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Evidence-Based Practices for Managing Emergence Delirium in Patients Diagnosed with PTSD: Pilot Evaluation of a Nursing Education & Simulation Program

A dissertation submitted in partial satisfaction of the

requirements for the degree

Doctor of Nursing Practice

by

Kimberly Leanne Liss

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ABSTRACT OF THE DISSERTATION

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by

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Doctor of Nursing Practice

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Background

Emergence delirium is an adverse reaction when awakening from anesthesia, defined as an abnormal mental state of restlessness, confusion, and possible combativeness. Emergence delirium occurs in approximately 5% of the general population, but it is more common and problematic in patients with a history of Post-Traumatic Stress Disorder (PTSD). Emergence delirium can lead to significant patient and staff injury and adverse patient outcomes, but many perioperative nurses lack training in best practices for the management of emergence delirium.

Objectives

To educate perioperative nurses on the identification and management of emergence delirium among patients with post-traumatic stress disorder (PTSD).

Methods

Perioperative nurses at three healthcare institutions were invited to participate in a 60-minute education intervention, including a simulation, to introduce evidence-based practices when caring for patients diagnosed with PTSD who experience emergence delirium. Participants completed a knowledge assessment and a self-reported confidence measure collected via Qualtrics electronic survey before and after the educational intervention and six weeks post-intervention. Bivariate tests were used to assess pre/post change in learning outcomes, and repeated measures ANOVA was used to examine retention of learning over time.

Results

Perioperative nurse participants (n= 36) at three hospitals participated in the intervention. Participants were predominantly women (81.8%) whose ages ranged from 18 to 64 years. Perioperative nurses most commonly worked in peri-anesthesia settings. Nurses who participated in the intervention demonstrated a pre/posttest increase in knowledge levels from 65.2% to 89.1% ($p<.001$) and confidence levels from 6.07 to 8.09 on a 10-point scale ($p<.001$), respectively. Knowledge and confidence gains were sustained at a six-week follow-up.

Conclusion

A brief educational intervention can raise nurses' awareness of the serious complication of emergence delirium and high-risk populations and increase their knowledge and confidence levels when caring for this patient population.

KEY WORDS: Posttraumatic Stress Disorder, PTSD, Emergence Delirium, Evidence-Based Practices, Perioperative Nurses, Education

The dissertation of Kimberly Leanne Liss is approved.

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This dissertation is dedicated to my children.

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CHAPTER ONE: INTRODUCTION

Emergence delirium is an adverse reaction when awakening from anesthesia, defined as an abnormal mental state of restlessness, confusion, and possible combativeness (McGuire, 2012). Emergence delirium occurs in approximately 5% of the general population, but it is more common and severe in patients with posttraumatic stress disorder (PTSD) (Lovestrand et al., 2021). PTSD is a syndrome that results from exposure to traumatic and life-threatening events that includes persistently re-experiencing the traumatic event, intrusive thoughts, nightmares, flashbacks, dissociation, intense negative emotions, and physiological reactions when being exposed to the traumatic reminder (Mann & Marwaha, 2023). The lifetime prevalence of PTSD in civilians in the United States is 3.4–26.9%, while the lifetime prevalence in military veterans has been found to be 7.7–17.0% (Huang et al., 2023). Although combat soldiers and veterans do reassimilate into society, the diagnosis of PTSD often persists. Combat soldiers and veterans are not the only persons at risk for developing PTSD. Exposure to traumatic events, such as sexual assault, child abuse, domestic violence, natural disasters, and motor vehicle collisions, places people at risk for developing PTSD (Bryant, 2019). It is common to manifest at least some symptoms of PTSD after a traumatic event, and symptoms can develop at any time in the lifecycle (Bryant, 2019). In what little research exists on emergence delirium and PTSD, one study found that the incidence of emergence delirium in postoperative military members with combat exposure was 20%, which is four times higher than levels observed in the general population (McGuire, 2012).

Given the lifetime prevalence of PTSD and its association to emergence delirium, it is possible that emergence delirium could affect a significant segment of the population undergoing

surgery. When undergoing or emerging from anesthesia, patients with PTSD may be more likely to experience emergence delirium due to physiological and psychological factors associated with their condition, including re-enacting or reliving a traumatic event before awakening completely from anesthesia (McLott et al., 2013). Patients diagnosed with PTSD can have a heightened stress response to trauma-related cues and a higher susceptibility to anxiety and agitation during healthcare encounters (María-Ríos & Morrow, 2020). Agitation associated with PTSD and emergence delirium may put both patients and nurses at risk for injury and other adverse outcomes.

Pathophysiology of PTSD and Emergence Delirium

Research on PTSD and emergence delirium is limited, but key changes to the brain have been identified in patients diagnosed with PTSD that might increase the risk for emergence delirium (Lovestrand et al., 2021). In patients diagnosed with PTSD, the amygdala, which is the brain region responsible for processing emotions, is often hyperactive (McLott et al., 2013). This hyperactivation may lead to overreaction to perceived threats and traumatic stimuli, leading to increased emotional responses, including anxiety and hypervigilance (McLott et al., 2013). Motor hyper-reactivity may accompany the disordered affective response, including constant aimless motion and vigorous resistance to restraint. The hippocampus, the area of the brain responsible for memory and differentiating between past and present, decreases in size in PTSD (McLott et al., 2013). Additionally, decreased function of the ventromedial prefrontal cortex, which controls rational thinking and regulated emotions, has been identified. The amygdala, medial prefrontal cortex, and hippocampus interactions comprise the Amygdalocentric Neurocircuitry (AN). PTSD-related changes in the AN have been proposed to underlie glutaminergic hyperactivity due to impaired regulation of principal neurons in the basolateral

amygdala by local gamma aminobutyric acid (GABA)-ergic neurons (Huang et al., 2023). In this context, increased glutamate neurotransmission is associated with stressful states and may be a mechanism implicated in the relationship between PTSD and emergence delirium (Huang et al., 2023).

Although the specific pathophysiology of emergence delirium and its mechanism of action is poorly understood (Huang et al., 2023), the AN is believed to be the area that provides amnesia during the administration of general anesthesia (McLott et al., 2013). The interaction of some of the medications given in the administration of general anesthesia is believed to cause further dysregulation of the AN, increasing the propensity for hyperarousal and agitation (McLott et al., 2013). Additionally, a neuroinflammatory mechanism has also been hypothesized, as patients who have experienced emergence delirium have been found to have elevated inflammatory markers (increase in pro-inflammatory cytokines (IL-6 and IL17)) and endogenous catecholamines at the neuronal adrenergic terminals (Huang et al., 2023).

Delirium and Emergence Delirium

Delirium and emergence delirium are related but refer to different clinical phenomena in distinct contexts. Delirium is a neuropsychiatric syndrome characterized by an acute and fluctuating disturbance in attention, awareness, and cognition (Thom et al., 2019). It can occur in response to an underlying medical condition, intervention such as surgery, substance, or medication, and is often reversible. Delirium can develop at any time and may occur during a hospital stay in response to an infection, metabolic abnormalities, surgery, or a side effect of medications. Delirium can last for days or weeks, depending on the underlying cause, and usually resolves when the underlying condition is treated. Common symptoms are similar in some ways to emergence delirium symptoms and include confusion, disorientation, altered

consciousness, impaired attention, hallucinations, agitation, and incoherent speech. Patients with delirium may have difficulty processing information, maintaining focus, and understanding their environment (Thom et al., 2019).

Emergence delirium is a distinct phenomenon that occurs immediately after anesthesia as a patient regains consciousness from surgery or a medical procedure (McGuire, 2012). It also involves confusion, agitation, and potentially aggressive or restless behavior. Emergence delirium occurs during the emergence (regaining of consciousness) from anesthesia and is most often seen in the post-anesthesia care unit (PACU) or the immediate recovery period. Emergence delirium is usually short-lived and brief, lasting minutes to hours. The exact causes of emergence delirium are not fully understood but are thought to be related to the abrupt transition from a state of consciousness induced by anesthesia to full consciousness (Huang et al., 2023). Factors include the type of anesthesia used, individual patient characteristics, and the surgical procedure. Symptoms can include restlessness, combativeness, confusion, and crying (McGuire, 2012). Delirium and emergence delirium involve acute disturbances in cognition and behavior, although they occur in different clinical contexts and have distinct causes and durations.

