitudes into practice (Dreifuerst, 2009; Dreifuerst, 2010; Forneris et al., 2015; Reierson et al., 2017; Sabei & Lasater, 2016). However, there is an opportunity to refine the process of designing prep work and prebriefing to focus the student’s thinking in preparation for the simulation experience.
Traditionally, prep work has prepared students for the content and objectives of the scenario and established the ground rules of the simulation (International Nursing Association for Clinical Simulation and Learning (INACSL) Standards Committee, 2021). Preparation activities such as assigned readings and review of a patient health record or patient report, medications, and psychomotor skills needed for the experience are designed to support the understanding of the concepts and content related to the simulation (Page-Cutrara, 2015). Additionally, however, this preparation work, or prep work, is also an opportunity to introduce layer 4 CJMM aspects and begin to challenge students to build SA about their anticipated clinical situation and teach them to think like a nurse.

Prebriefing, which is typically conducted by a facilitator just prior to initiating the simulation scenario, can also be an opportunity to assist learners to move from perceiving (level 1 SA) the provided information into comprehension (level 2 SA) or an initial grasp of the situation. Particularly with the group model of simulation commonly used in nursing education, moving towards a shared mental model by guiding students to use the cognitive skills of CJMM layer 3 is advantageous for success and establishes a psychologically safe learning environment. Prompting can also help make sense of the clinical situation, promote the development of the beginnings of sound clinical judgment (Hensel & Billings, 2019).

**Statement of the Problem**

SA is inexorably linked with making good decisions informed by and resulting in clinical judgment in nursing practice. The cognitive processes used in developing SA are interwoven into the CJMM, and using simulation to develop these skills is a recommended practice (Ayed et al., 2022; Bussard, 2018; Cantrell et al., 2016; Klenke-Borgmann et al., 2020). Intentional and strategic prep work and prebriefing for simulation
may allow nursing students to deliberately cultivate SA that can enhance their clinical practice.

Extensive research with SA theory indicates that SA has a critical role in actionable decision-making in healthcare (Cooper et al., 2013; Stubbing et al., 2012; Wright & Endsley, 2008). Nursing students are at risk for common SA errors due to their inexperience and underdeveloped mental models. Instead of assuming that nursing students learn to develop SA through happenstance in simulation, methodically practicing the cognitive skills to build both SA and clinical judgment in preparation and prebriefing may allow students the guidance needed to know how to develop SA.

Additionally, simulation is a suggested activity that will build SA across many disciplines (Endsley & Garland, 2000). However, nursing students are learning to think like a nurse and should be supported in thinking before action in formative simulations. Amongst the goals of simulation’s preparation and prebriefing phase is increasing learner success by guiding nursing students to grasp the meaning of the scenario information. There is little information about effectively meeting this prebriefing standard and even less research demonstrating concrete learner benefits. Therefore, a gap exists in how to best teach SA to nursing students, including using preparation and prebriefing to maximize simulation.

**Purpose of the Study**

The purpose of this study was to test an intentional and strategic structured preparation and prebriefing method that fostered the cognitive processes used in SA to measure clinical judgment and actionable decision-making of nursing students engaged in a simulation. This intervention was compared to customary preparation and prebriefing. Three different methods of assessment were used to measure student SA: an objective freeze probe technique, post-trial subjective rating, and the SA performance measure of clinical judgment.
Significance of the Study

Nursing students must be prepared by their education to function within complex, dynamic systems. SA is a critical factor in decision-making and clinical judgment in nurses but is often only implicitly taught through experiential learning in the clinical setting. However, in an educational environment where simulation is utilized to replace up to 50% of clinical experience, nurse educators must optimize simulation learning to provide experiential learning and practice using the cognitive skills required of nurses (Hayden et al., 2014). This research will contribute to the body of knowledge surrounding SA in nursing and provide evidence for preparation and prebriefing best practices.

Definition of Terms

Active participant: A learner role in simulation in which the learner is actively participating in the decision-making and implementation of nursing care during the scenario. (Jeffries & Rizzolo, 2006).

Clinical judgment: The observed outcome of situation awareness, critical thinking, and decision-making in the clinical nursing setting. (Betts et al., 2019).

Debriefing: A session after the clinical scenario that encourages learner reflection, provides feedback about performance, and fosters assimilation and accommodation of learning to future practice situations (Johnson-Russell & Bailey, 2010; Dreifuerst, 2012).

Observer: A learner role in simulation in which the learner is located externally to the scenario watching over audio-visual technology while other students actively participate in the scenario’s action. Observers participate in the same preparation, prebrief, and debrief as active participants. (Johnson, 2018).

Prebriefing: The in-person procedures of preparation and briefing that occurs just prior to the clinical scenario in a simulation activity to prepare learners for educational content, establish a psychologically safe learning environment, and create the ground rules for the experience (INACSL Standards Committee, 2021b).
**Prep Work:** A preparation activity to support understanding of the concepts and content related to the simulation including objectives, assigned readings, patient health record, review of medication, labs, and psychomotor skills needed (INACSL Standards Committee, 2021b).

**Simulation:** Structured activities or events that represent actual or potential practice that allow participants to develop or enhance knowledge, skills, and attitudes while responding to realistic events in a simulated environment (Lioce et al., 2020).

**Theoretical Framework**

Considering that Endsley’s (1995) Model of Situation Awareness, Tanner’s (2006) Clinical Judgment Model, and the NCSBN’s Clinical Judgment Measurement Model (2019) share many overlapping constructs, a new combined framework for utilizing these concepts within simulation was used in this study. While SA is not explicitly stated as a measurable cognitive aspect of clinical decision-making in the CJMM, the precursors to SA are present in layer 3 and individual, system, and task factors are represented in layer four of the model. Endsley (1995) identified perception, comprehension, and projection as the fundamental cognitive processes to developing SA; in simulation, these processes begin long before the actual simulation scenario begins. Coupling the cognitive processes of SA and clinical judgment and teaching students to recognize, analyze and comprehend clinical cues in preparation and prebriefing in simulation extends the benefit of this phase beyond preparing and briefing for the current simulation.

In Figure 1, the inner circle depicts Endsley’s model of the development of SA including a 3-level linear process that begins with perception, then comprehension, and finally, projection about the state of the environment has been incorporated into this study’s theoretical framework. Decisions and subsequent actions follow the development of situation awareness. In the circular loop, the performance of actions produces
feedback that affects the state of the environment, inducing potential changes in situation awareness. Individual and task/system factors may affect situation awareness at any level. This illustrates the cognitive processes needed to understand complex, ever-changing systems. The model acts as an explanation of SA development when learners encounter a simulation situation. Developing SA is an interactive progression that changes as new information is available about the state of the environment, and this is represented in the model by the overlap of perception and comprehension that occurs in preparation and prebriefing. These processes of SA occur throughout the simulation scenario as well as new information is received which is shown by circular arrows rotating in the center of the diagram.

The four aspects of Tanner’s Clinical Judgment Model and the CJMM layer three cognitive processes and the three phases of simulation are also incorporated into the framework to show the relationships between these elements (Figure 1). Tanner’s Noticing, which entails acquiring an initial perceptual grasp of the clinical situation, correlates with level 1 SA perception, and CJMM recognizing cues occurs initially during student preparation and prebriefing. Noticing is heavily influenced by individual factors such as the nurse’s knowledge, experiences, and values that frame their perception of the situation (Tanner, 2006; Dickison et al., 2019).

In simulation, interpreting transpires when level 2 SA comprehension and the cognitive process of analyzing cues occur individually during preparation and in the group setting of prebriefing. Similarly, students will begin to form hypotheses and engage in level 3 SA projection during preparation and prebriefing. Still, since these are more difficult cognitive processes, especially for the novice, the facilitated prebriefing may be where this type of thinking occurs before the simulation. The scenario and debriefing phases of simulation are diagramed in figure 1 to show where the
concentrated cognitive work of clinical judgment and the CJMM are taking place during a simulation.

**Figure 1**

*Relationships Between Situation Awareness and Clinical Judgment in Simulation*

Note. This model illustrates Endsley’s Situation Awareness (SA) process and Tanner’s Clinical Judgment (CJ) constructs embedded in the phases of simulation in which they occur most often. The circular arrows in the middle of the diagram suggest the cyclical nature of the development of SA and CJ throughout simulation.

The framework used in this research relates the elements of SA and the aspects of the clinical judgment model diagrammed within the simulation phases. This framework incorporates the concepts of situation awareness, clinical judgment and operationalizes layer three of the clinical judgment measurement model within a simulation setting.
model serves as guide to explicitly connect the cognitive work of thinking like a nurse to the simulation phases and highlights the ever-present role of SA in nursing. Both the model (Figure 1) and the preparation and prebriefing tools (Appendix A and Appendix B) developed for this study, guide students to recognize and focus on the implicit cognitive skills such as SA that underpin clinical judgment. The following research questions were used to test this assertion:

**Research Questions**

1. Is there a difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?

   H01: There is no difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?

2. Is there a difference in SA based on student role in the simulation?

   H02: There is no difference in SA based on the student role in the simulation.

3. Is there a difference in prelicensure nursing students’ satisfaction with prebriefing the simulation experience based on whether they received SA or customary prep work and prebriefing?

   H03: There is no difference in prelicensure nursing students’ satisfaction with prebriefing based on whether they received SA or customary prep work and prebriefing.

4. Is there a relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing?

   H04: There is no relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing.
**Substruction**

Theory substruction is a process of examining and diagraming relationships between constructs, concepts, variables, and indicators to test the congruence of the theoretical foundation and the operational aspects of a research study (McQuiston & Campbell, 1997). This process visually represents the movement from abstract constructs to concrete operational referents. When theory substruction was applied to this research study, the constructs of the predictor variable are the inclusion or exclusion of SA in prebriefing prior to simulation and the role in simulation (active participant or observer). The constructs of the outcome variable are clinical judgment and student satisfaction with prebriefing (Figure 2). The referential of the predictor variable are self-report of situation awareness prior to the simulation, and satisfaction with the prebriefing. The referential of the outcome variables are clinical judgment noticing and interpreting and situation awareness. These predictor variable referents were measured by the Prebriefing Experience Scale and Situation Awareness Rating Tool for all roles. The outcome referents (Figure 2) were measured by the LCJR noticing and interpreting scales and the Situation Awareness Global Assessment Technique (SAGAT).

**Assumptions**

This study included the following assumptions: (a) students engaging in simulation will be provided preparation, prebriefing, and debriefing; (b) situation awareness is a construct that is involved in thinking like a nurse; (c) nursing students are capable of developing situation awareness; (d) situation awareness and clinical judgment can be developed in simulation and taught to nursing students; and (e) differences seen between the control and intervention group are due to the intervention and no other related factors.
Chapter I included the background of the study, the statement of the problem, the purpose, significance and aims of this study, the theoretical underpinning of this research, definitions of pertinent terms, and finally, the assumptions of the study. Chapter II will provide a review of the literature, which includes a review of the literature organized into the following concepts: a) situation awareness, b) situation awareness in nursing, c) clinical judgment in nursing, d) teaching situation awareness and clinical judgment in nursing education, e) simulation in nursing education, f) prebriefing. Chapter III will describe the methodology planned for this research study. It includes the selection
of the participants, instruments that were used and why, the data collection process, and data analysis associated with the research questions.
CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The purpose of this study was to test the impact of an intentional and strategic structured preparation and prebriefing format designed to enhance thinking like a nurse by fostering the cognitive processes used in SA. Historically, SA has been explored and measured in a variety of complex environments and the concepts have been used to improve human performance in actionable decision-making situations. Simulation and debriefing can be used to improve SA within complicated systems. In a healthcare environment, where newly graduated Registered Nurses struggle to demonstrate the competencies associated with good clinical judgment, there is a call to focus nursing education on the cognitive processes associated with good judgment. Therefore, simulation pedagogy is increasingly being used to augment nursing student clinical experiences.

Simulation debriefing methods have been refined to capitalize on guided reflection and analysis of performance to assist students to accommodate and assimilate their experience into future practice (Dreifuerst, 2010; Dreifuerst, 2012). However, prebriefing has not been optimized and operationalized to contribute to cognitive learning outcomes in the same way. Since SA is a precursor to sound decision-making and clinical judgment in nursing practice, it can be developed throughout simulation. Consequently, research to test a simulation-based prebriefing intervention to teach and develop SA as part of the development of clinical judgment was planned. Chapter Two includes a review of the literature organized into the following concepts: a) situation awareness, b) situation awareness in nursing, c) clinical judgment in nursing, d) teaching
situation awareness and clinical judgment in nursing education, e) simulation in nursing education, and f) prebriefing.

**Literature Search**

The literature for this study was explored using the following databases CINAHL, ERIC, PubMed, and Google Scholar. Search terms included history of situation awareness, situation awareness education, situation awareness measurement, situation awareness AND nursing, clinical judgment, clinical judgment education, Clinical Judgment Measure Model, simulation in nursing education, and prebriefing. Search results were limited to those published in English, research articles available in peer-reviewed academic journals, and dissertations published since 2000. Situation awareness was examined from 1995 to 2023 to capture the advent of the Endsley Model of SA. Equivalent term searching was included when available.

**Situation Awareness**

The concept of SA has been established as an important factor in the domain of human performance and there is an extensive list of situations in which SA is critical to safety and performance including air traffic controllers, jet pilots, nuclear power plant operators, and military officers (Gronlund et al., 2005). SA defies one definition and at least one review found 26 distinct descriptions of the concept distributed throughout different complex environments (Roy et al., 2007). The most often referenced definition is Endsley’s (1995) who defines SA as a state of knowledge or product that is arrived at by “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future” (p. 36). There are other thinkers who describe SA differently (Chiappe et al., 2015; Klein, 2015; Stanton et al., 2015), However, Endsley’s model has been influential in extant
literature with thousands of references across many settings. Some of the most common papers using Endsley’s Model include evaluating accidents, identifying desirable human characteristics for operators, and the role SA plays in situation specific decision-making. A small sampling of this literature is included to illustrate the wide variety of settings in which SA is relevant, beyond its aviation origins.

Accidents or errors in complex environments are often explored to look for root causes like inaccurate or missing SA. Grech et al. (2002) analyzed maritime accidents to evaluate whether SA was a relevant factor in merchant shipping operations. In 71% of accident reports where human errors occurred, SA related problems were to blame. Similarly, a large percentage of forklift accidents can be attributed to problems with SA in the operator (Choi et al., 2020). Experts also applied a SA framework to cases reported to a German anesthesia critical incident reporting system and found SA error in 81.5% of cases (Schulz et al., 2015).

SA concepts have also been applied to task analyses for a wide variety of occupational roles to identify crucial abilities for those roles. Golightly et al., (2010), established that operator expertise about the local environment played an important role in determining SA within rail signal operators. Endsley’s model was also used as a framework to understand the key cognitive processes needed by oil well drillers to detect problems during the task (Roberts et al., 2016). More generally, psychologists have explored human decision-making by focusing on the underlying processes of SA and attempting to understand how humans perceive, process, and use information (Durso et al., 2017).

Moving beyond the individual in complex systems, SA frameworks have also been used to isolate important SA precursors to decision-making in job-specific tasks. For example, virtual reality (VR) simulations were used to identify problematic tasks for
fork-lift operators that resulted in a loss of SA (Choi et al., 2020). Isolating these problem areas led to VR training on those specific tasks to improve performance. Pedestrian street crossing decision-making was analyzed to appreciate the complexity of this task in the context of SA. Researchers found that one third of the street crossings were risky and there were a multitude of individual and system factors that affected SA, leading to targeted suggestions for improving safety including adding auditory and visual cues to increase noticing as the signal changes (Coeugnet et al., 2019).

Across all these settings, SA was found to be impactful and relevant to the intricate cognitive work and actionable decision-making that humans do in rapidly changing environments. Safety and the performance of tasks requiring a high degree of precision and risk-based decision-making were outcomes studied by researchers as they applied Endsley’s Model of SA to various venues. In addition to applying the concepts to diverse situations, other researchers explored SA as a discrete outcome rather than a process or cognitive choice (Choi et al., 2020; Grech et al., 2002).

There are many different measures to quantify SA. Measuring situation awareness provides valuable information about the cognitive processes in a dynamic environment (Endsley et al., 1998). Salmon et al. (2006) identified several categories of SA assessment methods, including freeze probe techniques, real-time probe techniques, post-trial subjective rating techniques, observer rating techniques, performance measures, and process indices. These methods can be further grouped by objective, subjective, and performance measures and process indices.

**Objective Measures.** Objective measures of SA compare a participant’s perceptions, thoughts, and projections about the situation to reality. This is usually assessed using a simulation by either freezing in the middle of the action or measuring in real time. The accuracy between the participant’s perceptions of the situation and
what is actually happening is scored in these measures. Endsley’s Situation Awareness Global Assessment Technique (SAGAT) tool is frequently used as an objective measure of SA (Bogossian et al., 2014; Hansel et al., 2012; Hogan et al., 2006; Hultin et al., 2019; Lavoie et al., 2016; Lavoie et al., 2019; McKenna et al., 2014; O’Meara et al., 2015). The SAGAT was developed to assess each level of SA based on queries posed to the participant during a situation (Endsley & Garland, 2000). The queries used are developed a priori by performing a detailed task analysis based on the goals of the situation. The task and environment are then paused to allow SA assessment using the SAGAT. An overall score is available for SA but also an assessment of perception, comprehension, and projection. The Situation Present Assessment Method (SPAM) used by Shelton et al. (2013) is similar to the SAGAT but does not use assessment pauses and instead relies on latency between queries and received answers to measure SA.

**Subjective Measures.** Subjective measures of SA ask participants to rate their own SA on a Likert scale. The Situation Awareness Rating Technique (SART) rates ten dimensions of SA on a seven-point Likert scale based on performance of a task under analysis (Taylor, 1990). Bracq et al. (2021) examined SA among scrub nurses and scrub nursing students while detecting errors in a virtual operating room environment. In their investigation, they found a statistically significant correlation between SART scores and detection of errors. Trained observers can subjectively measure SA by observing actions and vocalizations. Their observations are considered subjective because they cannot objectively know the participant’s true awareness of the situation (Endsley, 1995). Peddle et al. (2019) conducted interviews and focus groups to collect student perceptions and experiences following patient interactions in a virtual environment. The transcripts were analyzed for evidence of student learning about SA. Tower et al. (2019) incorporated a unique qualitative methodology by instructing participants in post-
operative scenarios to verbalize their thoughts, or to think out loud, as they completed clinical care during simulated scenarios. This voice data and traditional interview transcripts were then analyzed for evidence of SA. Objective Structured Clinical Examinations (OSCE) have been used to measure SA in students by trained observers (Frere et al., 2017). By analyzing several available OSCE guides using NVivo software, Frere and colleagues (2017), also substantiated that the three levels of SA were accounted for in OSCE assessment criteria.

**Performance Measures.** Based on data that find better SA yields better performance; performance measures are commonly used to infer SA from the successful achievement of task outcomes (Endsley, 1995). To assess performance, researchers developed study-specific tools to quantify the accuracy of correct actions or observations. These tools are generally used in addition to other SA measures (Bracq et al. 2021; Cooper et al., 2010; Cooper et al., 2012; Hansel et al., 2012; Hultin et al., 2019). Gluyas et al. (2019a) developed the Performance Based Situation Awareness Observation Schedule to evaluate the performance of nursing students during two different tasks: pain assessment and management and assessment and management of a patient with a change in clinical status. This method involved observing for the absence or presence of expected behaviors, actions, and reactions during the specific tasks. The tool demonstrated content validity and acceptable interrater reliability (Cohen’s Kappa 0.61-0.80) (Gluyas et al., 2019b).

