PEDIATRIC AIRWAY MANAGEMENT TO IMPROVE COMPETENCE AND SELF-EFFICACY IN PACU NURSES

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Dedication and Acknowledgments

I would like to dedicate this work to the ones who have truly supported me in every sense, my family, friends, and partner. I hope I am there for you like you were for me in my times of need.

To my parents who put in the work before me, so I could have the same and even greater opportunities. Thank you for your love, guidance, and unwavering support even when I made it difficult.

To my sisters, Jennifer and Rachael, and friends that answered all the late-night, teary-eyed phone calls, put up with the anger, sadness, depression, and distance – you have carried me through this journey and helped me to remember who I am outside of being a nurse and doctoral student.

To the man I pushed away on countless occasions, and still financed the $144.00 of Chinese food it took, to get this paper done. We, in fact, did this work and drastically changed our lives to be together. I hope to spend the rest of our lives making up for the three years we spent apart.

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Abstract

Background: Caring for pediatric patients during the perioperative period poses unique challenges. Pediatric patients require specialized care, particularly in airway management, to prevent perioperative respiratory complications and adverse events. Focused expertise through targeted educational experiences in pediatric airway management is crucial in mitigating these risks and improving patient care. Many Post-Anesthesia Care Unit (PACU) Registered Nurses (RNs) lack the exposure needed caring for critically ill pediatric patients to build competence and self-efficacy in managing this special population; however, they are crucial as first responders in recognizing and managing pediatric airway-related issues to ensure positive patient outcomes.

Purpose: This Doctor of Nursing Practice (DNP) project aimed to alleviate stress and enhance competence and self-efficacy in managing pediatric airways in the PACU setting. Targeted, low-fidelity, deliberate, hands-on practice and educational presentation were used to improve PACU RNs' perceived competence and self-efficacy in pediatric airway management. Improved competence and self-efficacy may improve the care experience for all involved, and reduce the risk of perioperative pediatric respiratory complications and adverse events.

Methods: A pre-test was completed via Qualtrics to collect demographic information and assess participant competence and self-efficacy prior to a simulation enhanced educational intervention. The PACU setting was used to conduct the intervention with the nurse participants (n=28). The intervention included a one hour PowerPoint presentation and a two hour hands-on mannequin simulation. Following the educational intervention and a three week wash-out period, a posttest was administered via Qualtrics to assess for improvement in perceived competence and self-efficacy. A paired t-test was used to evaluate participant perceived competence and self-efficacy pre-intervention versus post-intervention.

Results: The data demonstrated a statistically significant ($p < 0.5$) increase in both perceived competence and self-efficacy regarding pediatric airway management. The perceived competence scores increased by 20% with a pretest mean of 4.0 and posttest mean of 4.8 on a 5-point Likert scale. The perceived self-efficacy scores increased by 26% with a pretest mean of 3.8 and posttest mean 4.8 on a 5-point Likert scale.

Conclusion and Recommendations: Low-fidelity simulation coupled with didactic education has the potential to increase safety, improve clinical judgement, and is useful for teaching clinical, as well as non-technical skills. The use of a simulation enhanced educational intervention on pediatric airway management for PACU RNs has been shown to improve perceived competence and self-efficacy. Education and simulation should be incorporated into annual training and new employee orientation in the post anesthesia recovery unit.

Key Words: "pediatric", "airway management", "nursing", "education", "low-fidelity", "simulation", "deliberate practice", "post anesthesia care unit", "PACU", "perceived competence", "self-efficacy", "respiratory adverse event", and "respiratory complication"

Background and Significance

Caring for pediatric patients can be a source of stress and anxiety for many providers, stemming from various factors specific to the pediatric patient population.. Pediatric patients are inherently vulnerable with multifaceted conditions, unique anatomy and physiology, varying emotional and communication needs, and distinct quality, safety, legal, professional, and ethical implications. These factors have dynamic relationships that influence pediatric behavior and outcomes, rendering them an unpredictable and high-risk population. Fear in caring for pediatric patients is not unfounded, as they pose unique challenges in providing appropriate and responsible care to ensure well-being for all.

Anatomy and Physiology Differences

Pediatric patients are delicate, inherently more vulnerable, and anatomically and physiologically different from the average adult. Many of the pediatric differences in anatomy and physiology make them a high-risk population (Egbuta & Mason; 2020; Mamaril, 2020; American Academy of Pediatrics, 2015). Significant differences include narrower airways with larger tongues and heads, increasing the risk for airway obstruction, and developing organs, changing responses to medications and therapy (Mamaril, 2020; American Academy of Pediatrics, 2015). Furthermore, pediatric patients have limited anatomical and physiological reserves, meaning fewer mechanisms to compensate for disturbances (Mamaril, 2020; American Academy of Pediatrics, 2015). Thus, pediatric patients are more prone to significant decompensation when supply or demand is compromised (Egbuta & Mason, 2020; Mamaril, 2020; American Academy of Pediatrics, 2015). Failure to consider these unique pediatric anatomical and physiological differences can lead to mismanagement of conditions and devastating sequelae for the child, family, provider, and healthcare organization. Witnessing the suffering, distress, pain, fear, and potentially adverse outcomes of sick children, and their loved ones, can be emotionally taxing and significantly impact the stress experienced for all. Therefore, education in the unique needs of pediatric airways and the prevention of perioperative complications for providers caring for this special population is paramount.