Patients experiencing emergence delirium can exhibit various disruptive and distressing behaviors that vary from person to person, such as agitation, confusion, restlessness, and inability to stay still or follow directions (Huang et al., 2023). Patients may move their bodies around frantically and attempt to escape the narrow surgical bed or remove medical equipment. Although patients appear awake, they are disoriented and unaware of person, place, and time. Confusion about their surroundings, the people present, and the current situation are common as patients may reexperience a traumatic past event (McGuire, 2012). Some patients may display aggressive behavior, such as hitting, kicking, or attempting to push away caregivers or healthcare

providers. Patients may cry loudly, shout, or scream without clear cause or provocation (Lovestrand et al., 2021). A clinical sign of emergence delirium is that the patient's eyes are open and appear to be awake, but they are not making meaningful eye contact and have difficulty following simple instructions given by healthcare providers. Patients may attempt to remove intravenous lines, endotracheal tubes, drains, and monitoring equipment. Their uncontrolled bodily movements can cause the dehiscence of recently closed surgical sites and even hemorrhage.

As patients attempt to get out of the surgical bed, surgical staff unfamiliar with emergence delirium, may physically intervene by trying to keep the patient in bed by holding the patient down. At the same time, due to the dangerousness of the situation, healthcare providers often raise their voices. The actions of restraining the patient, using force, and heightened emotions and voices can exacerbate emergence delirium by triggering memories of a traumatic event (McGuire, 2012). During these episodes, patients have unknowingly lashed out and injured staff while in this disoriented state, often also causing self-injury.

Despite their differences, the care of patients experiencing emergence delirium and delirium does require nurses' special training and knowledge. Although limited studies have been conducted on educating perioperative nurses about emergence delirium, numerous studies have found that a delirium educational program can increase nurses' knowledge and or confidence levels when caring for patients with delirium, in general (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022; Aldawood et al., 2023; Alhalaiqa et al., 2023; Lee et al., 2022; Lieow et al., 2019; Lovestrand et al., 2021; Wireko et al., 2022; Yıldırım et al., 2022). Approaches used to educate nurses on management of delirium in general may be adapted for emergence delirium education.

This Doctor of Nursing Practice (DNP) project involved implementing an education and simulation training session regarding emergence delirium in patients diagnosed with PTSD with a sample of perioperative nurses. A pre/posttest survey was administered to determine if the educational intervention improved perioperative nurses' knowledge and confidence in managing patients diagnosed with PTSD experiencing emergence delirium. Increasing nurses' knowledge and confidence when addressing emergence delirium among individuals with PTSD may improve patient and health system outcomes and reduce the risk of further morbidity or complications among patients with PTSD.

Problem Statement

Emergence delirium episodes can be stressful and dangerous for the patient and healthcare staff (Lovestrand et al., 2017). It is important for healthcare providers to address emergence delirium promptly to ensure the safety and well-being of the patient, but most nurses do not receive in-depth training on recognizing or managing emergence delirium during their prelicensure training, as perioperative clinical experiences are minimal. Nurses also do not receive detailed education about risk factors for emergence delirium, such as PTSD. Although research on emergence delirium is still growing, strategies for managing emergence delirium may include patient reassurance, providing a quiet and calm environment, and administering medications necessary to reduce agitation (Lovestrand et al., 2021). If a diagnosis of PTSD is known preoperatively, steps can be taken to minimize the risk of emergence delirium, such as choosing specific anesthetic agents or employing non-pharmacological interventions to promote a smoother transition from anesthesia to wakefulness (Lovestrand et al., 2017). Unlike other types of delirium, emergence delirium is shorter in duration, and patients regain awareness after a short period of time as the effects of anesthesia wear off. If confusion and agitation can be kept

to a minimum during this period through nursing intervention, adverse sequelae can be decreased or avoided, and the prognosis is excellent.

The lack of nursing knowledge of emergence delirium recognition and management increases the risk for adverse sequelae, especially among patients with PTSD, who are at higher risk for emergence delirium. Injuries incurred from a fall, physical altercation, intravenous or foley dislodgement, self-extubation, wound dehiscence, and hemorrhage are adverse sequelae that may occur in emergence delirium (Huang et al., 2023). These episodes are emotionally, physically, and financially exhausting to patients, family, staff, and the hospital. Currently, no data exist on the cost of emergence delirium specifically. However, one study found that delirium, in general, can cost $806–$24,509 per event (Kinchin et al., 2021). Although not yet quantified, treating incurred injuries from emergence delirium and prolonged hospital stays are likely to be costly.

There is a lack of specialized training for perioperative nurses in managing patients with emergence delirium (Lovestrand et al., 2021). Many perioperative nurses may not have received adequate training on recognizing and managing patients with PTSD and emergence delirium, leading to suboptimal care for this population (Dahlberg et al., 2021). Improving nurses' knowledge of how-to best support patients during emergence delirium episodes through evidence-based practices has the potential to improve the outcomes of PTSD patients with emergence delirium, such as reducing injuries and procedure complications.

Perioperative Nursing Education and Job Literacy

Perioperative nurses, specifically post-anesthesia care unit (PACU) nurses, are among the first professionals to care for patients recovering from anesthesia's effects immediately after surgery. Perioperative nurses vary in age, gender, race, levels of education, and years of nursing

experience (Stobinski et al., 2022). There is no consensus regarding the education or competencies needed to provide safe, high-quality patient care in perioperative care (Dahlberg et al., 2022). The International Collaboration of PeriAnesthesia Nurses (ICPAN) Board has discussed the need for consensus on these requirements to strengthen the nurse's role in the perioperative setting, but to date, there are no specific education requirements or clinical competencies around emergence delirium (Dahlberg et al., 2022).

As a result of the varied educational levels and prior experiences of newly hired perioperative nurses, the specific training of perioperative nurses mostly takes place in individual hospital settings. This institution-specific training varies significantly depending on hospital needs and protocols. There is a lack of standardization of what is taught in perioperative training (Stobinski et al., 2022). Perioperative nurses have noted variations and inconsistencies even in the educational training received in one PACU in one hospital (Hughes et al., 2022). Differences among nurses in training and experience have been found to affect job literacy and performance (Dahlberg et al., 2022).

Emergence delirium can be very frightening as patient and staff safety are sometimes in danger. Without proper training on at-risk populations, quick identification of emergence delirium, and its management, a perioperative nurse may easily rely on interventions that could exacerbate delirium, such as raising one's voice or restraining the patient. An emergence delirium educational program has high potential to benefit perioperative nurses in the management of emergence delirium and to benefit their patients. Because nurses' levels of perioperative experience vary and experience requirements vary significantly among healthcare institutions (e.g., education level, degree, required training and certification, years of experience, and type of nursing experience needed), post-licensure continuing education for nurses practicing

in the perioperative setting may be an efficient way to address emergence delirium knowledge gaps (Dahlberg et al., 2021).

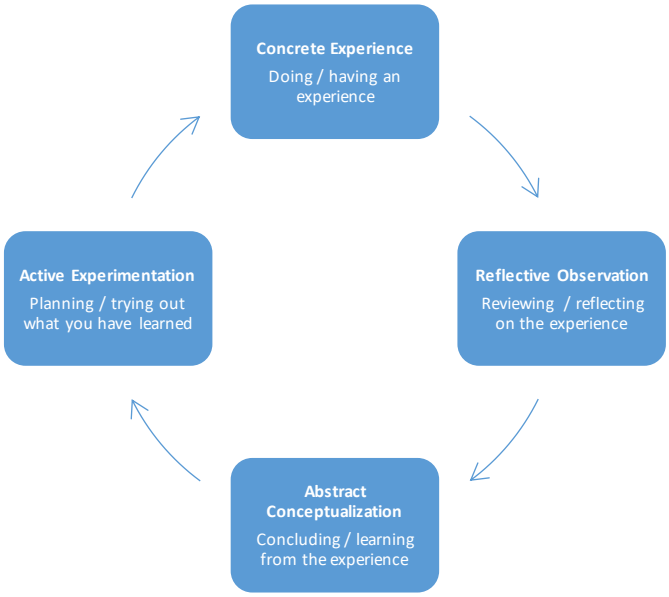
Clinical Question-PICOT

A Population, Intervention, Comparison, and Outcome (PICO) question was developed to identify the best research evidence to address these gaps: Among perioperative nurses (P), how does an education and simulation training program on the management of emergence delirium in patients diagnosed with PTSD (I) affect the nurse's knowledge and confidence in managing emergence delirium in patients diagnosed with PTSD (O)?

CHAPTER TWO: THEORETICAL FRAMEWORK

Kolb's Theory of Experiential Learning is a widely studied and applied framework that explains how individuals learn from experience (Wijnen-Meijer et al., 2022). It emphasizes the cyclical process of learning that involves four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Wijnen-Meijer et al., 2022). Experiential learning theory suggests that an active learning process, with reflection and experimentation, leads to abstract concepts and generalizations, which are then used to test the hypothesis in future situations, resulting in subsequent new concrete experiences (Abulebda et al., 2022). In this project, Kolb's experiential learning theory informed the development of an education intervention with experiential learning via simulation and can explain how perioperative nurses integrate new knowledge and apply new knowledge into practice. A visual depiction of the theory is shown below in Figure 1.