**Process Indices.** Process indices are a surrogate measure of SA and are most often used with other assessments of SA or to examine the underlying processing mechanisms of SA. They examine how people process information in their environment, and include physiological measurements such as eye gaze tracking, eye blink counts, or electroencephalography (Bolstad & Cuevas, 2010). Anbro et al. (2020) used gaze
fixation count and fixation duration as evidence of the perception phase of SA in the virtual reality arm of their design. However, patterns of attention detected by the eye tracking that should bolster SA were not correlated with performance in this study (Anbro et al., 2020). O’Meara et al. (2015) used eye tracking technology to identify participants’ area of interest, gaze fixation/duration, and scan path with eye tracking technology and hypothesized that gaze fixation was strongly associated with focus of thought.

As the concept of SA was applied to various complex work environments, the literature reports SA as both an outcome and a predictor of other task-related goals (Durso et al., 2017). Since SA is most likely to affect outcomes in environments where multiple goals are pursued simultaneously, multiple tasks are expected to be performed concurrently, and/or operator performance under time stress leads to negative consequences and poor performance it is difficult to separate outcome from achievement of goals (Kaber & Endsley, 1998). The work of nurses in the acute care environment is described aptly as this type of dynamic, complex environment where SA is closely tied to decision-making and action. However, SA is most often described as a critical cognitive process in nursing (Fore & Sculli, 2013; Sitterding et al., 2012).

**Situation Awareness in Nursing**

SA is an essential skill for all healthcare professionals as they manage complex systems in dynamic, uncertain environments (Gaba et al., 1995). As SA occurs in an ever-changing environment like healthcare, a nurse, for example, is affected by several system factors that can help or hinder SA, including stress, workload, complexity, interface design, and other system characteristics (Endsley, 1995). Endsley’s model accounts for individuals varying in their ability to develop SA, most often related to abilities, experience, and training which affects the number and accuracy of available mental models. In addition, SA is influenced by any situation’s goals, objectives, and
expectations. Stubbings et al. (2012) state, “SA is essential in all complex, dynamic occupational settings reliant on human operators making decisions where safety is paramount” (p.1444), and it is most often identified as part of the cognitive work of nurses. Investigating SA in nursing practice has focused on defining the attributes identifying the consequences when it is not present, in addition to measuring and improving SA in the context of patient care.

**SA in Nursing Work Environments.** Several studies have identified nurses engaging in the cognitive work of SA in various practice settings (Afkari et al., 2016; Busby & Witucki-Brown, 2011; Koch et al., 2012; Korkiakangas et al., 2014; Mitchell & Flin, 2008; Patterson et al., 2016). In all these papers, SA was a part of the decision-making or nursing actions expected in the specific context. SA has been examined most often in nurses within the operating room (OR). Mitchell & Flin (2008) were among the first to identify that the scrub nurse’s ability to gather information, understand the information and project futures states particularly in relation to the surgeon’s needs correlated with SA through their review of literature. Afkari et al. (2016) used video recorded observations of micro neurovascular surgeries and interviews with scrub nurses to conclude that the nurses frequently used projection to anticipate the surgeons desired instruments while observing multiple sources of data to monitor the OR environment. Similarly, video recordings of surgeries were used to evaluate scrub nurse SA based on speed of their instrument passing and other verbal and non-verbal behaviors. Researchers concluded that SA was involved in their task, but the environment could greatly impact it (Korkiakangas et al., 2014). Furthermore, an online Delphi technique identified SA as a necessary non-technical skill of operating room nurses (Sirevag et al., 2021).
In the OR, nurses must use all senses to gain SA, be attentive to maintain SA, contribute to shared SA, have awareness of wrong information, and use SA, knowledge, and experience to be one step ahead (Sirevag et al., 2021). These skills have also been isolated in other healthcare settings. Busby and Witucki-Brown (2011) described SA as the process of establishing and maintaining control of dynamic, contextually based multicausality incidents after interviewing emergency response providers and analyzing the transcripts for evidence of SA. In the ICU, Koch et al. (2012) identified the instances where environmental information was not readily available for nurses as they performed their nursing work confirming that they used SA in their patient care but experience significant challenges navigating the dynamic and complex information-rich environment. Moreover, SA was also suggested as a framework for understanding the complexity that is encountered by mental health nurses making decisions about involuntary psychiatric admissions (Patterson et al., 2016).

In each of these clinical settings, particular nursing tasks were enhanced by SA and often consequences impacting patient safety or optimal care were avoided. Since SA has been identified as a critical cognitive process for nurses that is involved in actionable decision-making, it is closely tied to quality patient care and patient safety. Lacking SA or having faulty SA has been associated with medical errors (Endsley, 2006; Sitterding et al., 2012). SA is a vital component of the nursing process of assessment, nursing diagnosis, and planning patient care. Awareness of clinical cues from multiple sources, such as subjective and objective patient assessments involving technology and computers, is influenced by SA (Stubbings et al., 2012; Wright et al., 2008). In nursing, the lack of SA may increase the potential for adverse events such as failure to rescue, medication administration errors, and missed nursing care (Fore & Sculli, 2013; Marshall & Finlayson, 2022; Sculli et al., 2011; Sitterding et al., 2014). Even expert clinicians are
at risk for SA error, especially in acute and changing situations that pose a high cognitive demand. Novices, such as nursing students and newly graduated nurses have a higher risk for poorly developed SA because they may have less developed working memory and mental models (Gutzwiller & Clegg, 2013).

Nursing students’ development of SA has been categorized and measured by researchers, most often by using the simulation environment. Utilizing simulation scenarios featuring deteriorating patients, Cooper et al. (2010) measured SA in final year nursing students using a freeze probe technique and found that students were most successful at the perception level of SA but that their overall global perception and comprehension of the situation was poor. In another study, final year students cared for post-operative patients in simulation and were instructed to think-aloud to capture their decision-making (Tower et al., 2019). The data from the simulations and post-simulation interviews was coded for evidence of all three levels of SA and again students were found to demonstrate mostly level 1 SA perception thoughts and behaviors. They also attempted to interpret these clinical observations but often over-relied on policy and other nurses’ judgment to make sense of their assessment data (Tower et al., 2019).

McKenna et al. (2014) also used a freeze probe technique to measure SA during simulated patient deterioration scenarios, but they found that overall SA was low, and students scored lowest on perception and the highest on projection. Although all studies demonstrated evidence of developing SA in nursing students, their skills varied and there were deficiencies in students’ abilities to perceive, comprehend, and project. Fortunately, no real patients were harmed in these instances because each study was conducted in simulation, but performance of skills was low and decision-making was negatively affected by low levels of SA (Cooper et al., 2010; Tower et al., 2019). Not
surprisingly, given the potential negative impacts of poor SA, researchers have explored interventions for improving SA for practicing nurses and students alike.

**Interventions to Improve Situation Awareness.** Published efforts to improve SA are as numerous as the attempts to define and measure it. Typically, within the discipline of nursing, interventions focus on either addressing system or task factors that are detrimental to SA or improving the human decision maker’s cognitive processes, through task training or increasing knowledge and awareness of SA. To address system and task factors, studies have addressed the effects of user interface on SA which primarily affects the perception level of SA in nursing practice. For example, Koch et al. (2012) conducted a study in a burn trauma intensive care unit to investigate the effect of an integrated display on nurses’ SA. The integrated display, which aggregates multiple sources of data into one visual presentation, increased nurses’ SA scores and decreased the amount of time that it took them to find information (Koch et al., 2012). Similarly, intensive care nurses with head-worn displays achieved better scores on SA-related questions and responded to patient alarms more quickly and were less likely to miss alarms (Pascale et al., 2019). Also, as a strategy to increase perception of important information, huddles were implemented in several units at National Health Service facilities (Stapley et al., 2018). Interviews with nurses revealed that they felt more aware of department issues, and that this information helped them anticipate and plan care more effectively (Stapley et al., 2018).

In addition to these innovative interventions aimed at reducing negative system influences on SA, practicing nurses have received SA training intending to improve the individual characteristics that impact SA. For example, early career emergency department nurses were taught an assessment framework and SA was measured as part of a non-technical skill evaluation. SA improved after the nurses took part in a
simulation scenario in which they used the assessment framework (Munroe et al., 2016). Kass et al. (2018) developed a workshop to improve the SA of novice nurses taking part in a residency program. SA was measured using the SAGAT during a pre and post workshop simulation scenario. There was a significant difference in overall mean SA score (n=6, p < .05) when pre and post scores were compared (Kass et al., 2018).

Even though improving SA in nursing practice was the goal of multiple studies, the variation in interventions and findings limit the generalizability and transferability to other settings. Determining the variables that influence SA and identifying confounding variables in nursing practice remains challenging. Despite these differences in study design, simulation was commonly used as part of the intervention. A recent systematic review and meta-analysis found that for healthcare providers, simulation-based education offers better SA outcomes compared to other education modalities (Walshe et al., 2019). For nursing students, simulation is thought to promote SA (Sitterding et al., 2012) and is used frequently to provide students an opportunity to develop a systematic approach to patient care decision-making and critical thinking (Priambodo et al., 2022).

**Teaching SA in Simulation.** Although simulation has been used to promote SA in other fields such as aviation and the military, using simulation in nursing to develop or practice SA is a relatively new concept in a pedagogy that has only been at the forefront of clinical education since 2004 (Issenberg, 2006). For practicing nurses however, there are few studies using simulation specifically for improving SA.

A recent scoping review attempted to capture the literature about the use of simulation to teach or develop SA in nursing students (Priambodo et al., 2022). Only 9 titles however, met the inclusion criteria of studies conducted with nursing students that aimed to test the effects of simulation on SA with SA being the primary outcome (Cooper et al., 2010; Philips, 2014; Bogossian et al., 2014; McKenna et al., 2014; O'Meara, 2015,
Stomski, 2018, Gluyas et al., 2019b; Peddle et al., 2019; Morsey & Ahmed, 2020).

Notably, only two studies included explicit training about SA as part of the simulation activity (Gluyas et al., 2019b; Stomski et al, 2018). The situation awareness training provided by Gluyas et al. (2019b) consisted of a two-hour tutorial at the beginning of the semester followed by reminder emails that refreshed SA concepts throughout the semester. Stomski et al. (2018) provided a workshop-based education intervention to their participants prior to their single simulation. The other studies relied on the practice of the nursing process in simulation to teach SA. In all the reported studies, there were significant improvements in SA among the nursing students after simulation. However, SA was still considered to be low overall after the simulations (Priambodo et al., 2022).

This raises questions about the sensitivity of SA measures and the ability for the commonly used SA measurement tools such as the SAGAT and other performance measures to detect changes after single interventions without the use of other concurrent measures. Furthermore, eight of the nine studies in Priambodo’s review used deteriorating patient scenarios which reflects the concern that SA influences patient care in demanding situations when patients are changing rapidly. However, findings of low SA and poor performance in these scenarios as the patient deteriorated suggest that these types of scenarios should not be the only experiences that promote SA (Cooper et al., 2013). Building upon prior experiences with simulation and clinical to develop the cognitive processes involved with SA, may be more effective than one-time simulation opportunities focused on failure to rescue scenarios yet more research is necessary to explore this.

Clinical Judgment in Nursing Education

Clinical judgment is thought to be the embodiment of actionable decision-making and higher-order thinking in nurses. One of the simplest definitions of clinical judgment is
that it is thinking la nurse (Tanner, 2006). Tanner (2006) introduced the Clinical
Judgment Model to address the complexity of a nurse’s thinking beyond the nursing
process. Noticing, which is the first phase of Tanner’s Model, emerges from the cognitive
work of building SA and could be considered an antecedent of clinical judgment.
However, no concept analysis has explicitly identified the SA concept as an antecedent
to clinical judgment (Seidi et al., 2014; Uppor et al., 2022). Most definitions of clinical
judgment focus on the conclusion or outcome of thinking. For example, Tanner (2006)
described clinical judgment as “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” (p. 204).

Clinical judgment has also been described as the outcome or conclusion that
nurses make after thinking through a situation (Alfaro-LeFevre, 2013). And finally, The
National Council of State Boards of Nursing (NCSBN) defines clinical judgment as “the
observed outcome of critical thinking and decision making” (Betts et al., 2019, p. 23). In
the proposed research study, clinical judgment was utilized as an observable
performance measure dependent on SA. In a study comparing two different types of
debriefing, Lavoie et al. (2019) used a modified SAGAT measurement of SA and clinical
judgment as a performance measure directly after nursing students completed a high-
fidelity simulation. Unfortunately, the SA scores were very inconsistent between students
and scenarios making comparisons between the two debriefing methods difficult (Lavoie
et al., 2019).

Instead of directly measuring SA, another recent study looked for relationships
between clinical judgment measured by the LCJR and eye tracking data as a process
indices measure for SA (Shinnick, 2022). Interestingly, in this study there were no
differences in clinical judgment between novice and expert nurses. This is unexpected because thinking like a nurse involves being aware of the patient’s situation. Expert nurses know and understand their patients on a very deep and intuitive level that is difficult for new nurses to achieve. Experienced nurses use their knowledge, reflection, and anticipation to inform actionable decision-making and implement safe nursing care. Yet, a correlation was found between lower LCJR score (lower clinical judgment) and fixation time on provider orders (Shinnick, 2022). The researcher explained this finding by hypothesizing that nurses (novice and experienced) with lower clinical judgment, critical thinking and decision-making skills, spent more time looking for answers in the physician orders instead of focusing on interpretation of patient assessment findings (Shinnick, 2022).

There has been a renewed interest in measuring clinical judgment using the NCSBN CJM beyond exploring the theoretical relationships between clinical judgment, critical thinking, and decision-making. This model was designed to assist test developers in crafting a NCLEX that measures clinical judgment as well as knowledge (NCSBN, 2021). The model blends prior clinical judgment work and cognitive decision-making processes to create multiple assessment points for measuring aspects of clinical judgment (Dickison et al., 2019). Nurse educators are then called upon to teach nursing students these processes and create opportunities for practice and experiential learning. A survey study conducted by Jessee et al. (2023) found that nursing programs that had adopted a clinical judgment model to guide curriculum development in the past three years were influenced by the NCLEX-NGN. Overall, survey data reported positive outcomes to the adoption of a clinical judgment model and programs intended to use the model to develop teaching strategies and assessment methods (Jessee et al., 2023).
Troubled about the gap between nursing education and practice readiness and bolstered by the changes to the NCLEX, there have been several studies published about how to use the CJMM to develop innovate teaching and assessment strategies (Calcagni et al., 2023; Harden & Prochnow, 2023; Hensel et al., 2020). Hensel et al. (2020) provided a road map of how to integrate the CJMM into teaching throughout the curriculum by using realistic cases and scenarios and allowing students to demonstrate the cognitive processes through prompts.

Calcagni et al. (2023) compared clinical post-conference using active learning strategies to traditional post-conference activities in senior level nursing students by measuring clinical judgment development with the LCJR. In their study, clinical judgment improved at each successive time point for all students but there was no significant difference between the types of post-conference experiences. The CJMM was also implemented in a junior-level medical-surgical didactic course by Harden & Prochnow (2023). They systematically redesigned the course to use the CJMM structure and principles in a flipped classroom focusing on active learning strategies. Formal evaluation of this project was planned in future courses (Harden & Prochnow, 2023). The National Council of State Boards of Nursing (NCSBN) defines clinical judgment as “the observed outcome of critical thinking and decision making” (Betts et al., 2019, p. 23). To demonstrate clinical judgment, nursing students are typically taught to engage in the nursing process which encompasses phases including assessment, diagnosis, planning, implementation, evaluation. However, with the advent of the CJMM, nurse educators must go beyond this level of teaching and focus on the cognitive work underlying clinical judgment. Simulation pedagogy has been recommended to teach both SA and clinical judgment because of the opportunity to learn and apply in a safe clinical environment.
**Teaching Clinical Judgment in Simulation.** Simulation has been identified as a pedagogy that can positively impact clinical judgment both alone and in combination with other traditional teaching methods. In a recent systematic review, 15 studies were identified that used high fidelity simulation to develop nursing student clinical reasoning-related skills (Alshehri et al., 2023). Two of these studies measured clinical judgment. Fawaz and Hamdan-Mansour (2016) compared the teaching methods of high-fidelity simulation to traditional lecture and demonstration by measuring the clinical judgment of first year nursing students. Both groups also had the opportunity to attend an in-hospital clinical experience caring for patients with the same diagnosis as the simulation and lecture prior to clinical judgment measurement. They found that LCJR scores were significantly higher in the simulation group (Fawaz & Hamdan-Mansour, 2016). Similarly, Salameh et al. (2021) compared education about respiratory issues and mechanical ventilation with high fidelity simulation and without. In their study, groups who participated in simulation as part of their education achieved higher knowledge and clinical judgment scores measured by the LCJR compared to those without. Although not included in the review, another recent study found a significant difference between the LCJR scores of nursing students enrolled in a pediatric health nursing course who had high fidelity simulation compared to those who did not (Ayed et al., 2022). Hambach et al. (2023) also reported that sophomore students who completed three simulations demonstrated increases in clinical judgment and clinical competence over three time periods which supports simulation as an effective teaching strategy to develop clinical judgment over time. These recent studies support simulation as a teaching method to develop clinical judgment and are representative of a very large body of extant literature that dates back at least to the 2007 development of the LCJR in simulation.
Although significant increases in clinical judgment are reported and these differences are attributed to simulation, it is not known exactly how simulation contributes to the development of clinical judgment. Kelly et al. (2014) asked nursing students which parts of simulation are most helpful to developing clinical judgment. The students reported that the guidance provided by a facilitated debriefing with reflection was most helpful (Kelly et al. 2014). Perhaps reflecting the need to improve the preparation and prebriefing phases of simulation, the patient case notes and orientation to the simulation area were rated the least helpful (Kelly et al., 2014). Deliberate, thoughtful integration of CJMM layer three and four into simulation prebriefing, scenarios, and debriefing will produce a more meaningful learning experience that builds the underlying cognitive skills needed to reach the outcome of good clinical judgment.

**Simulation in Nursing**

The use of simulation in nursing education is supported by several educational frameworks and theories. Simulation pedagogy’s focus on providing a dynamic environment involving complex cognitive processes and human behavior elements that replicate the practice environment for experiential learning is firmly rooted in constructivism (Jeffries & Rodgers, 2007). Furthermore, learners in simulation are often functioning at the edge of their zone of proximal development (ZPD), an idea popularized by Vygotsky. ZPD is defined as “The distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaborations with more capable peers (Vygotsky, 1978, p. 86). Bruner (1986) expanded on the idea of guidance with the concept of scaffolding which is a special type of support given by a teacher to a student when they may not be able to accomplish an objective alone. In the case of formative simulation, facilitators can act as guides to help students
select appropriate mental models and expand their foundational knowledge during the preparation and prebriefing phases of simulation to function in nursing simulations more successfully. Preparation and prebriefing are akin to scaffolding to enhance the learner’s experience. Often, the subsequent simulation scenario involves decision-making and the performance of nursing actions, followed by a debrief that encourages reflective thinking in collaboration with peers and facilitators. In fact, the National League for Nursing Jeffries Simulation Theory (NLNJST) describes simulation as a learner centered, interactive, collaborative interaction between a learner and a facilitator in an experiential learning environment (Jeffries et al., 2016).