Pediatric patients have a higher risk of morbidity, mortality, and significant adverse events during the perioperative period than adults (Patel et al., 2022; Egbuta & Mason, 2020; Khoso et al., 2021). In pediatric patients, unrecognized hypoxia and poor ventilation can occur within seconds, leading to sudden bradycardia and cardiac arrest (Patel et al., 2022; Christensen et al., 2017; Habre et al., 2017; Bhananker et al., 2007). Children, especially infants and young children, have underdeveloped physiologic and immune systems, making them more susceptible to illness, complications, and adverse events (Egbuta & Mason, 2020; Mamaril, 2022; American Academy of Pediatrics, 2015). They also have smaller body sizes and different proportions affecting various aspects of their anatomy (Egbuta & Mason, 2020; Mamaril, 2020; Christensen et al., 2017; American Academy of Pediatrics, 2015). Their larger tongue, larger head, and smaller airway diameter make them more susceptible to airway obstruction (Egbuta & Mason, 2020; Mamaril, 2020; Christensen et al., 2017; American Academy of Pediatrics, 2015). In addition to their anatomical airway differences, pediatric patients have smaller lung capacities (American Academy of Pediatrics, 2015; Bhananker et al, 2007). This combination makes them more vulnerable to rapid deterioration from respiratory compromise (Patel et al., 2022; Egbuta & Mason, 2020; American Academy of Pediatrics, 2015; Bhananker et al., 2007).

In otherwise healthy pediatric patients, respiratory compromise is the leading cause of cardiac arrest and mortality during the perioperative period (Patel et al., 2022; Muhanuzi et al., 2019; Bester et al., 2018). The potential for rapid deterioration in pediatric patients requires vigilant monitoring and prompt, effective decision-making, contributing to heightened anxiety for PACU RNs. The most common and severe complications in pediatric anesthesia are related to airway management and the respiratory system (Egbuta & Mason, 2020; Khoso et al., 2021; Mir ghassemi et al., 2015; von Ungern-Sternberg et al., 2015; Bhananker et al., 2007). Pediatric patients undergoing surgical procedures frequently require airway interventions, such as proper sizing and placement of airway adjuncts, recognition of laryngospasm, and adequate bag-mask ventilation, to prevent common respiratory events during the perioperative period from becoming adverse events (Patel et al., 2022; Egbuta & Mason, 2020; Weatherall et al., 2019). Inadequate management of these critical tasks can lead to complications, such as hypoxia, ineffective ventilation, and, or airway obstruction (Patel et al., 2022; Egbuta & Mason, 2020; Weatherall et al., 2019). The consequences of such complications, or adverse events, may result in increased length of hospital stay, poorer outcomes, and higher costs to the patient, family, provider, and healthcare organization (Egbuta et al., 2020; Oofuvong et al., 2015; Subramanyam et al., 2016).

Targeted Education and Strategic Intervention Mitigate Risk

During anesthesia and the perioperative care period, this high-risk pediatric population poses an even greater risk as they lose and regain control of their normal airway reflexes. The increased risk of pediatric perioperative critical events warrants special attention. To prevent pediatric respiratory events from becoming adverse respiratory events, targeted education of the perioperative team and implementation of strategies for quality improvement in pediatric anesthesia are needed (Patel et al., 2022; Egbuta & Mason, 2020; Habre et al., 2017). Recognition and management of pediatric respiratory events requires anticipation, planning, and preparedness to attenuate risk and increase the safety and quality of care provided to the pediatric population (Patel et al., 2022). As such, focused attention and education are necessary for nurses who care for pediatric patients during the postoperative period. Improving the competence and self-efficacy of Post Anesthesia Care Unit (PACU) Registered Nurses (RNs) in pediatric airway management directly contributes to enhancing patient safety (Patel et al., 2022; Egbuta & Mason, 2020; Habre et al., 2017). Equipping PACU RNs with the necessary knowledge, skills, and confidence to recognize and manage pediatric airway issues can reduce the risk of perioperative adverse respiratory events and respiratory complications (Patel et al., 2022; Egbuta & Mason, 2020; Habre et al., 2017).

This Doctor of Nursing Practice (DNP) project aligns with current nursing practice goals by prioritizing patient safety and optimal outcomes. Through its focus on pediatric airway management, this DNP project provides an opportunity to generate new evidence and contribute to advancing evidence-based practice in nursing. It also serves as a steppingstone for future nurse anesthesia research, particularly in the area of pediatric airway management.

Purpose

The purpose of this DNP project was to alleviate stress and enhance competence and self-efficacy in managing pediatric airways by providing a targeted educational experience for PACU RNs using didactic instruction and low-fidelity simulation. The study objectives sought to improve PACU RNs' perceived competence and self-efficacy in pediatric airway management.