Figure 1: *Graphic Depiction of Kolb's Theory of Experiential Learning (1984)*



In the context of perioperative nursing, concrete experience refers to the direct interaction with patients experiencing emergence delirium. PACU nurses encounter these patients during recovery after surgery and anesthesia administration. Nurses observe the symptoms, behaviors, and challenges associated with emergence delirium, such as confusion, agitation, hallucination, and restlessness. This firsthand experience provides a foundation for learning. To operationalize this construct and provide an opportunity for concrete experience, an emergence delirium simulation was included in the education intervention.

Following the concrete experience, PACU nurses engage in reflective observation. They analyze and reflect upon their experiences with emergence delirium patients. This stage involves observing the consequences of their actions, critically evaluating the effectiveness of their interventions, and considering alternative approaches. Reflective observation helps nurses gain insight into the complexities of managing emergence delirium and identify areas for improvement. For this project, following the simulation, we held a debriefing session for reflection on what happened, what went well, and what could have been done differently.

In the abstract conceptualization stage, perioperative nurses attempt to develop a conceptual understanding of emergence delirium based on their concrete experience and reflective observation. They seek to form theories or models that explain emergence delirium's causes, risk factors, and underlying mechanisms. Nurses may explore relevant research, consult expert resources, and participate in educational programs to enhance their knowledge and conceptual understanding of this condition. Following the education intervention and debriefing, nurses were asked to share concluding reflections and encouraged to continue to make observations about emergence delirium and its management in their practice.

In the final stage, perioperative nurses engage in active experimentation to apply their knowledge and theories in practical settings. They implement new strategies, interventions, and approaches to manage patients with emergence delirium. This stage involves adapting their nursing practice based on their abstract conceptualization, actively seeking feedback from colleagues and supervisors, and continuously refining their skills through trial and error. Active experimentation helps nurses develop expertise in managing emergence delirium and optimizing patient care. This project did not directly measure active experimentation, but participants were asked to reflect on how they might apply what they learned in practice.

When waking from anesthesia, a patient with PTSD can develop emergence delirium, which can quickly escalate to an emergency situation (Lovestrand et al., 2021). Medical providers must have a prompt and shared understanding of the situation. Staff must work together and act expediently to ensure patient and staff safety. Mock simulations or mock codes have been shown to be beneficial when preparing for an emergency by providing learners with experience to draw upon when confronted with the same situation in a real-life scenario (Giorgetti et al., 2022). Simulation allows learners to learn from experience and gain comfort and proficiency with scenarios that are more rarely encountered, and in the case of emergence delirium education, a simulation-based educational intervention provided an opportunity to apply experiential learning theory (Davis & Warrington, 2023). Managing a patient with emergence delirium can be a challenging and unpredictable emergency situation that requires a rapid and competent response for optimal outcomes (Lovestrand et al., 2021). Acting out roles and familiarizing staff with all the involved steps is most helpful, as there is little time to contemplate what to do in an emergency (Giorgetti et al., 2022).

Currently, there are few evidence-based educational interventions on emergence delirium in patients diagnosed with PTSD available to nurses. An intervention that integrates experience, theory, and simulation may be a valuable addition to existing forms of teaching and improves nurses' ability to manage emergence delirium among patients with PTSD, ultimately improving patient outcomes (Wijnen-Meijer et al., 2022). The application of Kolb's Theory of Experiential Learning in the context of the educational intervention of this project in which perioperative nurses learn how to manage patients with emergence delirium, provides a structured framework for the intervention and learning process. By engaging in each stage of the cycle, nurses can

continually build upon their experiences, refine their understanding, and enhance their ability to provide effective care for patients experiencing emergence delirium.

CHAPTER THREE: REVIEW OF LITERATURE

Although numerous studies have evaluated educational interventions on delirium's effect on nurses' knowledge and confidence, none specifically focused on perioperative nurses and emergence delirium together, and most have been conducted outside of the US. There is one publication on an interprofessional staff training program focused on emergence delirium, which found that the program improved participant knowledge and preparedness for the management of emergence delirium (Lovestrand et al., 2021). Perioperative staff were given a pretest followed by didactic and simulation training. After completing the training, the staff were given a post-test. The questionnaire used to assess nurses' knowledge included ten multiple-choice questions. The pre- versus post-test score improved the interprofessional staff's knowledge of the management of emergence delirium from 49.2% to 81.6%. Although this publication is significant as one of the first to directly address emergence delirium education, there were several limitations to the program evaluation, including that no sample size was given and no formal statistical tests were performed to assess knowledge changes (Lovestrand et al., 2021). Additionally, this study did not address improved knowledge and its effect on patient outcomes.

Other studies have also been conducted exploring how educational programs about delirium improve nursing care. A recent quality improvement study aimed to increase intensive care unit (ICU) nurses' knowledge of delirium and validate screening tools to improve delirium assessment (Wirenko et al., 2022). In this study, twenty-three critical care registered nurses participated in a one-hour in-person educational session and had significant increases in pre- to

posttest knowledge with a mean difference of 4.3 (95% CI:4-5.3, p<0.001). This study did not address improved knowledge and its effect on patient outcomes (Wireko et al., 2022).

Delirium educational programs have been found to be beneficial for nurses on an international level. In Jordan, a nursing education program was found to improve nurses' knowledge, practice, attitudes, self-efficacy, and ability to detect delirium (Alhalaiqa et al., 2022). A total of 175 ICU nurses were followed for one year (January 2019- January 2020). Nurses were divided into a control and an intervention group, and the educational program intervention was found to significantly increase nurses' knowledge and practice, positive attitudes, and self-efficacy for the intervention group compared with the control group (p<0.001). Additionally, nurses' ability to detect delirium was increased. This study did not address improved knowledge and its effect on patient outcomes (Alhalaiqa et al., 2023).

A pre-posttest design was used to assess improvements in delirium knowledge among a sample of 50 nurses in Egypt (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022). After an educational program on delirium, significant improvements were observed in nurses' total scores of resilience, knowledge, and perception regarding delirium (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022). Pre-intervention mean scores of resilience increased from 1.34 to 2.38, with a possible range of one to three; p< .000. Pre-intervention mean scores of delirium knowledge increased from 1.24 to 2.58, with a possible range of one to three; p<.000. Pre-intervention delirium perception mean scores increased from 1.34 to 2.62, with a possible range of one to three; p< .000. The study's authors recommended conducting the intervention as a continuous training course to enhance the sustainability of the educational intervention. Like most others, the study did not include the correlation of increased knowledge to patient outcomes (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022).

In Taiwan, a quasi-experimental study conducted with 112 ICU nurses determined that an educational program on the effects of Pain, Agitation, Delirium, Immobility, and Sleep disruption (PADIS) can significantly assist novice nurses in increasing their knowledge, attitudes, and skills in managing patients that develop delirium, and was strongly suggested for clinical nurse practice (Lee et al., 2022). A baseline was measured before the educational intervention, followed by a post-test immediately after the intervention and an additional follow-up one month later. The study found differences between novice and advanced nurses before the intervention (knowledge mean for advanced nurses: 23.11 +/- 5.27 and novice nurses:17.23+/-7.95, $p<0.013$) but no difference in scores following the intervention between novice and advanced nurses (post-intervention (advanced nurse 31.47+/-4.63 and novice nurse 29.15 +/-5.05; $p<0.93$) or one month later (advanced nurse 31.00+/-3.74 and novice nurse 30.57 +/-3.24, $p<0.28$). The authors of the study concluded that educational programs can significantly assist novice nurses and are strongly suggested for clinical practice. This study did not address improved knowledge and its effect on patient outcomes (Lee et al., 2022).

A study was conducted in Saudi Arabia to assess the critical care nurse's knowledge of ICU delirium and the effectiveness of a delirium educational program (Aldawood et al., 2023). A quasi-experimental single group pre-test post-test design was conducted using delirium knowledge assessment questionnaires for 45 nurses. Participants demonstrated increased knowledge scores from 38.1% to 76.2% ($p<0.001$), from pre to post-test, indicating a significant change in nurses' knowledge after conducting the educational program. This study concluded that a simple educational program intervention improved critical care nurses' knowledge of ICU delirium, which can help recognize, assess, and treat delirium. This study did not address improved knowledge's effect on patient outcomes (Aldawood et al., 2023).