Crucial to learning how to develop SA, assuming the role of a nurse in the simulation scenario provides an opportunity to engage in the three defining attributes of SA: perception of salient elements in the environment, comprehension of their meaning, and projection of their status into the future to direct decisions and actions (Fore & Sculli, 2013). Since simulation endeavors to closely mirror the real world, the system or task characteristics that influence SA can be replicated in the simulation resulting in a more authentic experience. Debriefing is well established as the crucial final step of a simulation to guide learners through reflective thinking and developing critical thinking and clinical reasoning (Decker & Dreifuerst, 2012; Dreifuerst, 2012). While prebriefing and debriefing are both best practices in simulation and supported by the Healthcare Simulation Standards of Best Practice (HSSOBP™), debriefing is more widely studied and there are several theory-based methods available (INACSL Standards Committee et al., 2021a). Prebriefing does have a growing body of literature to support the practice of this phase of simulation.

Prebriefing
The recently created HSSOBP™ Prebriefing standard states that prebriefing encompasses both preparation and briefing prior to the start of a simulation scenario (INACSL Standards Committee, 2021b). It is acknowledged that historically prebriefing has been difficult to define because of the variety of activities and definitions of prebriefing that exist (INACSL Standards Committee, 2021b). Furthermore, the exact relationships between the preparation in prebriefing and the simulation and debriefing are not known. The new standard clarifies that there are two distinct components of prebriefing: preparation and briefing yet commonly they are known as prep work and prebriefing (INACSL Standards Committee, 2021b). The standard is not overly prescriptive about what activities should be included in these components because there are only a few studies to date exploring the impact of different methods, theories and learning strategies on learner outcomes. Additional work in this area is needed.

Attempts to clarify what prebriefing is and what it does have been complicated by differences that may rightfully exist due to variations in purpose, objectives, and participants for any given simulation. There have been at least four concept analyses of the term prebriefing (Brennan, 2021; Chamberlain, 2015; Ludlow, 2020; Page-Cutrara, 2015). Using the Walker and Avant method and including literature from all of healthcare simulation, Brennan (2021) posed this definition of prebriefing.

Prebriefing: (a) is the structured phase of simulation immediately before the scenario; (b) is guided by a facilitator, (c) is based on participants level of experience and knowledge, (d) includes activities to prepare participants for the logistics of the simulation, the scenario, and learning and (e) helps create a safe and trusting learning environment, promote engagement, and achievement of learning objectives. (p. 160)
A Rogerian concept analysis by Chamberlain in 2015 proposed the following definition of prebriefing:

Prebriefing is an educator designed phase of simulation that is implemented at a designated time prior to the “hands on” scenario and includes both orientation tasks and learner engagement activities that will enhance learner satisfaction, participation, and effectiveness of the simulation experience. (p. 321)

Using Walker and Avant’s method, and only nursing literature about prebriefing, Page-Cutrara, also in 2015, developed a concept analysis of prebriefing with the following definition:

Prebriefing should include information and activities that are provided to learners in consideration of their level of knowledge, learning needs, and prior experiences; structured for anticipatory reflection and planning; and facilitated by a qualified nursing simulation educator to support decision-making, psychological safety, and debriefing activities. (p. 339)

Ludlow (2020) utilized a principle-based concept analysis approach which revealed that the complexity of prebriefing was not captured by other definitions. As a result, a three-phase model of prebriefing including a preparatory phase, orientation phase, and prebriefing phase was recommended.

There is a great deal of overlap in these definitions with a few exceptions. All four authors agree that prebriefing should provide information about the logistics of the simulation experience and address learning needs of participants prior to the simulation scenario. Important to the planned study, Ludlow (2020) emphasized that preparation, or the preparatory phase, uniquely prepares the learner for the educational content of the
simulation. Also, Page-Cutrara (2015) directly addresses the potential for prebriefing to support decision-making and providing an opportunity for anticipatory reflection. Considering these three definitions and continued variability in the specific activities that are incorporated into prebriefing in practice, several literature reviews have been performed to examine how prebriefing is used in education (Silva et al., 2022; Dileone et al., 2020; Page-Cutrara, 2014; Tong et al., 2022).

These literature reviews confirm that the body of literature about prebriefing is growing. Page-Cutrara (2014) found 15 articles focusing on prebriefing compared to the most recent meta-analysis by Tong et al., (2022) which evaluated 42 studies. Encouragingly, the most recent meta-analysis reported on several randomized control trial designs signaling a maturation of the experimental literature surrounding prebriefing (Tong et al., 2022). These reviews confirm that there is no one structure or framework that guides prebriefing practices other than the HSSOBP™ standards and the content of prebriefing varies widely (Silva et al., 2022; Dileone et al., 2020; Page-Cutrara, 2014; Tong et al., 2022).

The HSSOBP™ prebriefing standard provided needed guidance by describing a minimum set of expectations for prebriefing (INACSL Standards Committee, 2021b). These expectations are that simulationists should be knowledgeable about the simulation scenario and prebriefing concepts and design of the prebriefing should flow from the purpose and learning objectives of the simulation and the learner’s knowledge and experience level should be accounted for in this design (INACSL Standards Committee, 2021b). The most recent prebriefing standard also delineates that preparation (prep work) and briefing (prebriefing) criteria should be addressed during the prebriefing but allows the autonomy to design the activities for the specific activity.
**Preparation**

Preparation or prep work is defined as materials and experiences that are designed to assist learners to be prepared for the simulation and be successful in achieving learning objectives (INACSL Standards Committee, 2021b). Ludlow (2021) described this as a discrete phase of simulation in which learners build a foundation to augment in simulation. However, within the literature, preparation is one of the most ambiguous terms because researchers often describe preparatory, or prep work without providing much detail in the paper. A qualitative interview design conducted with faculty discovered that all faculty were able to describe a current preparation activity that could be labeled prep work because it was completed independently by the student prior to simulation (Herlihy & Teel, 2020). However, the breadth, depth and scope of those activities varied greatly. Even within the small sample of eight faculty, a wide variety of activities were described including reading scholarly articles, textbooks, completing pre-quizzes, watching videos, reviewing electronic health records of the simulation patient, and skills drills (Herlihy & Teel, 2020).

**Briefing**

Briefing, also commonly known as prebriefing, is most often performed just prior to the simulation scenario and is an opportunity for the simulationist to establish learner expectations, discuss logistics of the experience, and conduct a formal orientation to the simulation environment (INACSL Standards Committee, 2021b). Throughout these activities, there is an expectation that a psychologically safe learning environment be established by nurturing a culture of trust and mutual respect (INACSL Standards Committee, 2021b; Rudolph et al., 2014). In the prebriefing literature, there are
additionally several common focuses of the prebriefing including planning, orientation, and establishing a psychologically safe environment.

**Planning.** Nearly all prebriefing studies include simulation objectives and the patient report in the prebriefing so that learners have information to reference during the simulation. Prebriefing facilitators include time to plan patient care for the scenario patient or, alternatively, a similar type of patient in the prebriefing. Most of these planning activities are a group discussion about the upcoming patient care, led by the facilitator. In one instance, students identified the planning session as the most beneficial activity that they participated in during the simulation-based learning (Elfrink et al., 2009). These strategies utilize a constructivist approach to simulation learning by directing the learner toward the simulation objectives and allow the participants to think critically and develop a plan for the care of their patients as a group (Parker & Myrick, 2009). Planning patient care as a group is also congruent with scaffolding within the zone of proximal development. These methods directly engage the learner in the simulation and encourage cooperation amongst participants in the simulation.

Other planning activities are more introspective in nature and involve an individual integrating new information into their cognitive schema (Parker & Myrick, 2009). Concept mapping can support reflective thinking that identifies a plan of action for the simulation scenario (Page-Cutrara & Turk, 2017; Roh et al., 2018). Observing an expert performing a skill or, in some cases, a comparable simulation on video provides the learner with information that could influence the learners’ thoughts and actions during the simulation (Josephsen, 2018; Jarvill et al., 2018; Coram, 2016; Chamberlain, 2017; Barber & Kardong-Edgren, 2019). No matter the method, prebriefing can provide time for reflection-before-action linking prior knowledge, previous clinical experience, and anticipating care (Page-Cutrara & Turk, 2017).
Orientation. Within the prebriefing literature, most studies explicitly identified the role of prebriefing as orientation to simulation and aspects of the environment including the use of the manikins and the associated equipment in the facility. Additionally, it is common to orient learners to the simulation scenario by reviewing the objectives of the simulation scenario and discussing the purpose. Content designed to understand the purpose of the simulation was identified by nursing students as one of the most important activities during a simulation-based learning event (Paige & Morin, 2015). Conversely, a group of students who were asked which simulation-based learning activities were beneficial to applying clinical judgment rated the briefing and orientation to the simulation area 7th out of 11 items (Kelly et al., 2014). Even providing information about the logistics of the day including time frames and schedules orients the learner to the situation (Buckley & Gordon, 2011; McDermott, 2016; Page-Cutrara, 2015; Page-Cutrara & Turk, 2017).

Prebriefing also often allows the students to enter the simulation environment and experience any equipment or skills that would be used during the simulation. Time to practice clinical skills can be provided if there are differences between the procedure in the simulation environment compared to the skills lab or in nursing practice (Husebo et al., 2012). Students identify opportunities to practice as an important part of a simulation-based activity (Paige & Morin, 2015).

To acquaint learners with simulation routines, some prebriefing addresses utilizing a fiction contract (McDermott, 2016; Roh et al., 2018). This is also referred to as suspension of disbelief by some simulation experts (Chamberlain, 2017). A fiction contract is an agreement between learners and educators that describes the obligations that both parties must have a successful simulation experience (Rudolph et al., 2014). Typically, educators state that they will do their best to make the simulation as real as
possible but explain the limitations of the environment. The learner is then asked to act as if the simulation is real and to respond accordingly. The fiction contract principle, if being used, must be explained to the learners prior to the simulation during the prebriefing.

**Establishing a Psychologically Safe Environment.** For experiential learning, nursing students enter a simulation environment that is realistic enough to replicate clinical practice (Rudolph et al., 2014). Patients may be safe from potential harm, but the student is at risk for stress and even psychological distress from performance anxiety, knowledge and skill deficits, video recording, and observation and evaluation by others (Kang & Min, 2019; Shearer, 2016). Learner engagement is promoted by an environment where learners face challenges, function at the edge of their expertise, but are also held to high standards without fear of shame (Rudolph et al., 2014; Turner & Harder, 2018). This is sometimes referred to as the safe container and establishing it during prebriefing is common.

Stress and distress threaten the simulation-based learning environment but prebriefing is an opportunity to set the tone of the entire learning experience (Hughes & Hughes, 2019). The facilitator is primarily responsible for creating a psychologically safe environment by not only providing orientation to the simulation environment but pledging to respect the learners (Kang & Min, 2019; Rudolph et al., 2014; Turner & Harder, 2018). Multiple studies identify creating a psychologically safe learning environment as an important mediator of student learning (Chamberlain, 2015; Chamberlain, 2017; Kim et al., 2017; McDermott, 2016; Page-Cutrara, 2015). As a solution to the anxiety felt by students in the simulation environment, Wheeler et al. (2021) tested a brief mindfulness exercise during the prebriefing prior to ungraded adult health simulation. In the intervention group, post-simulation anxiety scores were significantly lower on a visual
analogue scale (VAS) compared to pre-simulation in this study (Wheeler et al., 2021). However, many factors could have affected the anxiety scores including other school-related stressors, performance in the simulation (Wheeler et al., 2021), and simulation being over for the active participants. Other outcomes in the literature associated with prebriefing include student perceptions, faculty observations, knowledge, skill performance, and competency, and clinical judgment.

**Outcomes Associated with Prebriefing**

**Student Perceptions.** Student perceptions are the most collected outcomes. Students report increases in self-confidence (Chamberlain, 2017; Kim et al., 2017), learning (Chamberlain, 2017; Elfrink et al., 2009), and satisfaction (Kim et al., 2017; Page-Cutrara & Turk, 2017). In a quasi-experimental design Watts et al. (2022) implemented a structured prebriefing worksheet previously developed by Page-Cutrara. They collected quantitative data utilizing the Student Satisfaction and Self-Confidence in Learning (SSSC) tool. There were no significant differences on the SSSC for students who used the worksheet. Brennan (2022) investigated the effects of specific prebriefing method, the Self-Efficacy Prebriefing Model (SEPM), on perceived self-efficacy. In this method, senior level nursing students were provided a traditional prebriefing plus a facilitator led discussion about previous experiences that were like the simulation case, watched a video depicting an expert nurse caring for a similar patient, practiced hands on skills, and received time to plan care prior to entering the simulation. In that study, self-efficacy was rated by students on the Revised Clinical and Simulation Self-Efficacy Scale. The students who completed the SEPM had significantly higher self-efficacy scores (Brennan, 2022).
Students report decreased anxiety or nervousness after various prebriefing interventions (Barber & Kardong-Edgren, 2019; Elfrink et al., 2009; Zendejas et al., 2010). In some cases, the students felt more prepared to participate in the simulation after prebriefing (Barber & Kardong-Edgren, 2019). Using a modified Korean version of a self-report clinical competency tool, students who received the most prebriefing interventions rated their clinical competency the highest (Kim et al., 2017).

Students also report that the simulation experience was more effective with prebriefing activities using the Simulation Effectiveness Tool (SET) (Chamberlain, 2017). A recent retrospective design examined SET-Modified (SET-M) scores before and after implementation of a co-facilitation model in which the faculty and simulationist co-facilitated simulation activities from start to finish, compared to the prior model in which faculty prebriefed and debriefed alone. SET-M scores were significantly higher after the change. However, the actual change in mean total SET-M scores was very negligible, 51.9 versus 53.7 calling into question the practical significance of these results. After investigators added a group planning session to the prebriefing, students rated the 63% of students rated the simulation experience as helpful or more helpful than a clinical day as compared to 19% prior to the prebriefing intervention (Elfrink et al., 2009). When asked to identify the most helpful or useful parts of the simulation-based learning, students appreciated exposure to the objectives (Brackney & Priode, 2015; Paige & Morin, 2015), practice (Buckley & Gordon, 2011; Paige & Morin, 2015), time to plan (Chamberlain, 2017; Elfrink et al., 2009) and guidance by the instructor (Kelly et al., 2014). Another recent study by Wheeler & Kuehn (2023) reported the unexpected finding that a small group of students who had experienced in-person prebriefing prior to the pandemic, preferred the videotaped prebriefing that was delivered during the pandemic due to restrictions on physical contact. This finding may have been confounded by the
addition of extra time to plan care with fellow students afforded by the videotaped
debriefing (Wheeler & Kuehn, 2023).

**Faculty Anecdotal Observations.** Researchers reported that students were
more engaged in the learning during simulations after prebriefing interventions
(Chamberlain, 2017; McKendrick et al., 2019). Faculty observed that groups in their
experimental study that had the longer prebriefing had more in-depth conversations
during the debriefing (Chamberlain, 2017). Utilizing the Delphi technique, a group of
Certified Healthcare Simulation Educators came to agreement that prebriefing
accomplishes the following outcomes: reduces student anxiety, affects learner
performance, improves confidence, engages learners, contributes to learner’s ability to
provide competent care, leads to a better debriefing, and may lead to more reflective
students because they are more prepared (McDermott, 2016).

**Knowledge, Skill Performance, and Competency.** Knowledge was directly
measured in two different studies that involved prebriefing interventions. A group of
students who observed a recorded simulation meant to reduce cognitive load appeared
more knowledgeable about falls and SBAR report than the control group (Josephsen,
2018). Interestingly, medical students who received a didactic lecture during their
prebriefing did worse on a multiple-choice posttest than students who received the
lecture in the debriefing (Zendejas et al., 2010).

Checklists developed by the researchers were used to evaluate the student’s
clinical competency in a few studies (Jarvill et al., 2018; Kim et al., 2017; Watts et al.,
2022). During a simulation which focused on the skill of changing a central line dressing,
the researcher assigned points on a criterion referenced checklist and the students who
had watched an expert performance on video in prebrief achieved significantly higher
scores (Jarvill et al., 2018). Students who received the most prebriefing scored the highest on an instructor evaluated clinical competency scale (Kim et al., 2017). Watts et al. (2022) observed significant improvements in four specific areas, successful skill completion, demonstration of SA and environmental scanning, ensuring safety of students, and checking the medication rights on their researcher developed clinical skills checklist. In an experimental group that used concept mapping and facilitated reflection during the prebriefing, learners scored significantly higher on the Creighton Competency Evaluation Instrument (CCEI) than their control group peers (Page-Cutrara & Turk, 2017). Similarly, the SEPM model also resulted in higher CCEI scores.

**Clinical Judgment.** Students’ clinical judgment, while commonly referred to, was only evaluated in two studies that involved a prebriefing intervention. Clinical judgment scores were significantly higher on the clinical judgment subscale on the CCEI after a prebriefing intervention of concept mapping and facilitated reflection (Page-Cutrara, 2017). In this study, a potential confounding factor for clinical judgment was the students’ semester in school. In another study, trained faculty used the Lasater Clinical Judgment Rubric (LCJR) to evaluate a treatment group who viewed an expert role modeling video and control group. The treatment group LCJR scores were significantly higher than the control group (Coram, 2016).

**Conclusion**

Chapter II provided an overview of the literature including a brief history of SA and how SA has been applied in the field of nursing. The connection between clinical judgment and SA has been described including how simulation has been used to develop both SA and clinical judgment. A summary of prebriefing literature was provided to capture the state of the science surrounding prebriefing and illustrate the continued
variation in practice. Since there remain unanswered questions about the best practices related to prebriefing and how to maximize this phase of simulation to inform and develop SA in nursing students, this study will explore whether the integration of the CJMM and SA theory into a prework and prebriefing intervention impacts the development of SA and clinical judgment. Chapter III will describe the research methodology that is proposed to explore the impact of a SA focused prebriefing on nursing student's SA and clinical judgment.
CHAPTER III
METHODOLOGY

Introduction

The concept of situation awareness (SA) originated in aviation and is now studied extensively in psychology, military, and healthcare disciplines. SA is commonly described as appropriately knowing what is going on in an environment (Orique & Despins, 2018). Endsley (1995) articulated SA as a three-level cognitive process of perception of elements in an environment, comprehension of their meaning, and the ability to project future states based on this awareness. Recently, SA has been associated with nursing practice. Sitterding et al. (2012) produced a definition of SA in the nursing clinical environment through a concept analysis. At the perception level, nurses perceive clinical cues about patients and their environment and then assign patient-centric meaning to those cues. Based on these cues the nurse can anticipate patient needs and plan relevant interventions that direct the delivery of patient care (Sitterding et al., 2012).

Therefore, SA is an important antecedent to clinical judgment, actionable decision-making, and quality patient care, yet developing this skill is not explicitly learned in clinical environments and best practices for teaching it remain poorly understood. The purpose of this quantitative, quasi-experimental, independent groups study was to test the impact of an intentional and strategic prebriefing strategy on prelicensure nursing student’s demonstration of SA and clinical judgment during a high-fidelity simulation.