To enhance the competency and self-efficacy of PACU RNs’ this study aimed to improve their skills and intentionality in identifying (a) signs and treatment of pediatric hypoxia; (b) airway obstruction; (c) laryngospasm; (d) at-risk populations for perioperative pediatric respiratory complications; (e) differences in the pediatric airway; (f) common pediatric airway issues and effective management; (g) appropriate sizing and use of pediatric airway adjuncts; and (h) appropriate pediatric mask-ventilation technique.

Review of Current Evidence

Search Methods

A thorough literature review was conducted to determine and assess the current state of evidence for improving provider competence and self-efficacy in pediatric airway management through targeted, simulation-enhanced educational experiences. A systematic search of current evidence was conducted using the following electronic databases: PubMed, ProQuest Central, and Cochrane Library. Search terms included “pediatric”, “airway management”, “nursing”, “education”, “low-fidelity”, “simulation”, “deliberate practice”, “post anesthesia care unit”, “PACU”, “perceived competence”, “self-efficacy”, “respiratory adverse event”, and “respiratory complication”. Boolean phrases “AND” and “OR” were also used to help narrow the search.

The search criteria consisted of research studies published within the last eight years in peer-reviewed journals. However, seminal works related to pediatric airway management outside of the eight-year range were also included. Inclusion criteria were peer-reviewed articles with current practice recommendations available in English and full text. Exclusion criteria consisted of articles unavailable in English, full text, or not peer reviewed. Sixty-one articles were reviewed for this project.

Search Synthesis

To provide a sufficient and thorough evidence review, literature synthesis was categorized thematically. Many topics were considered significant; however, attempts were made by the project author to make this literature synthesis organizationally cohesive and applicable to the project objectives. This DNP project’s search synthesis includes four subsections (a) the pediatric airway; (b) airway management technique: the role of the nurse; (c) risk factors; and (d) simulation.

Pediatric Airway

Understanding the differences in the pediatric airway versus the adult airway is paramount. The pediatric airway presents unique anatomic and physiologic considerations, directly affecting airway management and increasing the risk for airway complications (Dalesio, 2018; Furmick et al., 2017; Grzeskowiak, 2012; M & I, 2019; Renberg et al., 2021). Changes occur in the pediatric airway throughout development. The most prominent differences occur in children less than two years of age (M & I, 2019). By eight years of age, the airway is similar to an adult (Castro & Freeman, 2022).

Anatomical. Due to anatomic and physiologic variations in the pediatric airway, pediatric patients are more prone to respiratory complications, such as airway obstruction, rapid desaturation, and hypoxemia (Egbuta & Mason, 2020; Mamaril, 2020; Furmick et al., 2017; Grzeskowiak, 2012; Adewale, 2009). In children, the airway is anatomically smaller, increasing the risk of difficult airway management (Egbuta & Mason, 2020; Furmick et al., 2017; Grzeskowiak, 2012; Adewale, 2009;). Infants and young children have a prominent occiput relative to their body size. This large head, relative to body size, naturally places the neck in a flexed position when lying supine (Furmick et al., 2017; Grzeskowiak, 2012; Adewale, 2009). During airway management, positioning of the head and neck is extremely important. Careful positioning of pediatric patients helps maintain an open airway and prevent airway obstruction. The potential for airway obstruction, due to the natural size and flexion of the head in pediatric patients, is reduced by placing the head and neck in a neutral, slightly extended position (Dalesio, 2018; Furmick et al., 2017; Grzeskowiak, 2012; M & I, 2019; Renberg et al., 2021; Whitten, 2019). In pediatric patients, the tongue and adenoid tissue are also disproportionately large in comparison to the size of the oral cavity, further contributing to the risk of airway obstruction and difficult mask ventilation (Grzeskowiak, 2012; Castro & Freeman, 2022; Whitten, 2019). The larynx is positioned higher and anterior in the neck at the third cervical vertebrae and is considerably smaller than an adult, predisposing children to greater risk for airway obstruction (Whitten, 2019). The airways in children are narrow and compressible, with the narrowest part being the cricoid (Whitten, 2019; Best, 2012). In the infant and young child, the tracheal rings, tracheal cartilages, and laryngeal cartilages are so soft it is easy for their airway to obstruct (Mamaril, 2020; Christensen et al., 2017; Subramanyam et al., 2016; American Academy of Pediatrics, 2015).

Physiological. The physiological differences of the pediatric airway inherently place children at higher risk of airway obstruction and complications during the postoperative period (Lorinc et al., 2020; Mamaril, 2020; Egbuta & Mason, 2020; Gonzalez et al., 2012). Pediatric patients need a higher respiratory rate and heart rate to meet their growing needs and increased metabolic demand. A slow respiratory or heart rate can lead to cardiorespiratory failure (Christensen et al., 2017; Bhananker et al., 2007). Once respiratory and heart rate deterioration begins, it progresses quickly, because young children lack the usual adult respiratory reserve (Patel et al., 2022; Mamaril et al., 2020; Christensen et al., 2017; Bhananker et al, 2007). An infant's lung capacity up to one year of age is 75% smaller than an average 70 kg adult (Whitten, 2019). Due to this naturally reduced respiratory capacity, pediatric patients are more at risk for apnea (Whitten, 2019; Engelhardt et al., 2019; American Academy of Pediatrics, 2015). Infants (one month to one year) have a four times higher risk of cardiac arrest in the PACU, than those aged one year to 18 years, due to their potential for rapid deterioration in cardiopulmonary status from preventable respiratory adverse events (Patel et al., 2022; Mamaril et al., 2020; American Academy of Pediatrics, 2015; Bhananker et al., 2007).