In Turkey, a one-group pre-posttest study was conducted consisting of 30 nurses working in four intensive care units of a university hospital (Yıldırım et al., 2022). Nurses received various delirium educational training programs and were evaluated three weeks after the educational intervention. There was a significant increase in nurses' delirium diagnosis, management skills, and care efficacy (Yıldırım et al., 2022). Nurses' pretest score mean increased from 6.17+/-2.29 pre-intervention to 11.17 +/-1.51 post-intervention (p<0.001); the range of scores was not delineated. This study determined that providing delirium information training to intensive care nurses positively affects the care of patients with delirium (Yıldırım et al., 2022).

A descriptive quantitative study was conducted in Singapore with 245 ICU nurses from five intensive care units with the goal of developing an educational program to enhance bedside nurses' knowledge, competency, and compliance in accurately performing delirium screening in intensive care units (Lieow et al., 2019). Test scores improved significantly following the educational intervention (mean +/- SD: 38.73+/-4.85 vs. 48.24 +/- 3.806, (range 0-100%), p<0.001). Competency was assessed before and two months after the program by simulation with a standardized patient, followed by real patients, and all participants passed the competency test two months after the completion of the educational intervention. Despite nurses' improved knowledge and competency, delirium screening documentation was poor three months after the educational intervention. The study concluded that improved knowledge and competency did not improve the compliance of documentation of delirium screening. The authors recommended that refresher courses be completed three months after the initial training program. This study did not address improved knowledge's effect on patient outcomes (Lieow et al., 2019).

Synthesis of the Literature

The majority of these studies were conducted as quality improvement, single group pre-test/post-test design (Aldawood et al., 2023; Lovestrand et al., 2021; Wireko et al., 2022; Yıldırım et al., 2022). One study used a quasi-experimental design with an intervention and control group of nurses (Alhalaiqa et al., 2022). The educational intervention varied across studies, with one educational program lasting an hour (Lovestrand et al., 2021), while others had numerous stages of the educational intervention lasting several weeks to months (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022, Yıldırım et al., 2022). One study followed nurses over the span of one year, while in other studies, post-test knowledge was assessed immediately post-intervention (Alhalaiqa et al., 2022; Lovestrand et al., 2021), three weeks later (Yıldırım et al., 2022), one month later (Lee et al., 2022), or two months later (Lieow et al., 2019). The number of nurses studied varied from 23 (Wireko et al., 2022) to 245 (Lieow et al., 2019). Post-intervention knowledge was assessed mostly through questionnaires; however, one study assessed nurses' knowledge and competency through simulation and real-life patient care (Yıldırım et al., 2022). As a result of this study's evaluation of nurses at bedside, the study conducted by Yıldırım et al., (2022) was able to link improved patient outcomes to knowledge gain.

These various studies representing nurses around the world have shown that educational interventions can positively impact nurses' knowledge, feelings of preparedness, and confidence when dealing with patients experiencing delirium. However, these studies have limitations because they are unique to their institution and may lack generalizability and external validity. Methodological gaps such as small sample size, sampling bias, lack of a control group, and lack of longitudinal follow-up affected studies (Wireko et al., 2022; Yıldırım et al., 2022). Inclusion criteria must also be considered, as the majority of studies were conducted on a single group of

nurses. Only one study had control and intervention groups of participants (Alhalaiqa et al., 2023). Content gaps identified are the narrow focus of some studies of delirium in a specific setting, such as the ICU, and may affect its generalizability to other settings where patients may exhibit delirium (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022; Aldawood et al., 2023; Alhalaiqa et al., 2023; Lee et al., 2022; Lieow et al., 2019; Wireko et al., 2022; Yıldırım et al., 2022). One must also consider testing threat, attrition, and participants' social interactions during assessments, as all outcome measures in studies were self-reported. None of the studies assessed whether knowledge gains improved patient outcomes or used objective measures of application of skills, such as direct observation. Some studies did not conduct statistical analysis (Lovestrand et al., 2021), and some did not delineate which statistical studies were conducted (Wirenko et al., 2022.)

Together, these studies provide evidence that nursing education about delirium, potential causes, risk factors, assessment tools, prevention strategies, and management approaches can increase short-term knowledge. There is a large gap in the literature pertaining to the management of emergence delirium, especially in patients diagnosed with PTSD, and the education of the nurses caring for these patients, as only one study addressed the phenomena of emergence delirium. However, this body of evidence provides a foundation for the development and evaluation of nursing education on emergence delirium because there are similarities in the patient presentations for both disorders (delirium and emergence delirium), the shared clinical situation of patients in an acute care setting, and the necessary nursing actions to manage these disorders.

The studies reviewed demonstrate that increasing nurses' understanding of delirium and enhancing their knowledge base can improve nurses' ability to recognize, assess, and manage

delirium in patients. Studies have indicated that the positive influence of educational interventions is sustainable over time (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022; Aldawood et al., 2023; Alhalaiqa et al., 2023; Lee et al., 2022; Lieow et al., 2019; Wireko et al., 2022; Yıldırım et al., 2022). Nurses who participated in ongoing educational programs exhibited better retention of knowledge and skills related to delirium management. Providing delirium information training to nurses positively affects the care of patients with delirium (Yıldırım et al., 2022). In conclusion, these studies identified the positive implications of delirium education for nurses and support the need for education on emergence delirium for perioperative nurses.

CHAPTER FOUR: METHODS

Design and Setting

This nursing education project was implemented in January 2024 at three hospitals' Post-Anesthesia Care Units (PACUs) in Southern California. The project used a non-randomly selected, single-group pretest/post-test design. The three units were in Southern California: two academic medical centers, one of which was a Level 1 Trauma Center, and a large military medical center. The project was implemented as a quality improvement initiative and, as such, did not require formal Institutional Review Board (IRB) approval, which we confirmed with the local IRB prior to beginning the project.

Sample

The sample was perioperative nurses employed and currently practicing in the PACU and pre-operative surgical area at any of the three study sites. Inclusion criteria were employment at the hospital in the perioperative setting, English-speaking, and consent to participation. There

were no exclusions to nurse participation. Nurses with any level of education were permitted to participate. Nurses were invited to participate in a 60-minute educational intervention (described below) to introduce evidence-based practices when caring for patients diagnosed with Post-Traumatic Stress Disorder (PTSD) with emergence delirium. There were 36 nurses who participated in the training across all three sites and 30 nurses who completed pre/posttest surveys and were included in the final sample.

Procedures

First, participants completed a web-based survey (pretest) that assessed knowledge and confidence measures around emergence delirium. The pretest was administered prior to the education intervention. Nurses then participated in a one-hour education session that included a didactic component and a simulation component. The intervention was offered in three separate sessions, one for each participating PACU. A debriefing session was held after the intervention, and participants repeated the survey as a posttest to assess knowledge and confidence changes. Six weeks after the posttest, participants received a final follow-up survey to assess knowledge and confidence retention over time. Those who completed the six-week follow-up survey received a $10 gift card incentive.

Educational Intervention

The sixty-minute educational intervention had two components: (1) a didactic session on emergence delirium, and (2) a simulation to apply knowledge and skills. The intervention was based on the information presented in the Lovestrand et al. (2021) training exercise and modified for this project to include new evidence-based interventions that have been identified more recently (Taylor & Pileggi, 2021; Taylor et al., 2022). In the 30-minute didactic portion, perioperative nurses learned to identify PTSD patients as an at-risk population for the

development of emergence delirium (McGuire, 2012). Trauma informed care and its guiding principles were discussed (Cannon et al., 2020), as well as the hypothesized changes in the brain's neurocircuitry that lead to PTSD and its link to emergence delirium (McLott et al., 2013). Participants were presented with nonpharmacologic and pharmacologic evidence-based interventions to treat patients with emergence delirium (Lovestrand et al., 2017). Methods of successful communication and collaboration with the multidisciplinary team in the event of emergence delirium were discussed, as well as the formulation of a plan for follow-up care (Lovestrand et al., 2021).

After the didactic presentation, nursing participants were presented with a case scenario and participated in a simulation with a live actor in the PACU as a PTSD patient with emergence delirium. The live actor was the same for all three education sessions and was a nurse, who was also a military veteran with prior combat experience who had seen emergence delirium and PTSD firsthand in the operating room and PACU. The actor received and rehearsed a script with the desired behaviors and responses before enacting the simulation. As the live actor exhibited the signs of emergence delirium, participants took on various roles and interacted with the hypothetical patient using evidence-based practices from the didactic component of the training in real-time. Perioperative nurses were able to identify how emergence delirium might present differently, identify key features, and develop a plan of care, including appropriate communication techniques, de-escalation strategies, and pharmacological management. After the simulation, there was a structured debriefing, during which participants and facilitators reviewed the experience, discussed what worked well, and identified areas for improvement.