This chapter reports the research design and methodology and is organized into eight sections: (a) research design, (b) research questions, (c) participants, (d) protection of human participants, (e) the intervention, (f) instrumentation, (g) study procedures, and (h) data analysis.
Research Design

A quasi-experimental design with independent intervention and control groups was used to test the effectiveness of an intentional and strategic prep work and prebriefing intervention prior to high-fidelity manikin simulation. This intervention is designed to foster SA and the cognitive skills needed for clinical judgment and actionable decision-making in prelicensure nursing students. A quasi-experimental design was chosen to test the cause-and-effect relationship between the prebriefing content and the dependent variables including SA, clinical judgment, and student satisfaction because true randomization of participants to control and intervention group was not possible because assignment to clinical groups is not random. At the study site, students can express preferences and apply to certain clinical sites such as a dedicated education unit affecting their clinical group assignment, and this impacts their simulation day and group. In a course with many students, pre-determined clinical sections consisting of approximately eight students were purposively assigned to the control and intervention groups based on the day of the week that they attended simulation. The aim of this study then was to understand the impact of this preparation and prebriefing intervention on students' SA, clinical judgment, and satisfaction.

Research Questions

The following specific research questions were tested:

1. Is there a difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?
H01: There is no difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?

2. Is there a difference in SA based on student role in the simulation?

H02: There is no difference in SA based on the student role in the simulation.

3. Is there a difference in prelicensure nursing students’ satisfaction with prebriefing with the simulation experience based on whether they received SA or customary prep work and prebriefing?

H03: There is no difference in prelicensure nursing students’ satisfaction with prebriefing based on whether they received SA or customary prep work and prebriefing.

4. Is there a relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing?

H04: There is no relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing.

Participants

Participants in this study included prelicensure students in their final year of a traditional four-year baccalaureate nursing program that utilized manikin-based simulation within their existing curriculum. They were recruited using convenience sampling the fall semester at a private university in a large Midwestern city. All students met the program admission criteria, passed prerequisite courses, and had exposure to at least one previous semester of clinical and simulation experience. To be included in the study, participants must have previously received didactic instruction on the clinical problems encountered in the simulation scenario.

Power Analysis
A priori, a sample size analysis was completed using G*Power 3.1 for t-tests comparing the means of two independent groups (Faul et al., 2009). A total sample size of 126 with 64 participants in the control and 64 participants in the experimental group is necessary using the input parameters $\alpha = 0.05$, power 80%, and effect size of $d = 0.5$. These parameters are similar to those used in prior prebriefing intervention experimental designs (Kim et al., 2017; Page-Cutrara & Turk, 2017; Brennan, 2022).

**Recruitment**

Students were recruited to participate if they were enrolled in their final year of a purposively selected traditional four-year nursing program that has agreed to participate in this research study. Participants were also enrolled in their second medical-surgical nursing practicum course that includes manikin-based simulation. Although participation in the high-fidelity simulations was a course requirement and the study instruments were embedded in the course design, students were informed of the purpose of the study at the beginning of the academic semester and agreed to allow the researcher to evaluate their performance and include their instrument scores in data analysis for the study. Participants were randomly assigned to the control and intervention by the arbitrary selection of groups that meet on one day as control groups and groups that meet on a different day of the week as intervention groups. Demographic characteristics of the participants were collected, including prior healthcare work experience and experience with simulation, and were mostly homogenous between the two groups. The sample reflected the student population of the private university’s college of nursing.

**Intervention**

In this quasi-experimental design, predetermined clinical groups were assigned to either the control or intervention group. In the control group, students completed
customary prep work and prebriefing previously offered in the course. In the intervention group, the students completed SA focused prep work and prebriefing designed for this study. The study instruments were collected during the first four scheduled simulations of the semester, allowing for all consenting students to have the opportunity to provide nursing care during the simulation scenario as an active participant once. Therefore, most individual students participated in a simulation scenario as an active participant once and as an observer three times. Unexpectedly, there were several participants who were active participants more than once during the data collection period due to smaller than expected numbers of students in the clinical groups and student unanticipated absences.

**Control Group-Customary Prep work and Prebriefing**

Students in the control groups prepared for simulations using existing, or customary, preparation and prebriefing methods that are currently used in this course. These methods are based on the Healthcare Simulation Standards of Best Practice™ (HSSBOP™) Prebriefing: Preparation and Briefing (International Nursing Association for Clinical Simulation and Learning (INACSL Standards Committee, 2021b). At this site, customary preparation consists of a packet with the simulation objectives, assigned readings, a list of skills to be reviewed, and patient medical record. Students utilized this information to complete a clinical preparation written assignment. Customary prep work for all scheduled simulations is posted in the learning management system and available to the students at the beginning of the semester. The written prep work assignment was turned in prior to the scheduled simulation. Customary prebriefing was conducted in-person directly before the simulation began and addressed the required elements of briefing: 1) students were informed of the expectations of the simulation through a review of objectives, role assignment, and logistics, and 2). a brief orientation to the
simulation environment to provide information about the equipment, environment, and technology. Simulation facilitators customarily nurture a psychologically safe learning environment throughout the prebriefing to meet the prebriefing standard.

**Intervention Group-SA informed Preparation and Prebriefing**

The participants in the intervention group experienced simulation prebriefing using an intentional and strategic SA-informed preparation format and prebriefing written assignment and worksheet. These tools were intended to improve students' SA and learning through the deliberate activation of the cognitive processes identified by Endsley (1995) to be necessary for SA. Prep work materials included a packet with the simulation objectives, required knowledge readings, skill videos, the patient scenario, and the patient's medical chart. The intervention participants also had a prep work written assignment consisting of a Kardex-style Patient Summary (Appendix A) and the Prebriefing Addendum Worksheet (Appendix B).

The Patient Summary and Prebriefing Addendum Worksheet guided participants to develop SA about the patient situation before entering the simulation by connecting long-term memory stores acquired in training and beginning practice with the state of the current situation. Prompts on the Prebriefing Addendum Worksheet directed the participants to use the cognitive processes involved in building SA. These processes: perception, comprehension, and projection, also closely mirror the foundational layer three cognitive processes identified in the National Council of State Boards of Nursing (NCSBN) Clinical Judgment Measurement Model (CJMM) as prerequisites for clinical judgment in the clinical environment. The worksheet used language that will become familiar to students as the CJMM is implemented more widely in nursing education. Furthermore, layer four, environmental and individual factors, was addressed by the worksheet prompts and facilitator-driven discussion and expansion of student work on these worksheets occurred during in-person prebriefing. As students do the cognitive
work of nursing in their preparation and prebriefing with the SA focused tools, students should become more metacognitive and aware of the strategies and processes that they use to think (Ritchart et al., 2009).

In the SA focused prebriefing, facilitators were trained by the researcher utilizing a "worked out" written example of the prebriefing that trained them to ask five planned teaching questions that assessed the students’ situation awareness and thinking regarding the environmental and individual factors affecting the patient situation based on the information provided by the prep work. These questions promote SA and the development of clinical judgment. The first prompt assesses students’ recognition of cues and perception: What information in the medical record and patient scenario was most worrisome? The second question will assess the students’ ability to combine their knowledge and previous experience with the current situation to analyze and comprehend clinical data: What findings in the medical record did you expect based on the patient’s diagnosis or symptoms and, conversely, were there any findings that seem contradictory?

The thinking encouraged by these questions allowed students to form hypotheses about the nursing care required prior to entering the simulation. The next two questions were intended to allow students to refine their hypotheses through prioritization and generation of solutions. The third question focused student thought on the most significant patient issues: What is most likely occurring with this patient and what is the worst thing that could happen? The fourth question allowed for students to begin a rudimentary plan of care by asking: Based on your hypothesis of what is going on, what interventions are potentially indicated? To address nursing care from a wholistic perspective, the final question was: Will the psychological, social, or spiritual issues of this patient complicate their nursing care? Through the collaboration of all students and the facilitator guidance answering these questions, a more mature mental model was
achieved prior to the simulation. The Prebriefing Addendum Worksheet aims to serve as a thinking routine that scaffolds and supports the complex cognitive work of caring for patients (Ritchart et al., 2011). Moreover, prior to the simulation the facilitator could choose to offer assistance based on their assessment of adequate student SA that is made visible by the SA-focused tools (Ritchart et al., 2011).

The SA-focused prebriefing was provided in the semester’s first simulation by the researcher in all groups except for one clinical instructor who had additional one on one training because of a scheduling inconsistency. In addition to meeting the established Healthcare Simulation Standards of Best Practice™, this visible thinking educational strategy resulted in simulation participants who had reflected before action. These prep work and prebriefing worksheets were intended to provide a visual record of the preparation and prebriefing phase of simulation and complement Dreifuerst’s (2015) Debriefing for Meaningful Learning (DML) worksheets.

Debriefing for Meaningful Learning (DML) is method of debriefing that is grounded in the theory of reflection by engaging participants in an interactive discussion aimed at reviewing patient care, reflecting on, and evaluating decision-making processes that occurred during a clinical experience to improve learning (Dreifuerst, 2015). It is currently used in this course and was used by both the intervention and control groups in this research study. The worksheets associated with DML are completed while the clinical learning occurs in the debriefing and the Prebriefing Addendum Worksheet provided a visual guide for the development of SA and reflection before a clinical learning experience in both the preparation and prebriefing phase of simulation.

**Protection of Human Participants**

The Institutional Review Board (IRB) determined an exempt review was appropriate for this intervention research on teaching. This research is appropriate for
exempt review because research activities presented no more than minimal risk to the human participants. Potential participants were informed of the study’s purpose, expectations, and potential risks with ample time to voluntarily agree to the researcher using their deidentified data in the study in their first-class meeting of the semester before simulations commenced. The Student Information Sheet (Appendix C) emphasized that the purpose of the study is to evaluate simulation procedures and not the performance of the students for grading purposes. All students were advised that allowing their data to be used in the study was voluntary, although simulation participation including prep work and prebriefing, simulation, debriefing and completion of the study instruments were required to successfully complete the course. Video recordings of the simulations were stored in a secure cloud-based video capture and debriefing platform per college of nursing policy and procedure. Students who chose to participate in the study agreed to allow their simulation recording to be viewed and scored by the researcher along with other deidentified data to be included in the database for the research study.

The researcher ensured privacy and confidentiality by utilizing an alphanumeric code that did not reveal the participant’s identity. Care was taken to label simulation videos with codes that did not readily identify the participants membership in the control or intervention groups by the simulation operation specialists. All individual data collected for study purposes remained confidential to researchers and was not shared with course professors. Group or aggregate data may be shared with the course coordinator for quality improvement or curriculum redesign in the future. Study data was stored on a private drive that is only accessible to the researcher for the duration of the study and then will be destroyed within a specified time period. The participants in this study were not deceived as part of the research design.
In this study, the identified minimal risk centered around potential loss of esteem due to clinical performance deficits. To minimize this risk, instruments measuring individual SA were collected away from observer students and clinical judgment was scored by video review. During this study, performance deficits may have been more recognizable to individual participants because of the instruments employed, but the standard debriefing encouraged healthy handling of these deficiencies. A list of academic and mental health resources was available in the event of a participant experiencing unanticipated embarrassment. However, these additional resources were not needed during the study. Furthermore, the simulation safe container was honored, and all video recordings will be destroyed at the end of the study or per local policies. The researcher was not involved in facilitating simulations in the course and did not evaluate the participants for grading purposes.

**Instrumentation**

Four instruments were used to collect data in addition to a demographic survey (Appendix D). As the primary outcome of interest, two instruments measured SA: the Situation Awareness Global Assessment Technique (SAGAT; Appendix E) and Situation Awareness Rating Tool (SART; Appendix F). Clinical judgment was evaluated utilizing the noticing and interpreting subscales of the Lasater Clinical Judgment Rubric as a performance measure of SA (LCJR; Appendix G). The Prebriefing Experience Scale (PES; Appendix H) measured student experience with prebriefing. Together, the findings from each instrument comprised the data for the study.

**Demographic Survey**

A demographic survey (Appendix D) was administered as an online survey on the last day of participation in the study. Participant demographics, including gender, age, previous simulation experience, past and current employment in healthcare were
collected from all consenting students across both the control and intervention groups. Demographic data was used to support descriptive and inferential statistical analysis.

**Situation Awareness Instruments**

Measuring SA is complex because it is a cognitive process, but doing so provides valuable information about how these processes function in dynamic environments (Endsley et al., 1998). Salmon et al. (2006) identified several categories of SA assessment methods, including freeze probe techniques, real-time probe techniques, post-trial subjective rating techniques, observer rating techniques, process indices, and performance measures. Due to the difficulty of accurately measuring SA, this study used multiple methods and triangulated the findings. Two direct methods, a freeze probe technique, and a subjective post-trial rating, directly measured SA. The instruments selected for this study included researcher-developed SAGAT-style probes for each simulation scenario and the SART.

**Direct Objective Freeze Probe Technique-SAGAT.** The SAGAT provides an objective measure of situation awareness based on queries that are delivered during a freeze in a simulation (Endsley et al., 1998). In a nursing simulation, the student nurse would be asked a series of questions designed to assess their knowledge of what is occurring in the clinical scenario at the time of the freeze. For example, they may be asked to report patient vital signs, which physical assessment finding is most concerning, potential problems, or settings of equipment such as an infusion pump. The queries are designed to assess all three levels of SA (perception, comprehension, and projection).

Queries are based on an *a priori*, in-depth cognitive task analysis of each situation that the SAGAT is used in. The queries will therefore be different for each simulation scenario but will assess the three levels of SA in that particular clinical situation. The queries are arranged into three subscales that are based on Endsley's
(1995) level of SA. Perception is further divided into two separate types, physiological and global situation. Physiologic perception focuses on the ability to notice a wide variety of relevant elements in the environment. The global situation perception analyzes the ability to notice both relevant and irrelevant aspects of the physical environment within the context of the simulation. The comprehension subscale detects the participant’s ability to synthesize the perception environmental elements with an understanding of the significance of those elements while simultaneously considering situational objectives. The projection subscale measures the ability to anticipate the actions of the elements in the environment.

To explicate the relationship between specific queries and the SAGAT subscales, examples from a SAGAT tool (Appendix E) developed by McKenna et al. (2014) to evaluate SA in a simulation about respiratory distress are offered in Table 1.

Table 1

Situation Awareness Global Assessment Technique Example: Levels of Situation Awareness (SA) and Associated Queries

<table>
<thead>
<tr>
<th>SA Level</th>
<th>Queries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception</td>
<td></td>
</tr>
<tr>
<td>Physiological</td>
<td>What is the BP at the moment?</td>
</tr>
<tr>
<td>Global</td>
<td>Is suction available?</td>
</tr>
<tr>
<td>Situation</td>
<td>What was on the wall near the patient?</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Is the patient adequately oxygenated?</td>
</tr>
<tr>
<td>Projection</td>
<td>If the condition does not improve, what will happen to the BP?</td>
</tr>
</tbody>
</table>

*Note.* This table provides example queries from the SAGAT utilized in McKenna et al. (2014).

Since this technique requires the development of domain-specific queries each time it is used, the queries were different for each simulation. However, the SAGAT technique has
demonstrated high validity, sensitivity, and reliability for measuring SA in aviation simulations (Endsley, 2000). A recent meta-analysis found the SAGAT to be predictive of performance with a high level of sensitivity compared to other methods (Endsley, 2021). In healthcare, the SAGAT has been used to measure SA (Bogossian et al., 2014; Hansel et al., 2012; Hogan et al., 2006; Hultin et al., 2019; Lavoie et al., 2016; Lavoie et al., 2019; McKenna et al., 2014; O’Meara et al., 2015). However, a complete evaluation of psychometric properties of the task specific forms have not been performed. Hogan et al. (2006) developed a SAGAT tool for three trauma simulation scenarios to evaluate the SA of medical teams comprised of a staff surgeon, a senior resident, a junior resident, and a medical student. In their study, the authors reported that the tool had construct validity and a Cronbach’s alpha of 0.767 (Hogan et al., 2006). Other researchers have reported using this same instrument; however, they have not published their validity and reliability data (Cooper et al., 2010; Bogossian et al., 2014).

Each correct answer on the SAGAT results in one point and an incorrect answer is scored as a zero. These points are summed for a total SAGAT score with higher scores indicating more SA. Individual subscales can be examined to detect difficulty with a specific level of SA which would be apparent from less correct answers in that subscale. A 12-item SAGAT was developed for each clinical simulation scenario in this study. Kuder-Richardson 20 (KR 20) tests were performed to assess the internal consistency of the SAGAT forms. KR 20 is a special case of Cronbach’s alpha for items that are scored dichotomously and are not assumed to be the same difficulty level (McDonald, 2018; Waltz et al., 2017). The closer the KR 20 test is to 1.0, the better the internal consistency. All forms of the SAGAT were found to have poor reliability (12 items each; KR 20 range 0.04 to 0.53)
The SAGAT data were used to answer research question one, measuring whether there was a difference in prelicensure nursing student’s SA during a simulation experience dependent on the type of prebriefing that they participated in. This data was gathered from active participants during the simulation scenario after two conditions had been fulfilled: (1) between 5-10 minutes passed from the start of simulation and (2) participants had gathered at least 3 05 5 of the vital signs. If 10 minutes of simulation occurred without the vital sign criteria fulfilled, the freeze was started at 10 minutes. Simulation operation specialists announced the start of the freeze and participants exited the patient care area and filled out paper and pencil copies of the SAGAT on a clip board stationed outside the simulation room. The researcher started a 3-minute timer as soon as participants uncovered the SAGAT form and they returned to the simulation as soon as both partners were done, or 3 minutes elapsed. Only active participants were included in this data collection because they have direct access to the physical environment and patient.

Direct Subjective Post-Trial Rating SART

Taylor (1990) developed the SART tool (Appendix F) with aircraft crew to estimate SA based on the operators’ subjective self-assessment. The significant advantages of this popular measure are that it does not require customization and can be delivered in real-world situations (Endsley et al., 1998). Researchers administer the SART after a situation has concluded. This scale includes nine items that evaluate ten separate dimensions: familiarity of the situation, focusing of attention, information quantity, information quality, instability of the situation, concentration of attention, complexity of the situation, variability of the situation, arousal, and spare mental capacity. These dimensions were grouped into three domains: attentional demand, attentional supply, and understanding. The dimensions were allocated to the three domains as shown in Table 2.
Participants rate themselves on each item on a seven-point Likert rating scale (1=low, 7=high). Participant ratings are combined to calculate a composite SART score using the formula Situation Awareness = Understanding - (Demand - Supply). The scoring category for each dimension is shown in Table 2. The higher the SART score, the more aware the participants judged themselves to be in the context of the situation. Extensive construct validity testing was completed during SART development including principal components analysis (Taylor, 1990). Bracq et al. (2021) assessed SA in nursing students completing a virtual reality simulation set in the operating room utilizing the SART. Reliability and validity measures were not reported in this study, but researchers detected an association between higher SART scores and better performance on the simulation’s objective (Bracq et al., 2021).

**Table 2**

*Relationship Between Situation Awareness Rating Technique Domains, Dimensions, and Scoring Category*

<table>
<thead>
<tr>
<th>Domains</th>
<th>Dimensions</th>
<th>Scoring Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attentional demand</td>
<td>Instability of situation</td>
<td>Summed demand</td>
</tr>
<tr>
<td></td>
<td>Variability of situation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complexity of situation</td>
<td></td>
</tr>
<tr>
<td>Attentional supply</td>
<td>Arousal</td>
<td>Summed supply</td>
</tr>
<tr>
<td></td>
<td>Spare mental capacity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concentration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Division of attention</td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td>Information quantity</td>
<td>Summed understanding</td>
</tr>
<tr>
<td></td>
<td>Information quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Familiarity</td>
<td></td>
</tr>
</tbody>
</table>
Although the SART does not require customization, Chen et al. (2023) adapted the tool to measure SA pre- and post-surgical rotation in medical students and found significant increases in SA after the surgical rotation. Reliability and validity were not reported in this adaptation of the instrument.