Infants and young children have a higher metabolism requiring increased oxygen demands (M, A. & I, A., 2019). Oxygen consumption in the pediatric patient is double that of an adult, 6 ml/kg/min compared to 3 ml/kg/min (M, A. & I, A., 2019). Carbon dioxide production is also significantly increased in the pediatric patient, at 100-150 ml/kg/min versus 60 ml/kg/min in the adult (M, A. & I, A., 2019). Because children have increased oxygen consumption and higher carbon dioxide production, airway obstruction or apnea can lead to rapid desaturation and hypoxemia (Mamaril, 2022; American Academy of Pediatrics, 2015; von Ungern-Sternberg, 2014). A higher respiratory rate and heart rate is seen in pediatric patients to compensate for increased metabolic demand (Mamaril, 2022; American Academy of Pediatrics, 2015; von Ungern-Sternberg, 2014). Young children under the age of two have an immature nervous system with predominate parasympathetic activity (Whitten, 2019). Hypoxia in a child causes bradycardia, which may be the first sign of hypoxia, and can rapidly lead to cardiorespiratory failure (Whitten, 2019; Engelhardt et al., 2019). Altered control of ventilation, apnea, and breath holding are common in the young pediatric population due to an immature respiratory center (Mamaril, 2020; American Academy of Pediatrics, 2015). Children have a short apnea tolerance and a delay in management can quickly lead to hypoxemia (Mamaril, 2020; Engelhardt et al., 2019; von Ungern-Sternberg, 2014). By realizing and applying these differences, managing the pediatric airway becomes a deliberate, intentional skill with practical outcomes.

Airway Management Technique: The Role of the Nurse

Managing pediatric airways in the PACU is paramount as children emerge from anesthesia and care is transferred from the anesthesia provider to the PACU RN. Perioperative nurses, especially PACU RNs, play a critical role as first responders by recognizing and managing pediatric airway-related issues, ensuring positive patient outcomes (Patel et al., 2022).

Airway-related events are common in the PACU. Nearly 50% of pediatric cardiac arrests in the PACU result from adverse respiratory events (Patel et al., 2022; Bester et al., 2018; von Ungern-Sternberg et al., 2015). Research shows that focused expertise in pediatric airway management reduces perioperative respiratory complications and the risk of a respiratory event from becoming adverse (Patel et al, 2022; Egbuta et al., 2020; Habre et al., 2017).

Common respiratory adverse events that occur in the PACU include airway obstruction, laryngospasm, and apnea (Christensen et al., 2017; Mamaril, 2020; von Ungern-Sternberg, 2014). Nurses in the PACU assume primary responsibility of care when the patient is transferred from the operating room to recovery (Patel et al., 2022). It is imperative that the nurse caring for the pediatric patient be proficient in airway assessment and basic airway maneuvers to effectively manage respiratory complications (Patel et al., 2022).

Laryngospasm. During pediatric anesthesia recovery, laryngospasm is one of the most frequent respiratory complications (Christensen et al., 2017; Michelet et al., 2017). Because children are particularly vulnerable to rapid deterioration when experiencing a laryngospasm, the PACU nurse must be able to recognize and intervene, quickly and effectively. Airway techniques to manage a laryngospasm include chin lift, jaw thrust, and positive pressure ventilation with a bag valve mask, and 100% oxygen (Collins et al., 2019; Holm-Knusden et al., 2009; Michelet et al., 2017). Nurses in the PACU must also be able to recognize the need to call for help, as managing a laryngospasm should never be done alone (Whitten, 2019).

Airway Obstruction. The significant differences in pediatric airway anatomy and physiology predispose pediatric patients to greater risk for airway obstruction. Furthermore, these same differences also make managing an obstructed pediatric airway more challenging. Respiratory obstruction, a form of respiratory distress, can quickly progress to respiratory failure.

Prevention requires vigilance and skill. Signs and symptoms for PACU nurses to be aware of include stridor, wheeze, suprasternal retractions, and apnea (Adewale, 2009; Engelhardt et al., 2019; Rybojad et al., 2016). To manage airway obstruction interventions include repositioning the patients head, insertion of an oropharyngeal airway or nasopharyngeal airway, suctioning, and calling for help (Castro et al., 2022; Engelhardt et al., 2019; Whitten, 2019; Holm-Knusden et al., 2009).

Apnea. Nurses recovering pediatric patients must be aware of the children at risk for apnea and children's short apnea tolerance. Premature infants, children less than 6 months of age, and those with obesity all have an increased risk for postoperative apnea (Egbuta & Mason, 2020; Mamaril, 2020; von Ungern-Sternberg, 2014). Care should be taken to monitor for apnea and promptly implement measures such as repositioning the child's head, utilizing the side lying position, cautiously administering opioids, and providing positive pressure ventilation (Erb et al., 2020; von Ungern-Sternberg, 2014).