Measures

These pretest and posttest surveys were based on an assessment used in a similar project aimed at managing emergence delirium in populations with PTSD; survey items were used and modified with permission from the authors (Lovestrand et al., 2021).

The knowledge assessment contained 10 items that assessed symptoms used to aid in the diagnosis of PTSD, medical reconciliation that would alert to the potential for emergence delirium, identifying a medication that counterintuitively could prolong and exacerbate an episode of emergence delirium, amygdalocentric neurocircuitry, anesthetic medication that has demonstrated positive patient outcomes in treatment, the integration of trauma-informed care, identifying triggers, appropriate interventions employed by the multidisciplinary team, interventions that decrease severity, and actions to utilize to keep the patient safe (see Appendix A). All items were multiple choice, and the knowledge test was scored as an overall percentage and score of correct answers out of 10. The confidence item asked, "How confident do you feel in your ability to keep the patient and staff safe when caring for patients in emergence delirium," and was rated on a 10-point Likert scale ranging from 0 to 10. We also measured participants' demographic characteristics and nursing experiences, including age, gender, race/ethnicity, level of education, years of experience as a perioperative nurse, familiarity with the clinical phenomenon of emergence delirium, and experience caring for patients in emergence delirium. The knowledge assessment and confidence items were repeated in the posttest and six-week follow-up survey. The follow-up survey also included one free-response item for participants to share examples of how they had applied knowledge from the training in practice.

Analysis

SPSS and R were used for statistical analysis. Frequencies and descriptive statistics were used to characterize the sample and examine item-level trends in knowledge content. Paired t-

tests were performed to compare knowledge and confidence scores before and after the intervention and determine the significance of the difference in both measures. Then, a series of simple linear regression models were estimated to determine if nurse characteristics (gender, race/ethnicity, level of education, PACU experience, familiarity with emergence delirium, and past experience with emergence delirium) had a statistical relationship to the difference in knowledge and confidence scores from pretest to posttest. Finally, repeated measure ANOVA (RM-ANOVA) was conducted with knowledge and confidence scores across all three time points (pretest, posttest, 6-week follow-up) to assess for changes over time. RM-ANOVA was conducted only with the subsample of nurses (n=28) who completed the 6-week follow-up survey. Following RM-ANOVA, we conducted post-hoc pairwise tests to identify at which timepoints significant changes occurred. P-values of less than 0.05 were considered statistically significant. As noted above, missing data were excluded from analyses using listwise deletion.

CHAPTER FIVE: RESULTS

The convenience sample consisted of 33 registered nurses working as staff in a post-anesthesia care unit setting. Participants were predominantly female (81.8%, N=27), with the largest group being between the ages of 35–44 years (27.3%, N=9). Participants predominately self-identified as White/Caucasian 54.5%, (N=18), Asian 21.2%, (N=7), Black/African American 9.1%, (N=3), and 15.2% (N=5) identified as Hawaiian Native/Pacific Islander or Other Ethnicity/Nationality. The majority of participants had a bachelor's degree (57.6%, N=19), and years of clinical practice ranged from 0–2 years (39.4%, N=13), 3-10 years (30.4%, N=10) and over 10 years (30.3%, N=10). Additional participant characteristics are shown in Table 1.

Before the educational intervention, nurses had a mean pretest score of 5.6 on a 10-point scale assessing their familiarity with emergence delirium. The frequency of nurse experiences caring for patients in emergence delirium was similar across response categories of no experience ('No' = 28.1%, N=9), some experience (' a few times' = 34.4%, N=11), and extensive experience ('many times' = 37.5%, N=12).

Figure 2 shows the mean scores for each knowledge test item at the pre, post and 6-week timepoints. Significant differences between pre-and post-intervention were found for six items: medical reconciliation that would alert for the potential for emergence delirium (mean difference= 0.7, p=<.001), recognizing a medication that counterintuitively exacerbates emergence delirium (mean difference= 0.6, p=<.001), amygdalocentric neurocircuitry and interventions, (mean difference=0.3, p=.001), identifying an anesthetic medication that is associated with positive outcomes for the treatment of Emergence Delirium (mean difference=0.1, p=.022), trauma-informed care (mean difference= 0.2, p= .006) and how anesthesia, psychology, and nursing could potentially collaborate to improve outcomes (mean difference= 0.3, p=<.001).

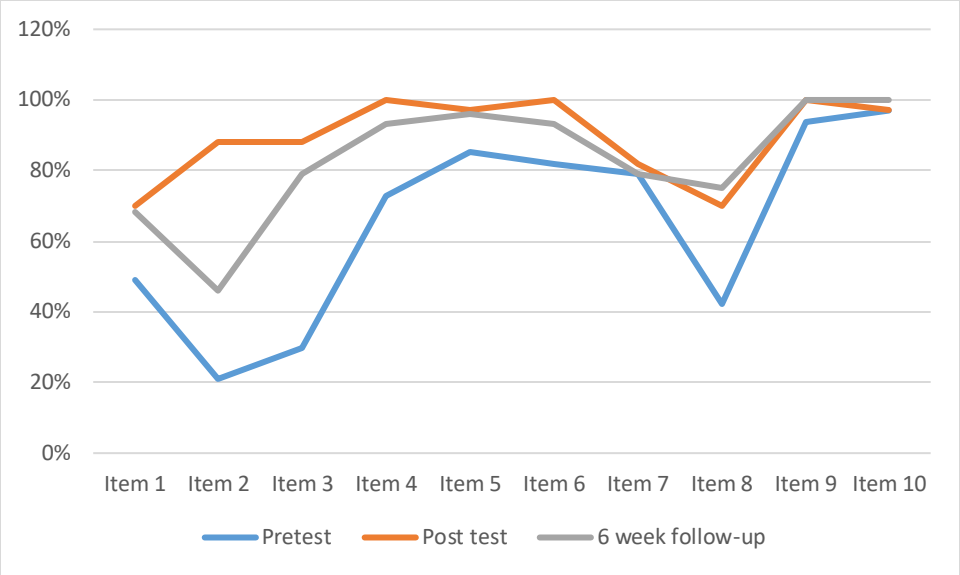
The total mean summed number of correct answers on the pretest knowledge assessment was 6.4 out of 10 (SD=1.6), and after the intervention, it was 8.9 (SD=1.4) out of 10 on the post-test. This 2.5-point knowledge increase from pre- to post-test was statistically significant (p<.001), as shown in Table 2. Additionally, there was a statistically significant increase in confidence levels in caring for patients with PTSD-related emergence delirium from 6.1 to 8.0 on a 10-point scale (p<.001).

In assessing nurse characteristics associated with the greatest knowledge and confidence gains (Tables 3 and 4), we found that having 6–10 years of prior PACU experience was

associated with 2.3 additional knowledge point gains compared with nurses with 3–5 years of PACU experience (SE=1.0, p=0.04). We observed that having prior experience with emergence delirium was associated with lower confidence gains (β= -1.1, SE=1.4, p=0.03) relative to nurses without prior experience.

Finally, in assessing retention of knowledge and confidence at the six-week post-intervention with the subsample of nurses who completed the longitudinal follow-up survey (n=25), we found that confidence levels decreased slightly from 7.7 points in the post-test to 7.4 (SD=.4) six-week follow up (Figure 2a). Knowledge scores dropped slightly over this time period from a posttest mean of 8.7 to a six-week follow-up mean of 8.3 (SD=.3) (Figure 2b). These differences were statistically significant (p=<.001). In a post-hoc analysis of pairwise differences between timepoints, we found that when comparing pre-intervention scores with six-week scores, statistically significant gains were only seen for two items on the questionnaire, which were medical reconciliation that would alert for the potential for emergence delirium (mean difference= 0.5, p=<.001) and how anesthesia, psychology, and nursing could potentially collaborate to improve outcomes (mean difference= 0.4, p=<.001). However, changes were insignificant when comparing post-intervention scores to 6-week scores, indicating that post-intervention knowledge loss was insignificant and learning was generally retained over time except for one item on the questionnaire.

Figure 2: *Item-Level Trends in Correct Responses for Pretest, Posttest, and 6 week Follow-up*



Legend. Item level trends in percentage of correct responses on a 10-question knowledge test taken by 25 perioperative care unit Registered Nurses (RNs) who participated in an educational program on emergence delirium among patients with posttraumatic stress disorder in January 2024. The knowledge test was administered three times: baseline (pretest), post-intervention (posttest), and six weeks after the intervention to assess knowledge retained. ED= emergence delirium.