The SART was used to measure the subjective rating of SA at the end of the preparation and prebriefing period for all participants including active participants and observers. This score was used to answer research question two, to measure whether there is a difference in prelicensure nursing student’s SA during a simulation experience dependent on their role in simulation.

**Clinical Judgment-Lasater Clinical Judgment Rubric**

Lasater (2007) developed the LCJR (Appendix G) to evaluate students’ clinical judgment during high fidelity simulations. The rubric has four subscales based on Tanner’s four phases of clinical judgment: noticing, interpreting, reflecting, and responding. The phases are further divided into eleven dimensions, each including four actions which can be observed during simulation. Each subscale is rated on a Likert-type scale from 1 to 4 with 1 being beginning, 2 developing, 3 accomplished, and 4 being exemplary based on student performance. Total scores on the rubric indicate the level of clinical judgment development, with scores ranging from 11 to 44. Individuals that score within the 34-44 range are exemplary, 23-33 accomplished, 12-22 developing, and a total score of 11 indicating beginning (Lasater, 2007). Content validity is well established for this instrument especially for the dimension of confidence (Victor-Chmil & Larew, 2013). The reliability of the LCJR was evaluated through multiple methods and the data generated by the rubric is reliable when raters and cases are stable (Adamson et al., 2012).

The LCJR has been used extensively in the simulation environment for both education and research purposes (Victor-Chmil & Larew, 2012). Recently, researchers
used the LCJR to assess clinical judgment in a quasi-experimental study that compared teaching pediatric nursing with either traditional methods or high-fidelity simulation. The LCJR detected a significant difference in the mean scores between the two groups (Ayed et al., 2022). Strickland et al. (2017) evaluated whether student self-assessment and faculty scores utilizing the LCJR were similar. The data in their study revealed a positive correlation between student and faculty scores suggesting that the LCJR could be used to foster development of clinical judgment (Strickland et al., 2017).

In this study, the noticing and interpreting subscales of the LCJR are theoretically most relevant to the three SA processes of perception, comprehension, and projection occurring during the preparation, prebriefing and scenario phase of simulation. These subscales were scored by the researcher utilizing blinded video review of the simulation scenario. As a result, only active participants (not observers) in the simulation were scored on the LCJR. Recordings of simulations were de-identified by using codes to obscure whether the video file was from a participant in the control or intervention group. The simulation operation specialists were assigned without regard to the control and intervention groups to prevent identification of the group assignment based on staff presence. Only the summed total of the noticing and interpreting subscales was reported in this study. The LCJR noticing and interpreting subscale scores were each used to measure and compare clinical judgment between and within the control and intervention groups to answer research question one.

Student Satisfaction-Prebriefing Experience Scale

Student satisfaction with simulation is essential to learner engagement and may affect SA as an individual factor as students become experienced with simulation-based learning. Hypothetically, students who are less satisfied with simulation may have difficulty engaging in the activity and developing the required SA for decision-making and action. Satisfaction with simulation facilitates participation and has been correlated with
The Prebriefing Experience Scale (PES) evaluates student satisfaction with the prebriefing phase of simulation exclusively (Page-Cutrara & Turk, 2017) (Appendix H). It is an adaptation of the Debriefing Experience Scale (DES) which was first developed in 2012 by Reed.

The PES is a 20-item scale with four categories: Analyzing thoughts and feelings, learning and making connections, facilitator skill in conducting the prebriefing, and appropriate facilitator guidance. Each item is rated on a 5-point Likert scale ranging from strongly agree to strongly disagree and an open-ended comment field (Page-Cutrara & Turk, 2017). The internal consistency reliability was reported as a Cronbach’s alpha of 0.94. Permission was obtained from the scale’s author to be used in this study. This scale was administered directly after prebriefing to all participants in both control and intervention groups. The PES results were used to address research question three and were compared between the control and intervention group.

Data Collection

Prior to the beginning of the academic semester, the prep work and prebriefing worksheet was loaded into the learning management system by the convention of customary prep work for sections that met one day of the week and SA-focused for those that met another day of the week. The research study was introduced during simulation orientation to the fall semester including a description of instruments that was included in the course procedures regardless of control or intervention group assignment. Links to the instruments, SART and PES, were provided in the weekly simulation modules for use during the simulation for both groups. Training was provided to intervention group simulation facilitators to use the Prebriefing Addendum Worksheet to facilitate a SA-informed prebriefing utilizing multiple teaching methodologies. SA-focused prebriefing facilitators reviewed a written module that explained the SA focused prep work and prebriefing and provides an example prebriefing. A handout with the
specific facilitator prompts or questions that should be used during the SA focused prebriefing was provided for facilitator use during prebriefing. The researcher also demonstrated the prebriefing technique for the facilitator during the first simulation of the semester and was present onsite to provide coaching during all of the other prebriefing sessions.

During the initial in-person meeting of the simulation portion of medical-surgical clinical practicum course, all students received a brief introduction to study purpose and procedures during their course orientation. Students agreed to release their course data including simulation video, SAGAT, SART, LCJR, and PES scores following an IRB approved method. All students created an identifier number to use instead of their name on study instruments that consisted of the fifth, sixth, and seventh digit of their phone number plus their birth month. The clinical simulation center, where the study took place, has six hospital rooms that reflect a variety of hospital settings including medical surgical, intensive care, pediatrics, labor and delivery, and operating room. A variety of high-fidelity manikins of different ages and gender were available. The center offers four debrief rooms with video capabilities for observation of simulation and review during debrief periods. The simulation activity was the same for both the control and intervention groups except for the intervention of the SA-informed prep work and prebriefing.

In this study, control group participants completed the customary preparation and arrived at the simulation center at their assigned time to participate in the traditional prebriefing. The intervention groups followed a similar process but used the SA-informed preparation worksheet and Prebriefing Addendum Worksheet to prepare for the simulation. The intervention group received all the elements of a traditional prebriefing and participated in a facilitator guided discussion using the Prebriefing Addendum Worksheet. Prior to advancing into the simulation, all participants were asked to
complete the PES and SART via a link to the instruments in their learning management site.

Two participants were selected to actively participate in the simulation scenario per institution procedures. Between five and ten minutes after the simulation scenario begins and once at least 3 of 5 patient vital signs have been assessed, the participants were asked to pause and step outside of the room from the action and individually complete a paper and pencil form with the simulation-specific SAGAT. If no vital signs were assessed at 10 minutes, the pause was called based on time. Participants answered these questions within a 3-minute time limit. During this freeze, the clinical environment will not be accessible to the active participants. During the clinical simulation, the researcher was unable to attend to all the scenarios concurrently, so the simulation scenarios were recorded for evaluation on the noticing and interpreting subscales and reviewed after they occurred. The researcher then entered the SAGAT scores and LCJR scores into an Excel and SPSS data file. Once the scenario was finished, the groups participated in DML. On the last day of the research study, participants were reminded to complete the demographics survey.

Data Analysis

The research questions were answered using participant data collected from the two different conditions, the customary prebriefing (control group) and SA-informed prebriefing (intervention group). Analysis used SPSS version 28, both parametric and nonparametric results were calculated because of differences in sample normality and homogeneity.

Descriptive statistics were used to summarize demographics and other variables. In this quasi-experimental design, the researcher used this data to compare the control and intervention group to determine if they are similar, especially in potential confounders. The accuracy of comparisons between the control and intervention group
depends on the group’s similarity therefore the researcher will verify the equivalence of these two groups at baseline (Hanita et al., 2017).

The first research question asked: Is there a difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing? Two-tailed independent samples t-tests comparing SAGAT, LCJR, and SART data was used to answer this question ($\alpha = .05, \beta = 0.20$). Active participants in the simulation completed the SAGAT instrument during the simulation. The mean SAGAT score for the active participants in the control group was compared to the mean SAGAT score for the active participants in the intervention group utilizing a two tailed independent samples t-test ($\alpha = .05, \beta = .20$). For this t-test analysis, a confidence interval of ($\alpha = .05$ at 95%) provided an estimate of the precision of identified mean differences. Effect size was calculated utilizing Cohen’s $d$ and was categorized as small if .20, medium if .50 and large if .80 (Cohen, 1988).

Active participants in the simulation were rated on the noticing and interpreting scales of the LCJR. This outcome is used as a performance measure of SA. The mean noticing score and mean interpreting score on the LCJR of the control and intervention groups were compared utilizing a two tailed independent samples t-test ($\alpha = .05, \beta = .20$). For this t-test analysis, a confidence interval of ($\alpha = .05$ at 95%) provided an estimate of the precision of identified mean differences. Effect size was calculated utilizing Cohen’s $d$ and categorized as small if .20, medium if .50 and large if .80 (Cohen, 1988). This established how likely it is that the LCJR noticing and interpreting mean scores are the same in both groups.

All participants, including both active participants and observers, completed the subjective SA measure, the SART. Comparing the total mean SART scores of the control and intervention groups regardless of role utilizing a two tailed independent samples t-
test ($\alpha = .05, \beta = .20$) provided additional information to answer the first research question. These tests established how likely it is that SA measured by the SAGAT and SART are the same in both groups.

The second research question asked: Is there a difference in SA based on student role in the simulation? This was answered by comparing the aggregate mean SART scores of the active participants to the observers aggregate mean SART scores within the control and intervention groups. Multiple t-tests were performed to compare the SA of the active participants and observers within the control and intervention groups. For each of the t-test analyses, a confidence interval of ($\alpha = .05$ at 95%) provided an estimate of the precision of identified mean differences. Effect sizes were calculated utilizing Cohen’s d and were categorized as small if .20, medium if .50 and large if .80 (Cohen, 1988).

The third research question asked: Is there a difference in prelicensure nursing students’ satisfaction with prebriefing with the simulation experience based on whether they received SA or customary prep work and prebriefing? This was answered by comparing the total PES scores of the control and intervention groups utilizing a two tailed independent samples t-test ($\alpha = .05, \beta = .20$). For this t-test analysis, a confidence interval of ($\alpha = .05$ at 95%) provided an estimate of the precision of identified mean differences. Effect size was calculated utilizing Cohen’s d and was categorized as small if .20, medium if .50 and large if .80 (Cohen, 1988). This established how likely it is that the PES mean scores are the same in both groups.

And finally, the fourth research question asked: Is there a relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing? This was answered using Pearson’s product-moment correlations. This test can be utilized for both within group and between group comparisons (Polit & Beck, 2021). Within the control and intervention groups, Pearson’s $r$ examined whether there was a
relationship between the three situation awareness scores and student satisfaction. Pearson's $r$ can also be used to investigate relationships between SAGAT, SART, clinical judgment, and PES scores between the control and intervention groups.

**Conclusion**

Chapter III detailed the research aims, research questions and study design. A description of the recruitment process and the study intervention was described. An overview was presented of the proposed instruments and data collection procedures throughout the matched comparison group design. Finally for each research question, the planned methods of statistical analysis were identified.
Table 3

*Relationship between Research Questions, Instruments, and Analysis*

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Instrument</th>
<th>Variable</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is there a difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?</td>
<td>SAGAT</td>
<td>Situation awareness</td>
<td>Independent samples t-test</td>
</tr>
<tr>
<td></td>
<td>SART</td>
<td>Clinical Judgment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LCJR</td>
<td>Control or intervention group</td>
<td></td>
</tr>
<tr>
<td>2. Are there differences in SA based on student role in the simulation?</td>
<td>SART</td>
<td>Situation awareness</td>
<td>Independent samples t-test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Role in simulation</td>
<td></td>
</tr>
<tr>
<td>3. Is there a difference in prelicensure nursing students’ satisfaction with prebriefing with the simulation experience based on whether they received SA or customary prep work and prebriefing?</td>
<td>PES</td>
<td>Student satisfaction with prebriefing</td>
<td>Independent samples t-test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control or intervention group</td>
<td></td>
</tr>
<tr>
<td>4. Is there a relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing?</td>
<td>SAGAT</td>
<td>Control or intervention group</td>
<td>Pearson’s r</td>
</tr>
<tr>
<td></td>
<td>SART</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LCJR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* SAGAT = Situation Awareness Global Assessment Technique; SART = Situation Awareness Rating Technique; LCJR = Lasater Clinical Judgment Rubric; PES = Prebriefing Experience Scale
Introduction

In this research, an intentional and strategic structured preparation and prebriefing method, intended to foster the cognitive processes used in situation awareness (SA), was studied to determine the impact on SA, clinical judgment, and actionable decision-making of prelicensure nursing students engaged in a simulation. Three different methods of assessment were utilized to measure participant SA: an objective freeze probe technique, post-intervention subjective rating, and the performance measure of clinical judgment. This chapter will describe the findings from this study and address each of the four research questions.

Demographics

Following IRB approval, students were recruited from a single medical-surgical clinical course in a traditional baccalaureate degree program that included simulation. Of the 141 enrolled students, a total of 9 either did not complete the agreement or indicated that they did not agree to have their data used in the research study. Therefore, the sample began with 132 eligible participants. However, the number of participants that completed each data collection instrument varied for a myriad of reasons, including student absences at simulation events. Furthermore, mislabeled, and unlabeled participant responses led to varying numbers of usable data for each research question. One hundred and twenty-one participants responded to the demographics survey (Table 4).
This was representative of the student population enrolled in this nursing program and 95.9% (n=116) were female and 4.1% (n=5) were male. Participants’ ages ranged from 20 to 23, with an average age of 21.2 years (SD=0.43). In this simulation center, facilitators assigned the participants to be either active participants in the simulation scenario or observing the simulation from a debriefing room. There were always two participants in the simulation working together as a nurse team to care for
the patient. The four different simulations had similar numbers of active participants to observers (Table 5) in the various data collections.

**Table 5**

*Number of Participants by Simulation and Role*

<table>
<thead>
<tr>
<th>Simulation</th>
<th>Active Participant</th>
<th>Observer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cynthia Bennett</td>
<td>36</td>
<td>75</td>
<td>111</td>
</tr>
<tr>
<td>Sophia Veracruz</td>
<td>40</td>
<td>81</td>
<td>121</td>
</tr>
<tr>
<td>Eleanor Simmons</td>
<td>37</td>
<td>71</td>
<td>108</td>
</tr>
<tr>
<td>William Edwards</td>
<td>37</td>
<td>86</td>
<td>123</td>
</tr>
</tbody>
</table>

**Experience Working in Healthcare**

Participants were asked about their healthcare related occupational history and 71.9% (n=87) had prior experience working in healthcare, most reported direct patient care roles. Additionally, 58.7% (n=71) participants reported that they were currently working in healthcare in direct patient care roles. Furthermore, 51.2% of the participants who reported working in healthcare (Table 6) stated that they had been doing so for 1-2 years.

**Table 6**

*Descriptive Data for Healthcare Employment*

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported employment in healthcare ever</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>87</td>
<td>71.9</td>
</tr>
<tr>
<td>No</td>
<td>34</td>
<td>28.1</td>
</tr>
<tr>
<td>Report current employment in healthcare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>71</td>
<td>58.7</td>
</tr>
<tr>
<td>No</td>
<td>50</td>
<td>41.3</td>
</tr>
<tr>
<td>Current role involves direct patient care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>74</td>
<td>61.2</td>
</tr>
<tr>
<td>No</td>
<td>41</td>
<td>33.9</td>
</tr>
</tbody>
</table>
**Prior Simulation Experience**

Participants also had differing amounts of experience with manikin-based simulation. The majority of participants (98.3%, n=119) had experienced manikin-based simulation in prior coursework. When asked to recall how many simulations that they had previously actively participated in as a nurse, most students (62.8%, n=76) reported participating in between 5-10 simulations prior to this study. Students were also asked their level of agreement with the following statement: “I have a positive attitude towards simulation” and to indicate to what degree simulation made them nervous. 69.4% (n=84) responded in the affirmative to the former and only 1.7% % (n=2) reported simulation never made them nervous (Table 7). They also reported that they spent between 1 and 7 hours preparing for simulation experiences (M=2.17, SD=0.93).

**Table 7**

*Descriptive Data for Simulation Attitudes*

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement with the statement, “I have a positive attitude towards simulation.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>16</td>
<td>13.2</td>
</tr>
<tr>
<td>Neither disagree or agree</td>
<td>19</td>
<td>15.7</td>
</tr>
<tr>
<td>Agree</td>
<td>75</td>
<td>62.0</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>9</td>
<td>7.4</td>
</tr>
<tr>
<td>Feel anxious or nervous during simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>21</td>
<td>17.4</td>
</tr>
<tr>
<td>About half the time</td>
<td>26</td>
<td>21.5</td>
</tr>
<tr>
<td>Most of the time</td>
<td>45</td>
<td>37.2</td>
</tr>
<tr>
<td>Always</td>
<td>25</td>
<td>20.7</td>
</tr>
</tbody>
</table>

**Between Group Differences**

Students were divided into a prebriefing intervention and control group based on the day of the week that their simulation sessions were held. The intervention group received SA-focused prebriefing and the control group received customary prebriefing.
The groups were examined for between group differences in demographic variables prior to addressing the research questions. Mean differences were examined between the prebriefing control and the intervention groups ($n_{\text{intervention}}=58$, $n_{\text{control}}=63$) on the variables of age, number of previous simulation experiences, attitude towards simulation, previous healthcare occupational experiences and length of preparation for simulation in Table 8. In summary, these results demonstrate that the control and intervention groups were relatively homogenous.

**Table 8**

*Means and Standard Deviations of Selected Demographic Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td>21.17(0.43)</td>
<td>21.19(0.44)</td>
</tr>
<tr>
<td>Number of manikin-based simulations (1-5)</td>
<td>2.05(0.52)</td>
<td>2.35(0.58)</td>
</tr>
<tr>
<td>Positive attitude towards simulation (1-5)</td>
<td>3.61(0.86)</td>
<td>3.68(0.76)</td>
</tr>
<tr>
<td>Length of healthcare employment (years)</td>
<td>1.93(1.27)</td>
<td>1.71(1.46)</td>
</tr>
<tr>
<td>Length of preparation for simulation (hours)</td>
<td>2.07(1.05)</td>
<td>2.26(0.81)</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are presented in parentheses.

**Testing the Research Questions**

**Research Question One**

The first research question asked: *Is there a difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?* This was answered using descriptive and inferential statistics comparing the mean differences of the Situation Awareness Global Assessment Technique (SAGAT), the Situation
Awareness Rating Technique (SART), and the Lasater Clinical Judgment Rubric (LCJR) scores between the intervention and control groups. Thirty-nine students participated in simulation for a second time due to smaller than anticipated simulation group size and absences. The students who completed a second simulation during the study period were removed from this data set prior to analysis. However, an evaluation of this subgroup was performed to investigate if there was a difference in SA over time in both the intervention and control group.

An Independent-samples t-test was used to determine if SA, measured by three different methods including the SAGAT, SART, or LCJR, was different for the intervention and the control groups. This study design met the first three assumptions for using independent-samples t-tests because SA was a continuous variable measured by all three instruments, there were two independent groups (intervention and control prebriefing groups), and each participant was only a member of one of the groups.