Risk Factors

Nurses in the PACU must be aware of the patients at risk and be prepared to perform necessary assessments and interventions to keep pediatric patients safe during recovery. Identifying children who are high risk for postoperative respiratory complications may minimize the incidence of events by aiding in the detection and management of events. Risk factors for determining who is prone to respiratory complications can be classified as patient, surgical, and anesthetic management (Wudineh et al., 2022; von Ungern-Sternberg, 2014; von Ungern-Sternberg et al., 2010).

Patient. The age of a child has a significant impact on a patient experiencing an adverse respiratory event. Infants younger than 12 months of age are at a greater risk for developing a post anesthesia respiratory complication (Egbuta & Mason, 2020; Mamaril, 2020; Wudineh et al., 2022). Respiratory related incidents are four times more common in children under the age of one year compared to older children (Egbuta & Mason, 2020; Holm-Knudsen and Rasmussen, 2009). Conditions such as asthma, upper respiratory infection, or obesity are predictor variables for postoperative respiratory events including laryngospasm, bronchospasm, and desaturation (Egbuta & Mason, 2020; von Ungern-Sternberg, 2014; von Ungern-Sternberg et al., 2010; Mamaril, 2020).

In children, upper respiratory infections are one of the most common perioperative comorbidities and are associated with increased risk in patients with current infection or within two weeks prior to the procedure (Lorinc et al., 2020; von Ungern-Sternberg et al., 2014; von Ungern-Sternberg et al., 2010). Increased airway reactivity also increases the risk of postoperative respiratory complications and is linked to a higher incidence of laryngospasm in the pediatric population (Collins et al., 2019; Mamaril et al., 2020; Holm-Knudsen et al., 2009). Childhood obesity is another risk factor for experiencing postoperative respiratory events and is associated with obstructive sleep apnea (Egbuta & Mason, 2020; Lorinc et al., 2020). Respiratory adverse events related to obesity include hypoxemia, airway obstruction, and difficulty with mask ventilation (Lorinc et al., 2020). Many of the predictable causes of respiratory events in children are attributed to congenital abnormalities including Down syndrome, heart defects, tracheomalacia, and Pierre Robin sequence (Grzeskowiak, 2012; Mamaril, 2020).

Surgical. Children undergoing oromaxillofacial or ear, nose, and throat procedures have an increased risk of postoperative respiratory events (Egbuta & Mason, 2020; von Ungern-Sternberg, 2014; Collins et al., 2019; Klučka et al., 2015). These surgeries are among the most frequently performed in the pediatric population and contribute to patients experiencing postop laryngospasm, bronchospasm, and stridor via swelling, increased oral secretions, and bleeding (Egbuta & Mason, 2020; Virag et al., 2019). A retrospective study including patients aged 2-18 post adenotonsillectomy revealed 15% of the cases experienced bronchospasm in the PACU and 29% experienced a laryngospasm (Hamilton et al., 2019).

Anesthetic Management. There are important factors to consider related to the anesthetic management of a child that contribute to postoperative respiratory events. The type of airway device used intraoperatively can lead to increased risk. Noninvasive airway management with a supraglottic airway or face mask, compared to an endotracheal tube, is associated with less postoperative respiratory events in pediatric patients (von Ungern-Sternberg, 2014; Harless et al., 2014). When invasive airway management is indicated, multiple intubation attempts, defined as three or more, required to secure a child's airway is indicative of respiratory adverse events, specifically laryngospasm (von Ungern-Sternberg et al., 2010; Wudineh et al., 2022). Also, opioid administration contributes to reduced respiratory drive and impaired respiratory function, which leads to airway obstruction and hypoxia (von Ungern-Sternberg, 2014; Mamaril, 2020).

Simulation

In the PACU setting, the nurse is often the first responder to recognize and manage a decompensating patient. Failure to identify and promptly intervene during an adverse respiratory event can lead to cardiac arrest and death. While airway events are rare, they are the most common to occur in pediatric patients and require a skilled and confident nurse to manage. Simulation is a strategy or technique used to enhance awareness, confidence, knowledge, critical-thinking, decision-making, procedural competence, and self-efficacy (Patel et al., 2022;

Morfoot & Stanley, 2018; Choi et al., 2017). Simulation provides an environment for nurses to practice high-risk and low-frequency events safely, while receiving immediate feedback to ensure practice is done correctly (Patel et al., 2022; Choi et al, 2017).

Simulation-based medical education has evolved over centuries and become an efficacious tool for skill acquisition and care improvement in the field of pediatrics (Davila & Price, 2022). Routine training and simulation on pediatric airway management has been shown to increase trainees' self-efficacy and competence in managing the pediatric airway (Karageorge et al., 2020; Lind et al., 2018; Patel et al., 2022). Studies have also found that trainees who receive simulation experiences in addition to didactic learning, as opposed to didactic learning alone, demonstrate notably enhanced skill levels and improved retention of knowledge (Powell et al., 2022; Bowling et al., 2016; Schmidt et al., 2013). Therefore, an educational intervention that provides targeted didactic and simulation education regarding pediatric airway management for PACU RNs may be effective in increasing perceived competence and self-efficacy. Enhanced competence and self-efficacy in pediatric airway management are critical to reducing adverse events, improving patient outcomes, ensuring pediatric patients' safety, and enhancing the overall quality of care during the post anesthesia period (Patel et al., 2022; Egbuta & Mason, 2020; Habre et al., 2017).