Figure 3: *Average Confidence Scores over Time*

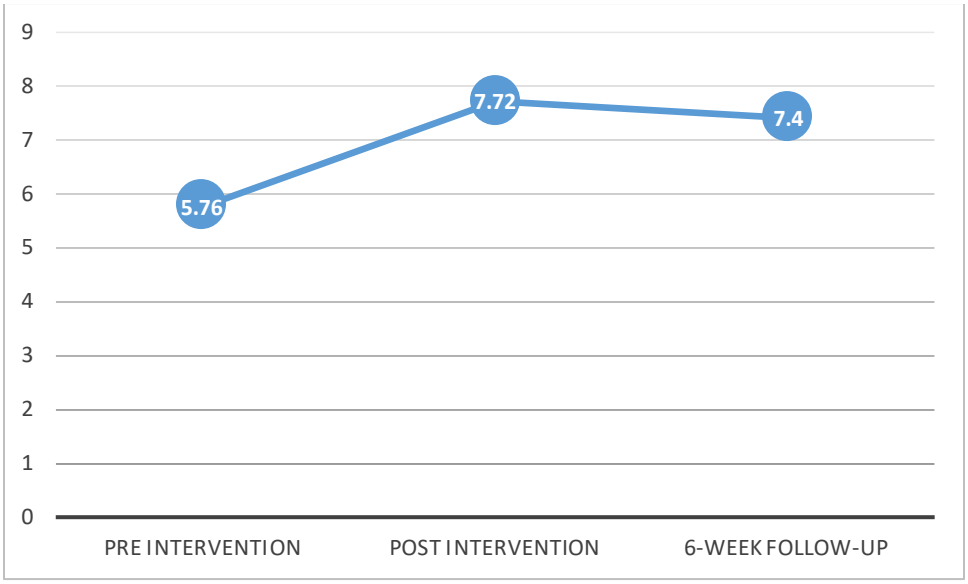
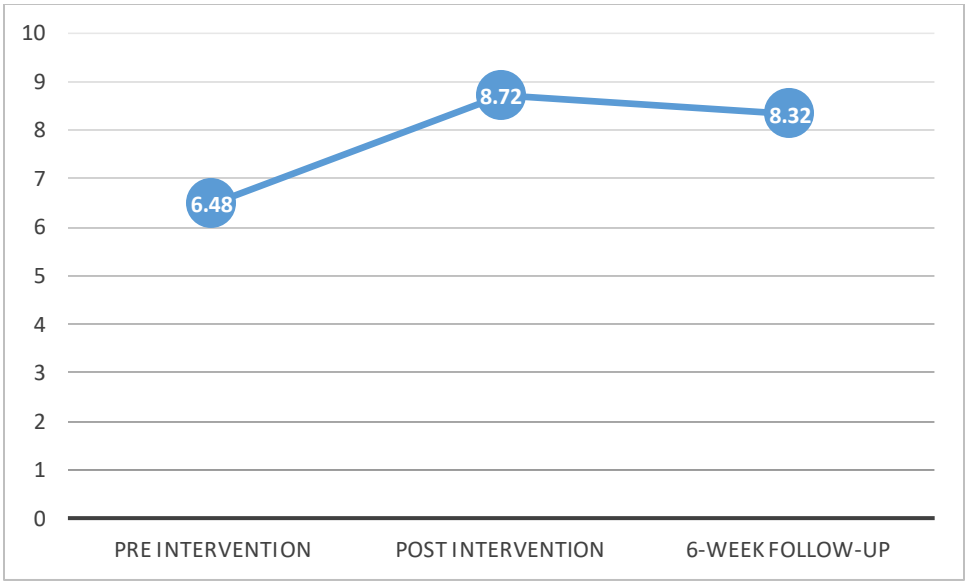


Figure 4: *Average Knowledge Scores over Time*



Legend. Average knowledge and confidence scores of 25 perioperative care unit Registered Nurses (RNs) over time who participated in an educational program on emergence delirium among patients with posttraumatic stress disorder in January 2024. ED= emergence delirium

Table 1: *Sample Characteristics*

	N	%
Site		
Military Medical Center	12	36.4
Academic Medical Center	10	30.3
Level 1 Trauma Academic Medical Center	11	33.3
Age category		
18–24 years	5	15.2
25–34 years	8	24.2
35–44 years	9	27.3
45–54 years	7	21.2
>55 years	4	12.1
Gender		
Male	4	12.1
Female	27	81.8
Non-binary & other	2	6.1
Race		
Asian	7	21.2
Black or African American	3	9.1
Native American & other races	5	15.2
White	18	54.5
Level of education		
Associates degree	3	9.1
Bachelors degree	19	57.6
Masters degree	6	18.2
Other	5	15.2
PACU nursing experience		
0–2 years	13	39.4
3–5 years	5	15.2
6–10 years	5	15.2
>10 years	10	30.3
Cared for patients with ED		
No	9	28.1
Yes, a few times	11	34.4
Yes, many times	12	37.5

Notes. Demographic and experience characteristics of 33 perioperative care unit Registered Nurses (RNs) who participated in an educational program on emergence delirium among patients with posttraumatic stress disorder in January 2024. ED= emergence delirium.

Table 2: *Average Pretest and Posttest Confidence and Knowledge Scores*

	Pretest		**Posttest**		**p-value**
	M	SD	M	SD	
Confidence in managing ED	6.07	3.194	7.97	1.790	<.001
Knowledge score	6.40	1.610	8.93	1.388	<.001

Notes. Pre and post-intervention knowledge and confidence scores of 30 perioperative care unit Registered Nurses (RNs) who participated in an educational program on emergence delirium among patients with posttraumatic stress disorder in January 2024. ED= emergence delirium.

Table 3: *Association between Nurse Characteristics and Knowledge Difference*

	β	SE	p-value	R^2
Gender (reference: Male)				0.04
Female	0.25	0.81	0.76	
Non-binary & other	1.75	1.68	0.31	
Race (reference: White)				0.05
Asian	0.45	0.76	0.59	
Black or African American	0.98	0.94	0.31	
Native American & other races	0.05	0.76	0.95	
Level of education (reference: Bachelors degree)				0.09
Associates degree	-1.22	0.92	0.20	
Masters degree	-0.88	0.74	0.25	
Other	-0.48	0.74	0.52	
Years as PACU RN (reference: 3-5 years)	2.33	0.81		0.17
0–2 years	1.05	0.90	0.25	
6–10 years	2.27	1.02	0.04	
>10 years	1.22	0.94	0.20	
Familiarity with ED score (0-10)				
Cared for patient with ED (reference: No)				0.04
Yes, a few times	0.11	0.70	0.87	
Yes, many times	0.65	0.71	0.37	

Notes. Association between nurse characteristics and knowledge difference scores of 30 perioperative care unit Registered Nurses (RNs) who participated in an educational program on emergence delirium among patients with posttraumatic stress disorder in January 2024. ED= emergence delirium.

Table 4: *Association between Nurse Characteristics and Confidence Difference*

	β	SE	p-value	R^2
Gender (reference: Male)				0.32
Female	1.17	1.33	0.32	
Non-binary & other	-7.25	2.74	0.01	
Race (reference: White)	2.47	0.70		0.06
Asian	-1.07	1.47	0.47	
Black or African American	-1.14	1.81	0.53	
Native American & other races	-1.67	1.47	0.27	
Level of education (reference: Bachelors degree)	2.06	0.69		0.08
Associates degree	1.61	1.79	0.38	
Masters degree	-0.46	1.45	0.75	
Other	-1.46	1.45	0.32	
Years as PACU RN (reference: 3-5 years)	1.33	1.65		0.08
0–2 years	0.97	1.83	0.60	
6–10 years	1.67	2.09	0.43	
>10 years	-0.44	1.91	0.82	
Familiarity with ED score (0-10)				
Cared for patients with ED (reference: No)				0.03
Yes, a few times	-0.32	1.34	0.81	
Yes, many times	-1.10	1.37	0.43	

Notes. Association between nurse characteristics and confidence difference scores of 30 perioperative care unit Registered Nurses (RNs) who participated in an educational program on emergence delirium among patients with posttraumatic stress disorder in January 2024. ED= emergence delirium.