SAGAT. The SAGAT score from the active participants was collected during a pause in the simulation scenario in both the intervention and control prebriefing groups. The SAGAT data were collected over four different simulations involving active participants in the intervention group (N=65) and the control (N=67). There were no outliers in the SAGAT data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. SAGAT scores were normally distributed for the control group with a skewness of -0.263 (standard error =0.293 and kurtosis -0.331 (standard error =0 .578) and intervention group with a skewness of -0.069 (standard error =0 .297 and kurtosis -0.743 (standard error =0 .586) (Table 9). SAGAT scores were not normally distributed for either group as assessed by Shapiro-Wilk’s test (p<.05) (Table 9). Since there were greater than 50 participants in each and the groups were similar in size (n_{intervention}=65 and n_{control}=67), the independent-samples t-test was
still performed because it is robust to deviations from normality in these cases (Laerd Statistics, 2015).

**Table 9**

*Tests of Normality for Situation Awareness Global Assessment Technique*

<table>
<thead>
<tr>
<th>Group</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Shapiro-Wilk Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference</td>
<td>Intervention</td>
<td>-.087</td>
<td>-.741</td>
<td>.948</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>-.239</td>
<td>-.293</td>
<td>.952</td>
<td>69</td>
</tr>
</tbody>
</table>

Situation Awareness

The assumption of homogeneity of variances was violated in the SAGAT data, as assessed by Levene’s test for equality of variances ($p = .011$) therefore, the Welch’s t-test is reported for this research question. A Welch’s t-test was run to determine if there were differences in SAGAT scores between intervention prebriefing participants and control group participants. The intervention participants actually had lower SAGAT scores ($M = 8.63, SD = 1.92$) than control group participants ($M = 9.0, SD = 1.53$). However, this was not a statistically significant difference, $M = 0.37, 95\% \text{ CI } [-0.23, 0.97], t(122.183) = 1.222, p = .224$. (Table 10).

**Table 10**

*Differences in Situation Awareness in Intervention and Control Group by Measure*

<table>
<thead>
<tr>
<th>SA Measure</th>
<th>Intervention</th>
<th>Control</th>
<th>t statistic</th>
<th>$p$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>SAGAT</td>
<td>8.63</td>
<td>1.92</td>
<td>9</td>
<td>1.53</td>
<td>1.222</td>
</tr>
<tr>
<td>SART</td>
<td>14.64</td>
<td>3.82</td>
<td>13.80</td>
<td>4.49</td>
<td>-1.09</td>
</tr>
<tr>
<td>LCJR</td>
<td>10.17</td>
<td>2.18</td>
<td>10.31</td>
<td>2.22</td>
<td>0.377</td>
</tr>
</tbody>
</table>

*Note.* SAGAT = Situation Awareness Global Assessment Technique; SART = Situation Awareness Rating Technique; LCJR = Lasater Clinical Judgment Rubric
SART. The subjective, self-reported Situation Awareness Rating Technique (SART) data was collected directly after the prebriefing phase of simulation over four different scheduled simulations. For this research question, only the active participant SART scores were analyzed, there were prebriefing intervention group (N=58) scores and control group scores (N=60). There were 8 outliers in the data, several in the control group including an extreme outlier, as assessed by inspection of a boxplot (Figure 3).

Figure 3

Boxplot of Outlier Data Points in Situation Awareness Rating Technique Scores by Group

Note. Circular dots represent outlier data points that are more than 1.5 box-lengths from the edge of the box. Asterisks denote extreme data points that are more than 3 box-lengths away from the edge of their box.

These outliers were examined, and none were found to be data entry errors, therefore the outliers were retained. The SART scores were not normally distributed in either group, as assessed by Shapiro-Wilk’s test (p < .05). The independent t-test was utilized
because it is robust to violations of normality when group size is similar (Laerd, 2015). There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .477$). The intervention group reported higher SART scores ($M=14.64, SD=3.82$) than the control group ($M=13.80, SD=4.49$). The mean difference between the groups was not statistically significant, $M = -0.84, 95\% \text{ CI } [-2.36, 0.68], t(116) = -1.09, p = .278$ (Table 10).

**LCJR.** The Lasater Clinical Judgment Rubric (LCJR) data from the Noticing and Interpreting subscales was also used to answer Research Question One (Lasater, 2007). Upon video review of the patient care portion of the simulation, the researcher assigned scores associated with the rubric criteria on the noticing and interpreting subscales items, based on students' actions, behaviors and available think aloud statements. This modified use of the LCJR resulted in possible scores of 5-20 with higher scores indicating more clinical judgment. Prebriefing intervention group active participants ($n=65$) and control participants ($n=67$) were assessed with this modified LCJR. There were no outliers in the data, as assessed by inspection of a boxplot. Shapiro-Wilk's test suggested that the LCJR scores were not normally distributed in intervention group ($p < .05$). However, LCJR scores were normally distributed in the control group, as assessed by Shapiro-Wilk's test ($p > .05$). There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .856$). The intervention prebriefing participants had slightly lower scores on the LCJR ($M = 10.17, SD = 2.18$) than control participants ($M = 10.31, SD = 2.22$). The mean difference between the intervention and control groups was not statistically significant, $M = 0.14, 95\% \text{ CI } [-0.61, 0.90], t(130) = 0.377, p = .707$ (Table 10).

Therefore, because there were no statistically significant differences in the three SA measures (SAGAT, SART, LCJR) for the intervention group that received SA-focused
prebriefing and the control group that received customary prebriefing, the null hypothesis for Research Question One cannot be rejected.

**Subgroup Analysis.**

Due to the availability of a subgroup of participants in the intervention group who participated in two simulations during the study period, a secondary analysis was completed to determine if there were differences in the intervention and control group SAGAT and LCJR scores over time. A two-way mixed ANOVA was conducted to determine if SA measured by the SAGAT or LCJR changed over time in the intervention and control group. There was a total of 41 participants who participated in simulation as the nurse for a second time in one of the groups: intervention (n=20) or control (n=21).

There were no outliers in the SAGAT data, as assessed by boxplot. The data was normally distributed for the second SAGAT scores, as assessed by Shapiro-Wilk's test of normality (p > .05). However, the first SAGAT scores were not normally distributed (p<.05). The ANOVA is considered robust to deviations from normality (Laerd, 2015). There was homogeneity of variances (p > .05) and covariances (p > .001), as assessed by Levene's test of homogeneity of variances and Box's M test, respectively. There was no statistically significant interaction between the prebriefing type and time on SAGAT scores, F(1, 39) = .179, p = .675, partial η² = .005. The main effect of time showed a statistically significant difference in mean SAGAT scores from the first time that participants acted in simulation and the second, F(1, 39) = 12.55, p < .001, partial η² = .244. However, the main effect of group showed that there was not a statistically significant difference in mean SAGAT score between the intervention and control groups F(1, 39) = .300, p = .587, partial η² = .008.
Similarly, a second two-way mixed ANOVA was performed to determine if there were differences in the intervention and control group LCJR scores over time. There were five outliers in the second time LCJR data in the control group, as assessed by boxplot (Figure 4).

**Figure 4**

*Boxplot of Outlier Data Points in Second Lasater Clinical Judgment Rubric Scores by Group*

*Note.* LCJR=Lasater Clinical Judgment Rubric. Group 1 is the control group and group 2 is the intervention group. Circular dots represent outlier data points that are more than 1.5 box-lengths from the edge of the box. Asterisks denote extreme data points that are more than 3 box-lengths away from the edge of their box.

These data were examined, and none was found to be erroneously recorded, and likely represented several high performing participants, therefore outliers were retained. The data was normally distributed for the first LCJR scores in both the
intervention and control group, as assessed by Shapiro-Wilk’s test of normality ($p > .05$). However, the second LCJR scores in the control group were not normally distributed ($p < .05$). The ANOVA is considered robust to deviations from normality, so the test was still performed (Laerd, 2015). There was homogeneity of variances ($p > .05$) and covariances ($p > .001$), as assessed by Levene’s test of homogeneity of variances and Box’s M test, respectively.

Although SA measured as a performance outcome on the LCJR increased in the intervention group over time and decreased in the control group, there was no statistically significant interaction between prebriefing type and time, $F(1, 39) = .823$, $p = .370$, partial $\eta^2 = .021$. The main effect of time showed no statistically significant difference in LCJR scores at the different time points, $F(1, 39) = 1.017$, $p = .319$, partial $\eta^2 = .025$. The main effect of prebriefing type showed that there was no statistically significant difference in the LCJR scores between intervention groups $F(1,39) = .002$, $p = .962$, partial $\eta^2 = .000$. Therefore, amongst participants who completed two simulations during the research study, time had a statistically significant impact on SAGAT scores but not LCJR scores. The type of prebriefing, SA-focused or customary, did not have a statistically significant impact on either score.

**Research Question Two**

Research Question Two asked: *Is there a difference in SA based on student role in the simulation?* This research question was answered using descriptive and inferential statistics of the SART scores collected from both active participants and observers of the simulations directly after the prebriefing phase of simulation. The SART was collected prior to each of the four simulations from all participants resulting in a large sample (n=463) for this question. The sample was further divided into two groups, active participants (n=150) and observers (n=313) without regard to their control or
experimental group membership. To measure reliability, Cronbach’s alpha was calculated for each administration of the SART. This value ranged from 0.731 to 0.867 indicating a good level of internal consistency (Laerd, 2015).

**Figure 5**

*Boxplot of Outlier Data Points in Situation Awareness Rating Technique Scores by Role*

Note. SART= Situation Awareness Rating Technique. Circular dots represent outlier data points that are more than 1.5 box-lengths from the edge of the box. Asterisks denote extreme data points that are more than 3 box-lengths away from the edge of their box.

An independent-samples t-test was used to examine the difference between SA measured by the SART in active participants and observers. The study design met the first three assumptions for the first research question investigation because SA was measured by the SART which was scored on a numerical scale, there were two independent groups (active participants and observers), and each participant could not be a member of both groups for each individual simulation. There were outliers in each
group identified by inspection of the box plot with one extreme value (Figure 5). Of the 17 outliers, there were 9 in the active participant group (5 high and 4 low scores) and 8 (4 high and 4 low scores) in the observer group. These data points were examined, and data entry was confirmed by reviewing the SART submission in Qualtrics. It is likely these are genuine data points potentially influenced by the simulation role; therefore, the outliers were retained. SART scores for active participants and observers were not normally distributed, as assessed by Shapiro-Wilk’s test ($p < .05$). However, the sample sizes were large in each group and the t-test is robust to violations of normality (Laerd, 2015). There was homogeneity of variance in the SART data, as assessed by Levene’s test for equality of variances ($p = .582$).

Active participants reported more situation awareness ($M = 14.19, SD = 4.34$) than observers ($M = 14.18, SD = 4.43$). This mean difference was not statistically significant, $M = 0.005, 95\% \text{ CI } [-0.85, .86], t(61) = 0.010, p = .992$ (Table 11). Since there was no statistically significant difference in SA measured by the SART between the active participants and observers, the null hypothesis for research question two cannot be rejected.

**Table 11**

*Independent Samples T-tests for Situation Awareness Rating Technique by Role*

<table>
<thead>
<tr>
<th>SA Measure</th>
<th>Active Participant</th>
<th>Observer</th>
<th>t(461)</th>
<th>$p$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>SART</td>
<td>14.19</td>
<td>4.34</td>
<td>14.18</td>
<td>4.43</td>
<td>0.010</td>
</tr>
</tbody>
</table>

*Note. SA=Situation Awareness. SART=Situation Awareness Rating Technique*

**Research Question Three**
Research Question Three asked: *Is there a difference in prelicensure nursing students’ satisfaction with prebriefing with the simulation experience based on whether they received the SA or customary prep work and prebriefing?* This research question was answered using descriptive and inferential statistics using the Prebriefing Experience Scale (PES) scores. These data were collected after the prebriefing phase of simulation from all participants (n=473). Cronbach’s alpha was calculated to measure internal consistency for each administration of the PES. In this study, this scale had a high level of internal consistency, as determined by Cronbach’s alphas that ranged from 0.966 to 0.982 which further demonstrates reliability that was established in a previous study (Page-Cutrara & Turk, 2017). An independent-samples t-test was used to examine the difference between participant satisfaction with prebriefing as measured by the PES in intervention (n=234) and control groups (n=239). The study design met the first three assumptions for the first research question investigation because satisfaction was measured by the PES which was scored on a 20-100 scale, there were two independent groups (customary prebriefing and SA-focused prebriefing), and each participant was a member of only one of the groups for the length of the study. There were 8 outliers in the control group data identified by inspection of the box plot. Correct data entry was confirmed by reviewing the original PES submissions in Qualtrics therefore, it is likely these are genuine data points, and they were retained.

PES scores were not normally distributed for either group as assessed by Shapiro-Wilk’s test (p<.05). Since there were greater than 50 participants in each group and the groups were close to equal sample sizes (n=234, n=239), the independent-samples t-test was performed because it is robust to deviations from normality in these cases (Laerd Statistics, 2015). The assumption of homogeneity of variances was violated in the PES data, as assessed by Levene's test for equality of variances (p =
so the Welch’s t-test is reported for this research question. The intervention prebriefing group reported higher PES scores ($M = 89.30$, $SD = 10.43$) than the control prebriefing group ($M = 80.85$, $SD = 15.38$). This difference was statistically significant, $M = 8.45$, 95% CI [-10.83, -6.07], $t(471) = -6.98$, $p = <.001$, Cohen’s $d= -.642$ with a medium effect size (Table 12). Therefore, the null hypothesis can be rejected indicating there was a difference in satisfaction with prebriefing between the intervention and control group participants.

Table 12

Independent Samples T-tests for Prebriefing Experience Scale Scores by Group

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
<th>$t(471)$</th>
<th>$p$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M$</td>
<td>89.30</td>
<td>80.85</td>
<td>-6.98</td>
<td>&lt;.001</td>
<td>-.642</td>
</tr>
<tr>
<td>$SD$</td>
<td>10.43</td>
<td>15.38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. PES=Prebriefing Experience Scale*

Research Question Four

Research Question Four asked: *Is there a relationship between prelicensure nursing students’ SA (SAGAT and SART), clinical judgment (LCJR) and satisfaction with prebriefing (PES)?* The null hypothesis is that there is no relationship between prelicensure nursing students’ SA, clinical judgment, and satisfaction with prebriefing.

This was answered with a series of Pearson’s product-moment correlations which assessed the relationships between SA and student satisfaction with prebriefing. This data set was created utilizing the SAGAT, SART, LCJR and PES scores for participants who participated in a second simulation during the research study period (n=20). These data satisfy the first two assumptions to utilize the test; all the variables being
considered, SAGAT, SART, LCJR and PES data, are measured on continuous scales and the data observations can be paired.

Scatterplot analyses showed the relationships between the SAGAT, SART, LCJR and PES scores to be linear. There were no outliers in the data. The SAGAT and LCJR data were distributed normally as assessed by Shapiro-Wilk’s test (p>.05). The SART and PES data was not normally distributed, as assessed by Shapiro-Wilk's test (p < .05). There was no statistically significant correlation between SAGAT, SART, or LCJR scores and PES scores (Table 13). The non-parametric Spearman’s Rho was also calculated due to the violation of normality in the SART and PES data, but results were similar. There were no statistically significant correlations between SA or clinical judgment and student satisfaction. Therefore, the null hypothesis for research question four cannot be rejected.

Table 13

<table>
<thead>
<tr>
<th></th>
<th>PES</th>
<th>SAGAT</th>
<th>SART</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAGAT</td>
<td>-0.097 (p=.702)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SART</td>
<td>0.248 (p=.321)</td>
<td>0.053 (p=.834)</td>
<td></td>
</tr>
<tr>
<td>LCJR</td>
<td>0.038 (p=.881)</td>
<td>0.268 (p=.282)</td>
<td>-0.138 (p=.585)</td>
</tr>
</tbody>
</table>

Note. SAGAT = Situation Awareness Global Assessment Technique; SART = Situation Awareness Rating Technique; LCJR = Lasater Clinical Judgment Rubric

Summary

In this chapter, an introduction of the data analysis and statistical tests to be performed was provided. This was followed by a demographic examination of the sample and an investigation into potential differences between the SA-focused
briefing and customary briefing groups utilizing individual t tests to explore differences between several demographic variables. Individual t-tests were also performed to examine differences between the control and intervention groups. And finally, correlations between SA and student satisfaction with briefing were considered.

Results from the first quantitative research question revealed that there were no statistically significant differences in situation awareness between participants who completed customary briefing compared to those who completed SA-focused briefing. This result was the same whether SA was measured objectively by the SAGAT, subjectively by the SART, or observed as performance measure on the LCJR. For the second research question, data analysis indicated that there was no statistically significant difference in SA measured by the SART between active participants and observers in simulation. However, results from the third research question identified that there was a statistically significant difference in student satisfaction with briefing between the control and intervention group. The SA-focused briefing participants were more satisfied with their briefing experience than the customary briefing participants. Furthermore, this difference had a medium effect size as measured by Cohen’s d=-.642. The results for research question four found no correlations between the SA measurements and student satisfaction with briefing. Results did not support SA-focused briefing as an effective intervention to increase SA in simulation scenarios. However, student satisfaction with the method may be valuable for learner engagement with simulation. Chapter V provides a discussion of the findings, in addition to the implications and future recommendations for research.
Chapter V
DISCUSSION

Introduction

This study tested an intentional and strategic structured preparation and prebriefing method including its effects on situation awareness (SA), clinical judgment (CJ), and satisfaction. This research contributes to the understanding of SA in nursing and the implications for the design of clinical simulations to prepare students for practice.

As educators use simulation pedagogy to teach the cognitive skills needed as a nurse, the significance of this study is heightened. The previous chapter presented the results of the data analysis of four research questions. Chapter V provides an interpretation of the findings, discusses the limitations, offers implications for nursing simulation education, furnishes recommendations for future research, and conclusions of the project. Moreover, this chapter will discuss the findings of this study in relationship to prior and future research on both situation awareness (SA) and prebriefing in simulation education.

Summary

A quasi-experimental design, with independent intervention and control groups at a single site, was used to test the effectiveness of an intentional and strategic prep work and prebriefing intervention prior to high-fidelity manikin simulation. To that end, this study examined four research questions:

1. Is there a difference in prelicensure nursing students’ situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing?

2. Is there a difference in SA based on student role in the simulation?
3. Is there a difference in prelicensure nursing students' satisfaction with prebriefing with the simulation experience based on whether they received SA or customary prep work and prebriefing?

4. Is there a relationship between prelicensure nursing students' SA, clinical judgment, and satisfaction with prebriefing?

Discussion of the Findings

Research Question One asked: Is there a difference in prelicensure nursing students' situation awareness during a simulation after participating in SA-focused prep work and prebriefing compared to customary prep work and prebriefing? This question was answered using quantitative data gathered from participants who were in the nurse role during the simulation utilizing three different measures of SA: the Situation Awareness Global Assessment Technique (SAGAT), the Situation Awareness Rating Technique (SART), and the Lasater Clinical Judgment Rubric LCJR. The results from the three different SA measures revealed no statistically significant difference in SA between the intervention and control groups. The scores of both groups were however very similar on all measures, and overall reflected an average amount of situation awareness in the participants. While not unexpected, this indicates that nursing students are developing this important clinical skill but have not yet fully attained it.