Conceptual and Theoretical Framework

The conceptual and theoretical framing of this DNP project was based on Bandura's Social Cognitive Theory (1986), providing valuable insight and guidance in line with the project objectives. Bandura's Social Cognitive Theory (1986) is a psychological framework centered around how personal, cognitive factors and environmental factors influence learning and behavior. According to Bandura (1997) how a person functions is related to their beliefs about themselves; self-beliefs affect and influence how a person functions. Self-beliefs influence one's confidence, motivation, decision-making and competence; thus, self-beliefs shape learning, behavior, and performance (Bandura, 1986).

Conceptually, self-efficacy and competence in pediatric airway management are situated within Bandura's (1986) social cognitive perspectives of self-beliefs. Self-belief constructs include competence, confidence, self-efficacy, self-concept, and anxiety (Morony et al., 2012). Self-efficacy is sometimes referred to as perceived ability (Shongwe & Mudaly, 2021). Furthermore, self-efficacy denotes a self-judgement of one's capability that is interconnected to one's motivation (Bandura, 1993). Bandura's theory suggests that individuals with higher self-efficacy are more likely to engage in and persist with challenging tasks (Bandura, 1997).

Bandura (1997) addresses other applicable constructs used in this project's intervention, such as observational learning, vicarious experiences, and self-efficacy assessment. Confidence is sometimes misused to denote self-efficacy; however, confidence is viewed as a product or endpoint, as it notes a person's state of being certain regarding successful completion of a task (Shongwe & Mudaly, 2021). In contrast, examination of self-efficacy is the process of learning and performing (Shongwe & Mudaly, 2021), as it "includes both an affirmation of a capability level and the strength of that belief" (Bandura, 1997, p. 282). Competence encompasses skills, knowledge, attitudes, and behavior, including commitment and consistency in effective performance (Tinoca et al., 2013). While one might possess a skill, competence further acknowledges consistent, effective performance even during anxiety-provoking or stressful situations (Tinoca et al., 2013). Through provision of this project's intentional learning experiences, PACU nurses may develop stronger self-efficacy, increased competence, and ultimately improved performance in effectively managing the challenges of the pediatric airway.

Methods

This Doctor of Nursing Practice project was a quality improvement, pretest-posttest design based upon the conceptual and theoretical framework of Bandura's Social Cognitive Theory. This project used a targeted, educational intervention experience to evaluate reported competence and self-efficacy by PACU RNs in managing the pediatric airway. The educational intervention included a one-hour didactic instruction and followed with a two-hour low-fidelity simulation.

Translational Framework

The translational framework utilized to design conduction of this project was the Plan-Do-Study-Act (PDSA) Model for Improvement (Institute for Healthcare Improvement, 2019; Langley et al., 2009). The PDSA cycle includes four phases as stated it its namesake: Plan, Do, Study, and Act. According to the authors of the Model for Improvement, the PDSA cycle may be used to materialize ideas into action and bridge action to learning (Langley et al., 2009). The Model for Improvement (see Appendix A) is the framework that combines the PDSA cycle and the following three improvement questions (Taylor et al., 2014; Langley et al., 2009):

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What change can we make that will result in improvement?

With this foundational improvement framework in mind, the basis of this project was designed and specifically created for the healthcare institution where this study took place. At the healthcare institution project study site, the volume of pediatric patients was increasing, and management shared pediatric care is not a strong clinical skill of many of the PACU RNs, making them apprehensive when caring for pediatric patients. According to the founders of the

Model for Improvement, improvement comes from predictable and appropriate changes (Langley et al., 2009). Thus, the basis of this project was conceptualized, tailored, and predicted to improve the competence and self-efficacy of PACU RNs caring for this unique high-risk pediatric population via a targeted, simulation-enhanced educational experience.

Plan

The Plan phase answers the questions why, who, what, when, and where. It encompasses the objectives, questions, and predictions, as well as the plan to carry out the cycle and data collection (Langley et al., 2009). The formation of this project team included the healthcare institution study site's Director of Practice, Quality, and Research, Chief Certified Registered Nurse Anesthetist, PACU Manager, and Clinical Educator of Surgical and Perioperative Services. The learning opportunity was planned after a thorough review of the current literature to target the specific educational points needed for understanding how to manage the pediatric airway. Through multiple sessions of feedback, suggestions, and edits, the study sites' Director of Practice, Quality, and Research and PACU Manager were an integral part of the didactic educational intervention planning. The PACU Manager and Clinical Educator of Surgical and Perioperative Services were highly involved in the facilitation and fruition of the project presentation and low-fidelity simulation. This planning process was cultivated over ten months to calibrate the integrity and fit of the project to the needs of the study population and requirements of the Doctor of Nurse Practice essentials.