Table 5: *Average Pretest, Posttest, and 6-Week Follow-up Changes*

	Pretest mean	**Posttest mean**	**6-week follow up mean**	**F**	**P**
Confidence in managing ED	5.76	7.72	7.40	7.99	.003
Knowledge score [a]	6.48	8.72	8.32	53.6	<.001

Notes. Repeated measures ANOVA (RM-ANOVA) comparing 1) confidence and 2) knowledge score changes over three timepoints. The sample was 28 perioperative care unit Registered Nurses (RNs) who completed a longitudinal (six-week) follow survey after an educational program on emergence delirium among patients with posttraumatic stress disorder, from a total sample of 33 RNs. [a] Mauchly's Test of Sphericity was conducted to verify assumptions of RM-ANOVA. Sphericity assumptions were met for the confidence test, but not the knowledge test. A Greenhouse–Geisser correction was applied for the knowledge RM-ANOVA.

CHAPTER SIX: DISCUSSION

This educational quality improvement project was implemented to disseminate evidence-based practices for caring for patients diagnosed with PTSD who experience emergence delirium. Findings indicated that perioperative nurses' knowledge and confidence significantly improved after the educational intervention and that these gains were sustained at a six-week follow-up.

There are few educational resources to support nurses when caring for patients with emergence delirium, and almost no evidence evaluating educational interventions or trainings on this topic. Prior studies of delirium generally have found similar results and demonstrated that training for nurses can increase their knowledge and confidence when caring for patients experiencing delirium (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022; Aldawood et al., 2023; Alhalaiqa et al., 2023; Lee et al., 2022; Lieow et al., 2019; Wireko et al., 2022; Yıldırım et al., 2022). Unlike the study conducted by Lee et al. (2022), no difference was found between pre-intervention knowledge scores between novice and experienced nurses, supporting the need for training for all nurses regardless of years of practice or degrees held. Our work aligns with these findings, as we demonstrated that a one-hour education intervention on emergence delirium can improve nurse participants' knowledge and confidence. The knowledge and confidence gain we observed could be due to the information presented being new to nurses and highly applicable to their daily practice. Additionally, the multiple components of the educational session, including the simulation and debriefing, may have helped solidify new information as nurses mentally incorporated interventions into their plan of practice.

This project, like others, has indicated that the positive knowledge gains of educational interventions can be sustainable over time (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022; Aldawood et al., 2023; Alhalaiqa et al., 2023; Lee et al., 2022; Lieow et al., 2019; Wireko et al., 2022; Yıldırım et al., 2022). We observed some loss of knowledge, and confidence was noted over the six-week time span, specifically in the areas of medical reconciliation, amygdalocentric circuitry, and trauma-informed care. However, we also observed that knowledge was retained for the majority of knowledge topics. Nurses who participate in ongoing educational programs exhibit better retention of knowledge and skills related to delirium management (Yıldırım et al., 2022). Studies recommended a continuous or ongoing training program to support nurses (Abo El ftouh Mohamed & Ahmed Wahba El-Salamony, 2022, Wireko et al., 2022), and as such, there might be a need for regular training or refresher education on emergence delirium to bolster knowledge and promote retention of evidence-based skills.

Prior studies on delirium education have shown that increased knowledge and confidence have been linked to improved patient outcomes (Yıldırım et al., 2022). As a quality improvement project testing a new educational program, we did not examine associations between knowledge or confidence gains and improved patient outcomes. However, this may be a fruitful direction for future research using larger samples and assessing knowledge changes over a longer time period.

Evidence-based practices have been developed and have been shown to be effective in the treatment and care of patients diagnosed with PTSD who experience emergence delirium. However, this information has not been widely disseminated to healthcare providers caring for this patient population. Emergence delirium can easily be mismanaged, which can increase patients' risk for adverse sequelae and potential for staff endangerment. Because there are no

standardized guidelines for clinical management of emergence delirium, it is important for future research and quality improvement projects to educate providers about this topic and for studies to be conducted to generate practice guidelines for emergence delirium.

Limitations

There are several limitations to this project. This quality improvement project is based on an emerging area of scholarship with limited prior research. Only one study presented similar information to a group of healthcare providers and evaluated the participants' knowledge gain (Lovestrand et al., 2021). Additionally, existing protocols or guidelines have not been standardized for managing patients with emergence delirium with a concurrent history of PTSD.

The project was implemented in three hospitals in Southern California, and thus, findings may not be generalizable to other settings. There was a relatively small number of nurse participants with limited time for follow-up, and we may have been under-powered to detect additional changes. To optimize knowledge and confidence gains and refine the intervention, a larger project within different communities and hospitals could provide valuable information. Because all study measures were self-reported, there is a potential risk for reporting bias (Alhalaiqa et al., 2023). Although we relied on an existing knowledge assessment, it has only been used in one other study, and replication projects are needed to confirm comprehensive knowledge assessment (Alhalaiqa et al., 2023; Lee et al., 2022; Yıldırım et al., 2022). There are also project strengths. This project used military and non-military hospitals, and although it might be assumed that nurses at a military institution may be more familiar with the emergence delirium and evidence-based interventions, this was not our finding. Three time points were used to assess knowledge retention, thus confirming that the intervention did improve both knowledge and confidence over time. Additionally, the inclusion of simulation and debriefing

helps solidify knowledge by providing hands-on, experiential learning opportunities and structured reflection.

CONCLUSION

Emergence Delirium in PTSD patients poses a significant danger to patients and the staff caring for them. However, by implementing comprehensive staff education on proper techniques, for patients with a history of PTSD who are experiencing Emergence Delirium, the risk associated with this condition can be mitigated. Educated staff can employ strategies such as creating a calm environment, using clear communication, employing non-pharmacological interventions, and administering appropriate medications when necessary. Such education-driven interventions have the potential to enhance patient safety, improve outcomes, and ensure the well-being of PTSD patients during the vulnerable post-anesthetic period.

APPENDICES

Appendix A- Knowledge Assessment and Confidence Questions

Q1- Which symptoms are used to aid in the diagnosis of Post-Traumatic Stress Disorder?

Intrusion, avoidance, negative alterations in cognition and mood, marked alterations in arousal and reactivity

Intrusion, avoidance, positive alterations in cognition and mood, marked alterations in arousal and reactivity

Intrusion, avoidance, negative alterations in cognition and mood, no alterations in arousal and reactivity

Fear, avoidance, positive alterations in cognition and mood, marked alterations in arousal and reactivity

Q2-Which four medications noted on a medication reconciliation would alert the pre-operative nurse to the potential for Emergence Delirium?

Venlafaxine, sertraline, gabapentin, fluoxetine

Lithium, sertraline, venlafaxine, diphenhydramine

Methimazole, levetiracetam, sertraline, hydroxyzine

Prazosin, sertraline, hydroxyzine, venlafaxine

Q3-Counterintuitively, which medication may prolong or exacerbate an episode of Emergence Delirium?

midazolam

clonidine

ketamine

flumazenil

Q4-The PACU nurse understands that PTSD and anesthesia both affect the amygdalocentric neurocircuitry (AN) of the brain. Which interventions would directly promote positive patient outcomes in relation to the AN in PTSD and anesthesia?

Pre-operative benzodiazepine and intraoperative use of potent inhalation anesthetic agents

Quiet environment, soft voices, tactile stimuli only to lower extremities

Exclusion of family and social support throughout the perianesthesia course

Pre-operative EEG screening and use of post-operative benzodiazepine

Q5- Which anesthetic medication has demonstrated positive patient outcomes for the treatment of Emergence Delirium?

Dexamedetomidine (Precedex)

Fentanyl

Midazolam

Succinylcholine

Q6- The PACU nurse can best integrate the Trauma Informed Approach into their care by:

Focus on getting the patient discharged

Avoiding potentially re-traumatizing behavior

Disregarding the patient's autonomy

Focusing on the patient's physical needs

Q7- Prompt identification of Emergence Delirium related to PTSD includes elimination of which of the following possible triggers:

Inadequate analgesia

Short duration of surgery

Volume overload

History of smoking

Q8- Which of the following sets of interventions for Emergence Delirium in the patient who has a diagnosis of PTSD represents the three disciplines in this scenario (anesthesia, psych, and nursing)?

Utilizing alpha 2 adrenergic agonists(Precedex), validating the Emergence Delirium event, providing a low-stimulation environment

Reviewing the medication reconciliation, providing a quiet environment, including family support

Reviewing the medication reconciliation, administering alpha 2 adrenergic agonists (Precedex) preoperatively, administering b enzodiazepines

Validating the Emergence Delirium experience, employing cognitive behavioral therapy, and consulting PTSD specialists.