The SAGAT mean scores for the SA-focused prebriefing group (M=8.63) and customary prebriefing group (M=9.0) indicated that the participants answered only 72-75% of the SA queries correctly. Again, this is not entirely unexpected, because participants were in the seventh semester of an eight semester prelicensure nursing program and are still acquiring and learning to apply both cognitive and behavioral skills contextually. Measuring SA in healthcare environments is difficult because the concept is complex and involves assessing the cognitive processes within the human mind. In this study, the SAGAT was chosen to measure SA because it is one of the most cited
direct measures of SA and generally has better reliability and validity than other methods. However, due to the nature of the technique, the queries associated with the SAGAT needed to be different for each task or simulation. Therefore, queries for this study were based on prior healthcare simulation research and limited to twelve, the minimum number of queries for practicality and participant acceptability (Bogossian et al., 2014; Cooper et al., 2012; Lavoie et al., 2016; O'Meara et al., 2015). Implementing a smaller number of queries that are not randomly sampled from a pool of applicable queries for each simulation does stray from the original SAGAT procedure outlined by Endsley (2000).

Participants in both the intervention ($M=40.3$) and control groups ($M=39.2$) also predominantly self-rated their SA near the mean of the SART scoring range indicating an average level of SA. As a self-report measure, the SART is susceptible to various response biases including the response set bias which could lead participants to pick the moderate option on a composite scale (Polit & Beck, 2021). That said, most study participants completed their simulation within a few weeks of the beginning of the semester following a summer break which also may have negatively affected the formal knowledge and clinical experience they could and did recall, impacting their perception and interpretation of relevant cues and influencing their subjective assessment (Benner et al., 1992; Lasater et al., 2019; Poledna et al., 2022; Rooney & Boud, 2019; Tanner, 2006).

Salmon et al. (2009) identified that the SART may measure a more global assessment of SA than the SAGAT, therefore the scores cannot be compared with each other. Also, the SART is a subjective measure of SA, which may impact the accuracy of this assessment. It is also noteworthy that this instrument was the most often omitted by participants throughout the study period, suggesting that there may have been some concerns about the suitability of this tool or its usability. Moreover, the SART uses the
language of human factors research in the phrasing of questions by asking, "How aroused are you in the situation?" This phrasing may have limited the ability or willingness of participants to give meaningful answers.

The LCJR data also needs to be considered. In this study, only the LCJR subscales of noticing and interpreting were used as performance measures of SA. Like the SAGAT and SART scores, the similar LCJR mean score for the intervention group (M=10.17) and the control group (M=10.31) indicated that participants received mostly developing ratings based on the criteria related to noticing and interpreting. Although these two LCJR subscales have not previously been utilized as a performance measure of SA, this developing rating, demonstrated by study participants is similar to the SA scores obtained in the SART and SAGAT. However, it is possible, the noticing and reflecting subscale of the LCJR may not have adequately captured the performance that reflects good SA. The behaviors associated with quality SA may differ from those needed to obtain an exemplary rating on the LCJR. It is also possible that limiting assessment to the noticing and interpreting scales did not allow for analysis of the final performance outcome associated with SA.

Additionally, achievement of criteria in the responding and reflecting subscales of the LCJR may be important indicators of SA that were not measured in this study. Utilizing any performance measure of SA is difficult due to the inferences made between the cognitive processes and observable behavior evaluated (Orique & Despins, 2018). In simulation, participants occasionally offer spontaneous think-aloud statements that offer insights into their thinking, but it is often difficult to link actions to correct thought processes during the scenario. This lack of an obvious connection makes it difficult to score the LCJR through the lens of providing evidence for SA.

It is also challenging to measure cognitive processes like SA in simulation scenarios, like those used within this study, where more than one participant is caring for
a patient simultaneously. Anecdotally, some participants scored below average on the LCJR and were noted to be more passive in the scenario than their clinical partner, but they achieved above-average scores on the SAGAT queries. This mismatch indicated that they had perceived, comprehended, and even projected, but had been prevented from demonstrating actions that provided evidence of that thinking. Conversely, some participants scored higher than average than their peers on the LCJR but had only average and, in some cases, below-average SAGAT scores. This unexplained relationship suggests that an unknown variable affects SA even when the observable behaviors of noticing and interpreting are present.

The lack of a significant difference in SA between the intervention group who received SA-focused prebriefing and the control who used customary prebriefing also could have been influenced by the complexity of the process of developing SA in a dynamic healthcare environment. The type and level of SA needed to provide nursing care requires multifaceted noticing and interpreting, which are high order cognitive processes that are still being cultivated. Developing SA is also susceptible to errors associated with individual factors as well as task and system factors (Endsley, 1995). This study did not however formally examine task and system factors affecting SA development.

Ninety eight percent (N=117) of participants reported that they were at least sometimes nervous about simulation. Furthermore, a subset of that group reported always being nervous about simulation (20.7%, N=25). Examining the connection between feeling nervous and a narrowed focus that could decrease SA may explain this study’s lower SA and LCJR scores. Analyzing the current SAGAT data may reveal at what level, perception, comprehension, or projection, participants struggled the most. Using a SAGAT with more queries at each SA level may assist in isolating the most
problematic deficiencies. A question bank would also ensure that participants could not guess what the queries would be about during administration of serial SAGATs.

Simulation is often added to a curriculum to supplement or even replace clinical hours with the goal of engaging students in experiential learning in several domains including cognitive and metacognitive domains (Chmil et al., 2015). As a process that involves multiple cognitive skills, SA may be similar to other learning outcomes like knowledge and clinical reasoning that need required exposure to multiple high-fidelity simulations for there to be progression (Svellingen et al., 2021; Theobald et al., 2021). Although research on the optimal dose of high-fidelity simulation is scarce, growth in cognitive domains over multiple simulations has been detected in other studies (Shin et al., 2015; Svellingen et al., 2021). This phenomenon was evident in this study also. Although unplanned, several participants completed more than one simulation during the study period. This subgroup of participants who were active participants in simulation more than once demonstrated small incremental gains in SA over the weeks of the study. Additionally, there was a statistically significant difference in SAGAT scores over time in both the intervention and control groups of this subset. It is possible that long-term memory stores were strengthened through additional study and repeated clinical experiences impacted participants’ pattern recognition and ability to develop SA. These findings are important because they support SA-informed prebriefing as an educational strategy that when used repeatedly fosters the development of SA in nursing students.

Research Question Two asked: *Is there a difference in SA based on student role in the simulation?* This question was answered using quantitative SART data from active participants and observers in the simulations. The research on observer roles in nursing simulation is growing, indicating that learning outcomes may be similar between active participants and observers (Bates et al., 2019; Johnson, 2019; Rogers et al., 2020). In this study, there was no statistically significant difference between the self-reported SA
on the SART with active participants and observers. This finding indicates that all participants in this study felt that they were on equal footing after the simulation preparation and prebriefing phase with their grasp of the patient situation, which supports prior literature.

One of the goals of preparation and prebriefing is to prepare the learner for the simulation by focusing on the context and gaining an understanding of the patient's situation. Importantly, in this study, those criteria were met equally for both active participants and observers. Engaging in the development of SA through the preparation and prebriefing phase equally, despite their role in the simulation scenario, is a desirable outcome. Observers should be equally engaged in simulation with active participants and this finding supports current simulation best practice regarding the use of observers. Anecdotally, most clinical instructors in this study selected their active participants during the simulation prebriefing and not before. This practice may positively impact the development of SA for all participants because they all have incentive to be ready for active participation, but it is unknown the extent to which this impacted the participant's ability and motivation to develop SA in this study.

Since the SART was administered directly after the prebriefing phase in this study, there may have been differences in the self-assessment of SA if measured after the simulation. Some SA research maintains that only active participants in a simulation can develop SA because they interact with the physical environment (Salmon et al., 2009). However, today's advanced audio and video technology enable simulation observers to have contact with the simulation scenario comparably to active participants. Observers do lack the ability to make decisions in the moment that impact the progression of the simulation and they are reliant on the decisions and actions of the active participants, yet many do engage cognitively by thinking through the decision-making process. Therefore, it is anticipated that the SA of observers continued to be
broadly comparable to the active participants even if their SA was measured later, after the simulation or debriefing.

Research Question Three asked: *Is there a difference in prelicensure nursing students' satisfaction with prebriefing with the simulation experience based on whether they received SA or customary prep work and prebriefing?* This question was answered using quantitative data from the Prebriefing Experience Scale collected from both active participants and observers in the simulations. The SA-focused prebriefing group was more satisfied with their prebriefing experience than the customary prebriefing groups, as demonstrated by the statistically significant difference in their PES scores. In general, high-fidelity simulation often earns high student satisfaction ratings compared to other learning strategies within the discipline of nursing. However, the PES captures satisfaction with prebriefing only, and in four categories: 1) analyzing thoughts and feelings, 2) learning and making connections, 3) facilitator skill, and 4) appropriate facilitator guidance. This study's SA-focused prebriefing resulted in positive ratings in these areas, an important finding because simulation participants who are more satisfied after prebriefing can engage meaningfully with both the simulation and the debriefing. Furthermore, a structured prebriefing that helps create a psychologically safe learning environment protects students from bullying and incivility in the simulation learning environment (Kardong-Edgren et al., 2024).

Research Question Four asked: *Is there a relationship between prelicensure nursing students' SA, clinical judgment, and satisfaction with prebriefing?* This question was answered using paired data from active simulation participants who had participated twice during the study period. Correlations revealed no statistically significant correlations between the SA prebriefing intervention and satisfaction. When comparing the three measures of SA, the subjective SART had the strongest positive relationship with satisfaction with prebriefing, although it was a small effect. This positive association
between satisfaction with the prebriefing phase of simulation and feeling well-informed about the upcoming scenario situation was anticipated because preparation is one of the primary goals of prebriefing.

However, there was an inverse relationship between SAGAT scores and PES scores. This finding, that students who are more satisfied with their prebriefing have less situation awareness in the scenario, is unexpected but not unprecedented. The Dunning-Kruger Effect (DKE) describes situations in which individuals lacking competence cannot recognize their own incompetence because they lack the metacognition to assess performance (Krueger & Dunning, 1999). With limited exposure to the SA-focused preparation and prebriefing, students may have not yet recognized the requisite environmental cues crucial to developing SA in nursing practice but felt prepared to participate in the simulation scenario.

Furthermore, it was surprising that correlation coefficient for the LCJR and PES scores indicated almost no linear relationship between the two variables. Prior research has consistently found that any prebriefing had positive effects on nursing student clinical judgment (Dileone et al., 2020) so that was expected here also. In this study however, even though the participants who received a SA-focused prebriefing were more satisfied with their prebriefing experience, this did not impact their development of SA within the scenario phase of a high-fidelity simulation. Measuring clinical judgment using only the noticing and interpreting subscales of the LCJR during the scenario did not allow for assessment of the full benefit of simulation pedagogy to development of clinical judgment without the debriefing.

In this study, none of the three different measures used to examine SA were strongly correlated with each other even though it has been suggested that objective, subjective, and performance measures of SA are comparable methods of measuring the same construct (Salmon et al., 2006). However, for the SAGAT and SART, this finding is
concordant with research that directly compared the two instruments and found weak associations (Endsley et al., 1998; Salmon et al., 2009) so those associations were anticipated in this study also. While there was a small, non-statistically significant positive correlation between the SAGAT and LCJR, meaning that participants who scored more points on the SAGAT also received more points on the LCJR, this was anticipated because the SAGAT queries and LCJR items measured similar constructs, such as noticing or perceiving environmental cues. There was however a negative linear relationship between the LCJR and SART scores, indicating that the SART score decreased as the LCJR score increased. Notably, there have not been other direct comparisons between the LCJR and the SAGAT or SART because the LCJR has never been utilized as a performance measure of SA and future work in this area is warranted.

In summary, the findings of this study must be considered for their practical application although statistically significant differences in SA were not found to be associated with the specific SA-focused prebriefing intervention. Practical significance is important because SA improved over time with multiple exposures to simulation and it was associated with improved clinical judgment in the SA-focused prebriefing group. This finding suggests that simulation is a valuable and effective pedagogy for developing SA and clinical judgment over time. The simulation preparation and prebriefing phase is undoubtedly critical to the success of clinical simulation participants but measuring that success in the ability to develop SA and clinical judgment in this time-limited intervention proved difficult.

Solitary training sessions that teach SA and relying on simulation to implicitly teach nursing students to develop SA have resulted in the improvements in SA but have not produced results that are adequate for practice readiness (Priambodo et al., 2020). Supporting the development of SA about clinical practice situations is likely an objective for nursing educators to focus on throughout the entire curriculum of a nursing program.
Harnessing the satisfaction reported in the SA-focused prebriefing groups as a result of a structured prebriefing method throughout a simulation curriculum may result in more meaningful simulation and debriefing participation that lead to student nurses who are more capable of developing both SA and clinical judgment in practice.

**Limitations**

There were limitations in this study, which included (1) loss of data due to difficulty accurately tracking participants' data throughout the study duration, (2) instrument sensitivity, and (3) constraints related to the research design. The first limitation was attrition of data. Participants in this study were challenged to complete all of the data documents including a study participant agreement, a demographics survey, and at least two instruments each time they attended a simulation over approximately six weeks. An unanticipated difficulty arose when a large number of participants misinterpreted the simple directions of how to create a unique identifier on their study participant agreement. The unique identifier was a combination of the participant's telephone number and birth month, and it was intended to be a number that participants could easily remember or re-create and use consistently.

Within the different data, various errors were observed, including using just the telephone number, using the wrong digits from the phone number, or placing the example identifier number on the participants’ agreement instead of their own. These errors were noticed early in the study period, and participants were re-instructed to use the number they had created for the duration of the study. However, several participants could not recall their number since it did not follow the study instructions. As a result, many participants had multiple identifiers including one that followed the convention that was included in the weekly instruments. Unfortunately, there was missing data throughout the study associated with incorrect unique identifiers.
This was addressed in several ways. In some cases, the old number and new number were easily reconciled. However, other participants had to be removed from the study data set because their data could not be verified. Despite using technology to reconcile similar or transposed numbers, additional data had to be removed from the analysis because it was unclear which participant or group the response belonged to. Furthermore, even though time was allotted for all course participants to fill out the instruments and simulation facilitators reminded them to complete them during simulation meeting times, some participants started an instrument, left the participant identifier blank and didn’t finish completing it which then prevented the rest of the instrument from being completed when they tried to return to it. It is unclear whether this was related to difficulty with the unique identifier or survey fatigue but resulted in the sample size for each research question fluctuating, and, in some cases, the sample size was underpowered for comparison between independent groups.

Another study limitation is that the SA instruments used in this study may not have been sensitive enough to capture differences in SA or the processes needed to develop it after a single intervention. A small feasibility study had been implemented prior, but the focus was on development of the study procedure and construct validity not on instrument sensitivity. Due to the timing of the assigned work, most participants had limited exposure to the SA preparation and prebriefing before SA was measured at the time of the simulation and it was clear that they were still learning the how to incorporate environmental factors into their awareness of the situation. In this study, limiting the breadth of the SAGAT items and the single pause were required to fit into preplanned simulation sessions that were scheduled for two-hour time periods. However, these changes could have affected the accuracy of SA measurement. Utilizing only the noticing and interpreting subscales of the LCJR may have inadvertently disregarded important indicators of SA that were demonstrated during all phases of simulation. In
fact, the Debriefing for Meaningful Learning method used at the study site provides opportunities for simulation participants to elucidate their thinking and use reflection to develop clinical reasoning (Dreifuerst, 2010; Dreifuerst, 2015). The debriefing period likely would have provided additional evidence of SA that could be evaluated using the responding and reflecting subscales of the LCJR. Finally, only one rater was used to score the participants on the LCJR. The scoring of the LCJR may have been unconsciously affected by subtle cues during the video review that revealed group membership. Including multiple blinded raters who demonstrated inter-rater reliability would be beneficial in this novel use of the LCJR.

As a small, single-site quasi-experimental study, several limitations and threats to validity are also related to the study's research design. True randomization of participants to intervention and control group could not be achieved due to the procedures used for enrollment in clinical courses at the site. The resulting small sample size from a single site limits generalizability to a larger population of nursing students. Additionally, intervention fidelity may have undermined the strength of the prebriefing and its impact on participant learning. The preparation portion of the SA-focused prebriefing was delivered through the learning management system (LMS) at the research site, and participants were required to submit one portion of their preparation work before participating in simulation. However, the time and effort participants used to engage with this material is unknown. The participants in this study self-reported that they had spent between one and seven hours in preparation for simulations in prior courses but no data about the time spent for this study was collected. As a result, the SA-focused preparation work effectiveness may have been weakened by less time devoted to it.

Comparably, the in-person portion of the SA-focused prebriefing was delivered by multiple facilitators throughout the study duration, which may have also impacted
intervention fidelity. The facilitators received training on implementing the intervention through individualized instruction, written instructions, tip sheets, a worked-out example, and a live demonstration of the SA-focused prebriefing. However, due to scheduling, it was not possible to conduct vigilant monitoring of the delivery of the SA-focused prebriefing throughout the study. Implementing the prebriefing and the robustness of the discussion may have varied widely, based on facilitator skill, group dynamics, and learner engagement.

Furthermore, both the SA preparation and prebriefing were only utilized by participants for a limited time at the beginning of their academic semester. This reduced exposure to the structured framework of the SA preparation and prebriefing prevented students from being able to build a thinking routine that would promote SA. Like any other nursing skill, time and practice are likely needed to perfect the development of SA in clinical situations.

Implications for Nursing Education and Practice

Developing the cognitive skills needed to be a practicing nurse in a complex and dynamic environment has always been important to nursing education yet, changes and limitations in the healthcare environment have contributed to calls to change from the traditional clinical apprenticeship model (Leighton et al., 2021) Simulation pedagogy has become commonplace in nursing programs and is evolving to be a method for learning and practicing not only skills of nursing but also "thinking like a nurse." Nursing organizations such as the National League of Nursing (NLN) and the International Nursing Association of Clinical Simulation and Learning (INACSL) urge rigorous investigation of simulation outcomes to support evolving best practices in the field. While this study focused on a specific prebriefing intervention utilized with prelicensure nursing students, the results have implications for nursing educators and nursing education.
Nursing programs that utilize simulation must employ best practices throughout their simulation opportunities, including the preparation and prebriefing period.

The recently created Healthcare Simulation Standards of Best Practice (HSSOBP™): Prebriefing requires that both preparation and briefing criteria are addressed in prebriefing (INASCL Standards Committee, 2021b). The SA-focused preparation and prebriefing incorporated the standard and research-endorsed emphases of prebriefing: planning, orientation, and establishing a psychologically safe environment. Therefore, the SA-focused preparation and prebriefing provide a structure to meet the prebriefing HSSOBP™. Moreover, this study demonstrated that participants had an improved prebriefing experience when the SA-focused prebriefing format was utilized.

Priambodo et al. (2022) found in a scoping review of nine studies that aimed to test a SA intervention to increase SA that even in studies that reported a statistically significant change in SA, the SA was still low. This continued finding of difficulty developing SA with nursing students suggests that developing SA that impacts clinical judgment takes a long time. Faculty and program administrators should incorporate teaching the foundational cognitive skills that SA is built upon throughout nursing programs. The recent NCSBN Clinical Judgment Measure Model (CJMM) and newly redesigned NCLEX-RN does signal a recognition that clinical judgment in nurses is dependent upon several critical foundational cognitive skills that are affected by environmental and individual factors.

The layer three cognitive skills, recognizing cues, analyzing cues, prioritizing hypotheses, and generating solutions, are like the cognitive work of SA. Teaching nursing students how to perform these cognitive skills with attention to environmental factors throughout their nursing programs and not just during their clinical-based education will likely make practitioners more adept at attending to the layer four environmental factors that build good SA. When environmental factor considerations like
time pressure and resources available are included in case studies and multiple-choice questions throughout a nursing program, it is more likely that the nursing student will be able to attend to these cues and develop SA when they encounter them in the simulation or traditional clinical environment.