Sample. A small, purposeful convenience sample was used and all participants who met the inclusion criteria were included in the sample. All practicing PACU RNs at the site were invited to volunteer and participate in the project. The inclusion criteria included any PACU RN that voluntarily participated, worked at the southeastern hospital project site during the study, and was deemed competent to care for pediatric patients. The exclusion criteria included any PACU RN not deemed competent for care of pediatric patients.

Following Institutional Review Board approval and with permission from the project team, the PACU RNs were informed and recruited via work email, as well as break room and bathroom flyers (see Appendix B). The recruitment email and flyers included a QR code for easy access and enrollment. Participants were notified, via the recruitment flyers, email, and QR code, that all data collected was strictly confidential and anonymous. Informed consent was obtained via the QR code at the beginning of the pretest Qualtrics survey.

Setting. The project took place in a private, non-profit, acute care hospital affiliated with a larger state university entity and enterprise in the southeastern United States. The hospital consisted of 660 beds and additional care centers. The main campus included approximately 40 anesthetizing sites with 24 main operating rooms, six procedure rooms, three obstetrical suites, and a variety of out of department locations. A conference room of the hospital facility was used for the didactic instructional portion of the intervention, providing an optimal learning environment where noise and traffic level were minimal. After the educational presentation, two separate PACU settings were used to conduct the low-fidelity simulation with the nurse participants ($N = 28$).

Do-(Implementation)

The Do phase is the implementation phase where the plan is carried out, problems and unexpected observations are documented, and data analysis begins (Langley et al., 2009). The implementation of the DNP project consisted of two separate parts to make a whole targeted, educational experience for PACU RNs on pediatric airway management. The intervention consisted of both a didactic portion and a low-fidelity simulation session.

Intervention. At the request of the PACU manager, the one-hour didactic portion of the project was presented at a recurring Thursday morning unit teammate conference. The conference room used was a small and intimate lecture-style set up with a speaker podium and presentation screen. Prior to the beginning of the presentation, the conference room was strategically arranged to induce a relaxed, interactive learning environment. The tables were sanitized and placed in a U-shape to emulate roundtable-fashioned equality, reduce stress, and mitigate distraction, as participants were encouraged to come and go as they pleased, or their schedule constraints would allow. Many pediatric airway supplies were placed around the room allowing study participants to appreciate and visualize the difference in sizes, including multiple sets and various sizes of oropharyngeal airways, nasopharyngeal airways, bag valve masks, suction catheters, endotracheal tubes, and laryngoscope blades. There were also two Jackson Rees breathing circuits, as well as a pediatric and infant mannequin. Showcasing the various sizes and supplies was intentional to help participants comprehend how pediatric anatomical and physiological differences relate to PACU pediatric airway management and nursing care.

Didactic Education. The educational presentation consisted of 40 PowerPoint slides. Throughout the presentation, participants were encouraged to palpate their own anatomical structures to better understand pediatric differences in relation to their own anatomy. For example, participants were encouraged to feel their own larynx, or voice box, and then note the difference in resistance while applying pressure or pushing on their larynx. This exercise was meant to help participants feel how manipulation of the airway changes even with the slightest application of pressure. Participants were also asked to find their own laryngospasm notch where the Larson’s Maneuver is applied. Without physically finding and feeling one’s own laryngospasm notch, it is hard to know where to correctly apply pressure to break a laryngospasm. Many of the study participants had to leave at the one-hour presentation mark to start their PACU shift. Approximately, ten study participants stayed behind after the didactic presentation was over to receive their low-fidelity simulation portion of the study. This constituted the first of three total low-fidelity simulation sessions.

Low-Fidelity Simulation. Bag valve masks, sometimes referred to by the proprietary name Ambu bags, were used to demonstrate ventilation of both a pediatric and infant sized mannequin. These mannequins were the low-fidelity simulators used to provide an opportunity for deliberate practice and feedback in the psychomotor skills needed to manage the pediatric airway. Each participant practiced ventilating both sized mannequins with the appropriately sized bag valve mask, allowing for one-on-one instruction, encouragement, demonstration, modeling, and correction. Participants had multiple attempts to practice proper technique. Examples of the individualized instructional feedback provided to the participants included physical modification of finger placement to avoid easily compressing the airway soft tissues, and suggestions on how to overcome the heaviness of the bag valve mask while simultaneously applying only the lightest pressure necessary to ventilate the mannequin.

While each participant had their individual one-on-one session, the rest of the participants were given learning tasks to help them internalize the didactic material and facilitate self-directed learning in an interactive and clinically applicable manner. These learning tasks included use of problem-solving techniques and vicarious learning strategies to encourage the participants to articulate what they know, what they have learned, and how to apply it to the pediatric patient in the real-world clinical setting. Examples included asking them to find where the specific size was located on the actual product, as well as the packaging. They were encouraged to do this for varying sizes of oral airways, nasopharyngeal airways, suction catheters, laryngoscopes, face masks, laryngeal mask airways, and endotracheal tubes. This learning task sought to demonstrate how hard it is to find, or even see, the size on both the product and packaging, even in a calm environment. This aided in imparting the added difficulty of finding the correct size in an emergent or critical situation, especially without knowing where to look. Participants were also encouraged to practice setting up a bag valve mask from start to finish which requires practice, muscle memory, and time. Additional exercises included application of properly positioned cardiac defibrillation pads and correctly sized airway adjuncts to the low-fidelity mannequin simulators.