Q9- Which interventions have been shown to decrease the severity of Emergence Delirium:

Providing a quiet PACU environment

Only one person talking to the patient in a soft, calm voice, continuing to reorient the patient

The administration of dexmedetomidine (Precedex)

Minimizes tactile stimulation of the patient

Q10- If the patient cannot be kept safe in an Emergence Delirium episode the PACU nurse should:

Use the minimal amount of bodily force to keep the patient safe

Call for Anesthesia help

Remain calm while continuing to talk to the patient and reorient

All of the above

Q11- How confident do you feel in your ability to keep the patient and staff safe when caring for patients in Emergence Delirium?
0 = not at all confident
10 = completely confident

TABLE OF EVIDENCE

CITATION	**PURPOSE**	**SAMPLE/SETTING**	**METHODS (Design, Interventions, Measures)**	**RESULTS**	**DISCUSSION, INTERPRETATION, LIMITATIONS**
Abo El ftouh Mohamed, S., & Ahmed Wahba El-Salamony, A. (2022). Enhancing nurses' resilience, knowledge, and perception regarding intensive care unit psychosis. *International Egyptian Journal of Nursing Sciences and Research, 3*(1), 635–650.	Enhance ICU nurses' resilience knowledge and perception regarding delirium	Egypt- ICU in Kafrelsheikh general hospital Sample:50 ICU nurses	Quasi experimental correlational research design Educational Intervention 3 tools used to measure: Tool 1: Nurses' perception questionnaire regarding delirium Tool 2: Nursing knowledge questionnaire regarding delirium and its risk factors Tool 3: The Connor-Davidson Resilience Scale	Statistically significant results: paired t test used Pre-intervention mean scores of resilience went from 1.3400 to 2.3800 with a p-value of .000. Pre-intervention mean scores of delirium knowledge increased from 1.2400 to 2.5800 with a p-value of .000. Pre-intervention delirium perception mean scores increased from 1.3400 to 2.6200 with a p-value of .000.	Included demographic info Recommendations: interventional program should be a continuous training

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Aldawood, Z., Alameri, R., Elghoneimy, Y., Swyan, A., Almulla, H., Hammad, S., Saleh, N., & Alameri, S. (2023). Impact of educational program on critical care nurses' knowledge of icu delirium: A quasi-experimental study. *Medical Archives*, *77*(1), 56.	Aim: to assess the critical care nurses' knowledge of ICU delirium and the effectiveness of an educational program about the recognition and assessment of ICU delirium on critical care nurses' knowledge	Saudi Arabia 57 ICU nurses	Quasi-experimental single group pre-test post-test design Using delirium knowledge assessment questionnaire Measure of percentage of correct answers - pre to post test	The result showed a significant change in nurses' knowledge pre to post test and post intervention Median pre-post test score 38.1 to 76.2, P<0.001 using the Mann Whitney U test (SPSS) to analyze pre vs post test	Included demographic data of nurses Has pre/posttest questionnaire included-along with score from each question Limitations- nurses under stress d/t COVID

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Alhalaiqa, F., Masa'Deh, R., Al Omari, O., Shawashreh, A., Khalifeh, A., & Gray, R. (2023). The impact of an educational programme on jordanian intensive care nurses' knowledge, attitudes and practice regarding delirium and their level of self efficacy: a quasi-experimental design. *Iranian Journal of Nursing and Midwifery Research, 28*(3), 312–319	Determine the impact of a nursing educational program on Jordanian nurses' knowledge, practice, attitudes, self-efficacy,and ability to detect delirium among ICU patients	160 ICU nurses 6 hospitals in Jordan	Nonequivalent quasi-experimental design from Jan 2019-2020 Intervention and Control groups Data obtained through a questionnaire	The educational program intervention (n=81) significantly increased nurses' knowledge and practice, positive attitudes, and self-efficacy compared with the control group (n=79, $p<0.001$). Additionally, their ability to detect delirium was increased. Paired t-test used	Convenience sampling-not randomized

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Lieow, J. L. M., Chen, F. S. M., Song, G., Tang, P. S., Kowitlawakul, Y., & Mukhopadhyay, A. (2019). Effectiveness of an advanced practice nurse-led delirium education and training programme. *International Nursing Review*, *66*(4), 506–513. https://doi.org/10.1111/inr.12519	To develop an educational and training program to enhance bedside nurses' knowledge, competency, and compliance in accurately performing delirium screening	N=245 Five ICUs in Singapore	Descriptive quantitative study with pretest-post-test design Multiple choice questionnaire Competency assessed through simulation followed by real patients at the bedside Post test 2 months after intervention	Improved knowledge and competency but not compliance with screening documentation using the paired t-test (SPSS) Test scores improved significantly following the educational intervention (mean +/- SD: 38.73+/- 4.85 vs. 48.24 +/- 3.806, $p<0.001$).	Documentation screening out of realm of this project

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Lee, S.-Y., Liu, C.-Y., & Wu, T.-Y. (2022). The effects of pain, agitation, delirium, immobility, and sleep disruption education on novice nurses in adult intensive care units. *Healthcare*, *10*(8), 1538. https://doi.org/10.3390/healthcare10081538	Bridge the gap by evaluating the effects of PADIS education programs on the knowledge, attitudes, and skills of these nurses, and compare the difference between novice and advanced nurses after receiving the PADIS educational program	Teaching hospital in Taipei N=112 ICU nurses	Quasi-experimental study Intervention: PADIS program Assessment through questionnaire post intervention and then again at one month after	Increase in knowledge for novice nurses Repeated ANOVA SPSS differences between novice and advanced nurses before the intervention (knowledge mean for advanced nurses: mean +/- SD (23.11 +/- 5.27) and novice nurses (17.23+/- 7.95)). However, no difference in scores was recorded following the intervention between novice and advanced nurses	Novice vs advanced nurse emphasis

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Lovestrand, D., Beaumont, C.D., Calder, M.S., Schmidt, M., Calaro, R. (2021). Simulation training exercise to improve outcomes of emergence delirium in patients with posttraumatic stress disorder. *AANA Journal*, 89(3), 187-193.	Development of a simulation exercise to unify peri anesthesia team's interventions for patients who have PTSD exhibiting emergence delirium	Sample: Interdisciplinary including OR and PACU nurses, surgeons, and anesthesia providers- simulation training occurred over one day (one hour) – each member of the team on duty completes the exercise - Exclusion: unclear- anyone that was not on duty that day - Sample number and size: Not given Setting: 3 PACUs – military hospitals	Design/ Procedure/ Intervention: An interdisciplinary staff comprised of surgeons, OR and PACU nurses, and anesthesia providers took a pretest before receiving written educational information and participating in three simulations in the treatment of the PTSD patient experiencing emergence delirium. Post-test was then given. Measurement- Pretest vs. Post Test scores, Likert scale	StatisticalAnalysis **:**NONE Results Pretest 49.2% vs Posttest 81.6%	Discussion/ Interpretation: Overall comments from those that participated in the simulations validated the efficacy of the training. Comments were positive and stated how the information learned would change personal practice. A Likert scale was used to evaluate the different aspects of the program, and all received a high level of 4. Limitations: no sample number/ no statistical analysis

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Wireko, F., Gharbin, J., Joseph, R., Laiyemo, A., & Mehari, A. (2022). Improving icu nurses' knowledge of delirium through a quality improvement initiative in an inner-city hospital. *Chest, 162*(4), A1501–A1502. https://doi.org/10.1016/j.chest.2022.08.1265	To increase ICU nurses' knowledge of delirium and validated screening tools to improve delirium assessment	Howard University Hospital Washington DC N=23 ICU nurses	Quality improvement quasi experimental pre and post-test study design Intervention: One hour in person education session Measure 10 Questions pre and post test	Pre to Post test score increased 2.9 to 7.2 post intervention (95%CI:4-5.3, p<0.001) STATA program used for statistical analysis - no description of what statistical tests were completed	Ongoing delirium education should be incorporated into clinical practice to improve healthcare providers' knowledge and assessment of delirium and improve patient outcomes explanation of statistical analysis would have been helpful

CITATION	PURPOSE	SAMPLE/SETTING	METHODS (Design, Interventions, Measures)	RESULTS	DISCUSSION, INTERPRETATION, LIMITATIONS
Yıldırım, F., Türkleş, S., & Altundal Duru, H. (2022). The effect of delirium information training given to intensive care nurses on patient care: Quasi-experimental study. *PeerJ*, *10*, e13143. https://doi.org/10.7717/peerj.13143	Examine the effects of delirium information training on patient care by intensive care nurses	N= 30 ICU nurses 4 ICUs University Hospital in Turkey	One group pretest-posttest quasi experimental design Intervention training booklet 2 sessions 40 min each Measure pre to post test scores	Nurses' pretest score mean went from 6.17+/-2.29 pre-intervention to 11.17 +/-1.51 post-intervention, with a $p<0.001$. The Wilcoxon Signed Ranks test was used to compare the pre and post-test point averages. Linked patient outcomes to increased knowledge	One group – no randomization/ control 6 stages of assessment

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