Similarly, faculty must continue to develop simulations that are situated within a realistic healthcare environment. Traditional simulations, where one patient is cared for with no distractions or competing priorities, do a disservice to nursing students who will encounter high expectations of practice readiness from their employer's nursing leadership. Also, nursing students should have access to similar resources in simulation that they would routinely find in the healthcare environment, such as electronic resources, decision-making tools, and robust electronic health records. Simulation scenarios that incorporate many environmental factors into the patient case and a simulation environment that supports the ability to maximize cognitive skills enable nursing students to graduate more prepared for the complex healthcare landscape. The acuity and complexity of the patients within the healthcare system demand that newly graduated nurses are prepared to respond with a high level of SA and clinical judgment.

Faculty must consider that, in this study, most senior-level nursing students with one academic year left in their education had only achieved, at best, a developing level of noticing and interpreting on the LCJR. This finding indicates a need for higher-order thinking improvement in the clinical learning environment. Providing multiple opportunities to demonstrate critical thinking and clinical judgment throughout simulation learning, including prebriefing and debriefing with tools like the SA-focused prebriefing addendum and Debriefing for Meaningful Learning (DML), are needed for optimized simulation learning outcomes. More guidance is needed from research about whether higher-order thinking simulation outcomes translate into practice outcomes (Hanshaw & Dickerson, 2020).
Recommendations for Further Research

This study tested a SA-focused prebriefing intervention on two higher-order cognitive thinking processes, SA and clinical judgment. There are many avenues for future research that may contribute to the current goal of examining the impact of simulation education on cognitive thinking processes essential to safe, quality nursing care. Future research should include methodological improvements to the current study. For example, more time and repeated measures may be needed to see an impact on the development of both SA and clinical judgment as nursing students refine their practice through simulation and traditional clinical education. Similarly, a larger multi-site sample would increase the generalizability of findings.

A second priority for future research is to continue to measure higher order thinking skills like SA and clinical judgment within the simulation environment. Clearly, research regarding teaching SA to find an impactful intervention that effectively improves the cognitive processes needed in nursing practice is warranted. Further testing of the relationship between SA and other higher-level cognitive processes involved in nursing, like critical thinking, clinical judgment, and clinical competence, is also needed. SA may be involved in other learning outcomes that are inclusive of successful clinical competence, such as the competencies involved in the holistic, ethical, and caring aspects of nursing care. Researchers should focus on investigating whether the positive outcomes associated with simulation transfer to the transition to practice period for newly graduated registered nurses. Measurable outcomes could include the first-time pass rate of the NCLEX-RN, retention of specific content, length of orientation, and patient outcomes.

With the introduction of the HSSOBP™: Prebriefing, continued research is needed to underpin the best practices and provide additional evidence. Further exploration of the relationship between prebriefing and debriefing would be valuable to
understanding simulation pedagogy. Understanding, from a student's perspective, the most beneficial aspects of prebriefing may be helpful to enhance the experience and improve learning in simulation.

**Conclusion**

This study contributes to the body of research in nursing education, specifically simulation pedagogy. The findings expand on prior research that supports prebriefing as an integral part of simulation learning. As simulation is used frequently as an adjunct to and, as a replacement for traditional clinical learning, this study endeavored to find a method to improve SA as a foundational cognitive skill that could impact clinical judgment. While the single preparation and prebriefing intervention did not make an appreciable difference in the SA or clinical judgment of nursing students in this study, students exposed to the SA-focused preparation and prebriefing intervention reported more satisfaction with their prebriefing experience. The criteria established by the HSSOBPTM: Prebriefing were utilized in the structured format of the intervention. Furthermore, the use of simulation to develop the ability to improve SA was supported by the findings of this study. Faculty and nursing program administrators can use the findings of this study to improve their prebriefing and foster student’s development of the skill of situation awareness necessary for safe and quality patient care.
References


education. *Journal of Nursing Regulation*, 5(2), S3-S40.
https://doi.org/10.1016/S2155-8256(15)30062-4

https://doi.org/10.1097/NNE.0000000000000773


https://doi.org/10.1097/01.ta.0000238687.23622.89

https://www.ncbi.nlm.nih.gov/books/NBK2672/

Hughes, P. G., & Hughes, K. E. (2022). Briefing Prior to Simulation Activity. In *StatPearls*
Retrieved July 17, 2023 from http://0-
www.ncbi.nlm.nih.gov.libus.csd.mu.edu/books/NBK545234/


Korkiakangas, T., Weldon, S. M., Bezemer, J., & Kneebone, R. (2014). Nurse–surgeon object transfer: video analysis of communication and situation awareness in the
operating theatre. *International Journal of Nursing Studies, 51*(9), 1195-1206. https://doi.org/10.1016/j.ijnurstu.2014.01.007


https://doi.org/10.1053/j.sane.2007.06.001


https://doi:10.1177/089431849701000305


https://doi.org/10.5430/jnep.v10n5p47


Simulation Objectives
By the end of this simulation, students will:
1.
2.
3.
4.

Required Activities Prior to Synchronous Simulation:
1. Review text
2. Review article
3. Review Skills Pertinent to This Simulation
   a. Skill
   b. Skill
3. Review EMR (patient chart in Excel)
4. Complete Sim Prep Work Sheet (below)

<table>
<thead>
<tr>
<th>Initials:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td></td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
</tr>
<tr>
<td>Code Status:</td>
<td></td>
</tr>
<tr>
<td>Diagnosis/Symptoms:</td>
<td></td>
</tr>
<tr>
<td>Past Medical History:</td>
<td></td>
</tr>
<tr>
<td>Department/Unit:</td>
<td></td>
</tr>
<tr>
<td>Length of Stay:</td>
<td></td>
</tr>
<tr>
<td>Allergies:</td>
<td></td>
</tr>
<tr>
<td>Provider:</td>
<td></td>
</tr>
<tr>
<td>Consults:</td>
<td></td>
</tr>
<tr>
<td>Isolation:</td>
<td></td>
</tr>
<tr>
<td>Cultural considerations:</td>
<td></td>
</tr>
<tr>
<td>Safety concerns:</td>
<td></td>
</tr>
</tbody>
</table>
IV access:

Type and Fluid Rate:

<table>
<thead>
<tr>
<th>Diagnostic Test</th>
<th>Result</th>
<th>Normal Range</th>
<th>If abnormal, provide rational</th>
<th>Nursing Actions (Assessment, interventions, teaching)</th>
<th>Why would you want to know this lab result for this patient?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abnormal Labs / Diagnostics

<table>
<thead>
<tr>
<th>Medications</th>
<th>Generic name</th>
<th>Drug class</th>
<th>Mechanism of Action</th>
<th>Common Side Effects</th>
<th>Adverse Reactions</th>
<th>Administration Considerations (IVP rate, w/food, etc?)</th>
<th>Assessments Needed Prior to Administration</th>
<th>Why is this patient taking this medication? Why might this be ordered? (relate to HPI/PMH)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix B

### Prebriefing Addendum Worksheet

**Patient Name**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Assessment</th>
<th>Problems/Priorities</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the key issue/diagnosis?</td>
<td>What is the history of the present illness?</td>
<td>What are the priority problems for this patient? Physical</td>
<td>What are the patient’s goals?</td>
</tr>
<tr>
<td>What is the pathophysiology of main diagnosis?</td>
<td>Subjective data: Known:</td>
<td>Psychological</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Still needed:</td>
<td></td>
<td>What are the desired nursing outcomes?</td>
</tr>
<tr>
<td>If diagnosis is unknown, potential causes of symptoms:</td>
<td>Objective data: Known:</td>
<td>Social</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labs: Results:</td>
<td>Spiritual</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pending or Unknown:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C

Student Information Sheet

STUDY INFORMATION SHEET FOR STUDENTS AS PARTICIPANTS

Testing a Preparation and Prebriefing Intervention in Nursing Simulation

You are invited to participate in a research study looking at best practices in simulation and specifically preparation and prebriefing. You were selected as a possible participant because the clinical group you are assigned to this semester is affiliated with this research study. We ask that you read this form and ask any questions you may have before agreeing to allow your data to be used in the study.

The study is being conducted by Amanda Potter, MSN, RN, a PhD candidate and Kristina Thomas Dreifuerst PhD, RN, a Professor at Marquette University College of Nursing.

STUDY PURPOSE

The purpose of this study is to explore different ways of student preparation and prebriefing in simulation. This study aims to improve the teaching and learning that occurs during simulation.

PROCEDURES FOR THE STUDY:

If you agree to participate in the study, you will:

- Allow your deidentified course data and video recordings from the first four simulations of the semester to be used in the study database.

If you do not agree to participate in the study, you will:

- Not allow your deidentified course data and video recordings from the first four simulations of the semester to be used in the study database.

CONFIDENTIALITY

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your course professor will not have access to your data and your identity will be held in confidence in reports in which the study may be published. Although video recordings cannot be completely deidentified because your likeness will appear in the simulation scenario recordings, it is unlikely that the researchers will be able to identify you. And your name will not be used or associated with any study data.

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator, the Marquette University Institutional Review Board or its designees and (as allowed by law) state or federal agencies, specifically the Office for Human Research Protections (OHRP) who may need to access your research records.

To minimize risk, you will use a confidential number instead of your name on course documents associated with the study. Since this course is affiliated with the study, and you are aware of the identity of the others in the class, all students will participate in the simulation, all students will take the instruments and all students will use their confidential number for documents instead of your name, whether you agree to participate in this study or not. In this manner, neither the simulation faculty nor the researcher will know who has agreed to participate and who has declined. If you decide to not agree
to data collection for this study, all study related instruments and with your participant number will be
removed from the data sample by the researcher.

PAYMENT

You will not receive payment for allowing data collection.

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study, contact the researchers Amanda Potter, MSN, RN at
amanda.potter@marquette.edu or Kristina Thomas Dreifuerst PhD, RN at
kristina.thomasdreifuerst@marquette.edu

For questions about your rights as a research participant or to discuss problems, complaints or concerns
about a research study, or to obtain information, or offer input, contact the MU Human Subjects Office
at 414.288.7570.

VOLUNTARY NATURE OF STUDY DATA COLLECTION

Agreeing to data collection is voluntary. You may choose not to take part or may rescind your
permission to use your data at any time. Deciding to not allow your data to be used or rescinding
permission will not result in any penalty. Your decision whether or not to allow data collection will not
affect your current or future relations with your nursing instructor or the School of Nursing. Your
nursing instructor and the students in your class or simulation group will not know you have chosen not
to participate.

Should you initially allow data collection and then later decide to rescind your permission, contact
Amanda Potter, MSN, RN at amanda.potter@marquette.edu or Kristina Thomas Dreifuerst PhD, RN at
kristina.thomasdreifuerst@marquette.edu

If you rescind permission or do not allow data collection, you will remain in your class and simulation
group which is affiliated with the research study and continue to participate in the activities including
future simulations as directed by your instructor. You will continue to complete study related
instruments using your personal participant number, but all of your de-identified data will be removed
by the researcher before it is entered into the database. Your instructor and the students in your class or
simulation group will not know you have chosen to not allow data collection.

This is your copy of this document.

Complete it and keep it in a secure place with the rest of the information about this study. This
page has your participant number on it that you will need at the beginning of the fall semester.

Your participant number is:
The seventh, eighth, and ninth digit of your ten-digit phone number plus the first 2 numbers of the
month you were born.
For example: My phone is (414) 123-4576 and I was born in March, so my participant number is 45703.

Choose 1 option below and complete fully:

AGREE TO ALLOW DATA TO BE USED IN THE STUDY:

In consideration of all of the information I have received, I agree to allow my data to be used in the
research study. My participant number is ____________________.
Date:
(Must be dated by the participant)

OR

REFUSAL TO ALLOW DATA TO BE USED IN THE STUDY:

In consideration of the information I have received, I refuse to allow my data to be used in the study.

I understand that although I refuse to allow my data to be used in the study, I still need to participate in the simulation activities with my clinical group members and fill out the study instruments. I also understand that my data will be removed by the researcher for the study and destroyed. It will not be included in the analysis or results of the study. My participant number is ____________________.

Date:
(Must be dated by the participant)
# Appendix D

## Student Demographic Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your age?</td>
<td>Number bar-select age</td>
</tr>
<tr>
<td>What is your gender?</td>
<td>Female</td>
</tr>
<tr>
<td>Have you ever been employed in healthcare?</td>
<td>Yes</td>
</tr>
<tr>
<td>Did this role require direct patient care?</td>
<td>Yes</td>
</tr>
<tr>
<td>Are you currently employed in healthcare?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does this role require direct patient care?</td>
<td>Yes</td>
</tr>
<tr>
<td>How many total years have you been employed in healthcare?</td>
<td>Number bar-select years. Round up to closest year</td>
</tr>
<tr>
<td>Prior to this course, have you participated in nursing simulations?</td>
<td>Yes</td>
</tr>
<tr>
<td>About how many simulations?</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Please rate how much you agree with this statement, “I have a positive attitude towards simulation”</td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>Please estimate how long you spent preparing for this simulation including completing prep work or practicing skills.</td>
<td>Number bar-select hours. Round up to nearest hour.</td>
</tr>
</tbody>
</table>
Appendix E

Situation Awareness Global Assessment Technique (SAGAT)

Situation awareness: subscale components.

1. Physiological perception
   - What is the BP at the moment?
   - What is the HR at the moment?
   - What is the RR at the moment?

2. Global situation perception
   - Is suction available?
   - What is on the patient's wrist?
   - What was on the wall near the patient?

3. Comprehension
   - Is the patient adequately oxygenated?
   - What is wrong with this patient?

4. Projection
   - If condition does not improve, what will happen to the HR?
   - If condition does not improve, what will happen to the BP?
   - What investigations may be required?
   - What medications may be required?

Cited in McKenna et al., 2014
Appendix F

Situation Awareness Rating Technique (SART) (Taylor, 1990)

<table>
<thead>
<tr>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instability of Situation</td>
<td>How changeable is the situation? Is the situation highly unstable and likely to change suddenly (High) or is it very stable and straightforward (Low)?</td>
</tr>
<tr>
<td>Complexity of Situation</td>
<td>How complicated is the situation? Is it complex with many interrelated components (High) or is it simple and straightforward (Low)?</td>
</tr>
<tr>
<td>Variability of Situation</td>
<td>How many variables are changing within the situation? Are there a large number of factors varying (High) or are there very few variables changing (Low)?</td>
</tr>
<tr>
<td>Arousal</td>
<td>How aroused are you in the situation? Are you alert and ready for activity (High) or do you have a low degree of alertness (Low)?</td>
</tr>
<tr>
<td>Concentration of Attention</td>
<td>How much are you concentrating on the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?</td>
</tr>
<tr>
<td>Division of Attention</td>
<td>How much is your attention divided in the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?</td>
</tr>
<tr>
<td>Spare Mental Capacity</td>
<td>How much mental capacity do you have to spare in the situation? Do you have sufficient to attend to many variables (High) or nothing to spare at all (Low)?</td>
</tr>
</tbody>
</table>
Scoring

Individual question scores are summed for an overall composite score of SA.
### Appendix G

Lasater Clinical Judgment Rubric (Lasater, 2007)

<table>
<thead>
<tr>
<th>Effective NOTICING involves:</th>
<th>Exemplary</th>
<th>Accomplished</th>
<th>Developing</th>
<th>Beginning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focused Observation</td>
<td>Focuses observation appropriately; regularly observes and monitors a wide variety of objective and subjective data to uncover any useful information</td>
<td>Regularly observes/monitors a variety of data, including both subjective and objective; most useful information is noticed, may miss the most subtle signs</td>
<td>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</td>
<td>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</td>
</tr>
<tr>
<td>Recognizing Deviations from Expected Patterns</td>
<td>Recognizes subtle patterns and deviations from expected patterns in data and uses these to guide the assessment</td>
<td>Recognizes most obvious patterns and deviations in data and uses these to continually assess</td>
<td>Identifies obvious patterns and deviations, missing some important information; unsure how to continue the assessment</td>
<td>Focuses on one thing at a time and misses most patterns/deviations from expectations; misses opportunities to refine the assessment</td>
</tr>
<tr>
<td>Information Seeking</td>
<td>Assertively seeks information to plan intervention: carefully reflects useful subjective data from observing the client and from interacting with the client and family</td>
<td>Actively seeks subjective information about the client’s situation from the client and family to support planning interventions; occasionally does not pursue important leads</td>
<td>Makes limited efforts to seek additional information from the client/family; often seems not to know what information to seek and/or pursue unrelated information</td>
<td>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</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effective INTERPRETING involves:</th>
<th>Exemplary</th>
<th>Accomplished</th>
<th>Developing</th>
<th>Beginning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prioritizing Data</td>
<td>Focuses on the most relevant and important data useful for explaining the client’s condition</td>
<td>Generally focuses on the most important data and seeks further relevant information, but also may try to attend to less pertinent data</td>
<td>Makes an effort to prioritize data and focus on the most important, but also attends to less relevant/useful data</td>
<td>Has difficulty focusing and appears not to know which data are most important to the diagnostic; attempts to attend to all available data</td>
</tr>
<tr>
<td>Making Sense of Data</td>
<td>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</td>
<td>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</td>
<td>In simple or common/familiar situations, is able to compare the client’s data patterns with those known and in developing an intervention plan; has difficulty, however, with even moderately difficult data/situations that are within the expectations for students, inappropriately requires advice or assistance</td>
<td>Even in simple of familiar/common situations but difficulty interpreting or making sense of data; have trouble distinguishing among competing explanations and appropriate interventions, requiring assistance both in diagnosing the problem and in developing an intervention</td>
</tr>
</tbody>
</table>

Appendix H

Prebriefing Experience Scale (Page-Cutrara & Turk, 2017)

Prebriefing Experience Scale (PES) (Adapted from Debriefing Experience Scale (Reed, 2012)) (Page-Cutrara, 2015)

Little is known about participants’ experience during prebriefing (the introduction or orientation to the simulation which involves a review of the objectives, equipment, environment, patient information, conduct and roles). You can add to professional knowledge by giving your opinions. Please complete the survey below. Your views are very valuable. There is no right or wrong answer.

Circle the number that best reflects your opinion about your prebriefing experience.

1-Strongly disagree with the statement
2-Disagree with the statement
3-Neutral
4-Agree with the statement
5-Strongly agree with the statement
NA-Not applicable, the statement does not pertain to the prebriefing activity performed.

<table>
<thead>
<tr>
<th>Analyzing Thoughts and Feelings</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prebriefing helped me to analyze my thoughts</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>2. The facilitator reinforced aspects of the health care team’s behavior</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>3. The prebriefing environment was physically comfortable</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>4. Unsettled feelings from the simulation were resolved by prebriefing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning and Making Connections</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Prebriefing helped me to make connections in my learning</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facilitator Skill in Conducting the Prebriefing</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. The facilitator allowed me enough time to verbalize my feelings before commencing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>14. The prebriefing session facilitator talked the right amount during prebriefing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>15. Prebriefing provided me a means for me to reflect on my plans prior to the simulation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>16. I had enough time to prebrief thoroughly</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>17. The prebriefing session facilitator was an expert in the content area</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appropriate Facilitator Guidance</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The facilitator taught the right amount during the prebriefing session</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>19. The facilitator provided constructive feedback during prebriefing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
<tr>
<td>20. The facilitator provided adequate guidance during the prebriefing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>NA</td>
</tr>
</tbody>
</table>

Comments: ________________________________