After the first low-fidelity simulation group finished, the conference room was cleaned, tables were returned to the original positions, and the supplies were packed up to be taken to the PACU for provision of the second and third low-fidelity simulation sessions. The second and third low-fidelity simulations took place in two separate, physically different, PACU units at the study site. Each of the two PACU units provided an empty PACU bay or bed. Each of the three low-fidelity simulations took approximately two hours to complete, totaling over six hours for the low-fidelity portion. The flexibility of timing and schedule, as well as being able to conduct the project in two separate PACUs, allowed for a greater inclusion of participants. In accordance with the Do phase of the PDSA cycle, unexpected observations were recorded. For example, study participants who received the low-fidelity simulation in the two PACU settings expressed wanting more time to practice and ask questions, but were unable to do so given their worktime constraints.

Data Instrument. This Quality Improvement (QI) study implemented a pre-posttest design. The intervention tool, or instrument, used was the pre and posttest Qualtrics survey questionnaire. This instrument (see Appendix C) included original material developed by the primary investigator to meet the identified project purpose and learning objectives. It was extensively edited by the project site's Director of Practice, Quality, and Research in order to ensure the study variables of self-efficacy and competence were accurately measured. This project tool was based off of the General Self-efficacy Scale (GSE) developed by Schwarzer and Jerusalem in 1995 (see Appendix D).

This DNP project tool included ten Likert scale questions to assess pre and post intervention pediatric airway management self-efficacy and competence. The survey tool requested participants to create a unique, de-identified code for data comparison between pre and posttest surveys, ensuring responses and participants remained anonymous while allowing for the data to be paired. The survey tool also contained two demographic questions to address years of experience practicing as a registered nurse and related clinical pediatric certifications currently held by the participant. The instrument included five questions to rate perceived competence and five questions to rate self-efficacy and intentionality in managing the pediatric airway. Participants were asked to rate their competence and self-efficacy before and after the project intervention using the ten Likert scale questions where each of the ten questions allowed them to rate their answer between the following five choices: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, strongly disagree.

Data Collection. Recruitment flyers and an informational email, containing the QR code, were disseminated one week prior to the implementation date. On the day of the presentation, participants were reminded to scan the QR code and take the anonymous pretest survey if they had not already done so. Additional QR codes were printed and hung around the conference room to ease access and streamline the pretest and informed consent process. In addition, the survey was printed out in anticipation of a study participant not being able, or wanting, to use their phone to complete the pretest survey using the QR code. One study participant was not able to get their browser to work with the QR code and completed the pretest via the provided paper survey. Nurses who were unable to make the didactic education portion were allowed to participate in the low-fidelity simulation, only after they took the pretest in real time. There were five nurses who fell into this category. Three weeks after the project implementation date, the posttest survey questionnaire was sent out via email by the PACU manager. The PI also visited the site, following the three-week wash-out period, to encourage posttest survey completion. The posttest survey was the exact same intervention tool used for the pretest survey questionnaire, as it contained the original QR code and questions. Respondents were asked to input the same de-identified code they had used in the pretest survey to strategically pair the data.

Study

The Study phase completes the analysis of the data, compares data to predictions, and summarizes what was learned (Langley et al., 2009). The study phase includes three subsections: data analysis, results, and discussion. The data analysis describes what type of analysis was done using the collected project data. The results include the outcomes evaluated, identified barriers to success, or limitations of the study, and identified strengths to overcome said barriers. The final subsection of the study phase, the discussion, entails ponderance of the project results, discussion of the key findings and outcomes presented, and what was learned from the conduction of the project.

Data Analysis. Quantitative data was collected from the pre and post surveys and manually entered into Microsoft Excel for analysis by the project leader. A statistician was consulted to evaluate the pre and post test data. Descriptive statistics including frequency and percentages was used to analyze and summarize the pre and post demographic data. Comparison of the pre survey and post surveys were made for all study participants to attain the mean and *p* value. This was done by performing a paired t-test. Paired t-test results were used to compare differences in knowledge and confidence scores for all the participants who had both pre and post data.

Results. The sample size was 28 nurses. Demographic information included years of nursing practice and relevant certifications held. Of the 28-nurse sample, nurses ranged in years of experience from zero to two years, three to five years, six to ten years, 11 to 14 years, and 15 plus years. The majority of nurses from the sample had 15 plus years of nursing experience, constituting 36% of the sample population. (Figure 1). Of the 28-nurse sample all, but one participant, held both Advanced Cardiac Life Support and Pediatric Advanced Life Support Certifications. Five of the nurses held additional certifications including Certified Post Anesthesia Nurse, Nursing Professional Development Certification, Certified Ambulatory Peri-anesthesia Nurse, and Certified Acute or Critical-care Registered Nurse. Knowledge and skill could be assessed by having years of experience as an RN and all, but one, had at least two extra certifications, indicating more in-depth training.

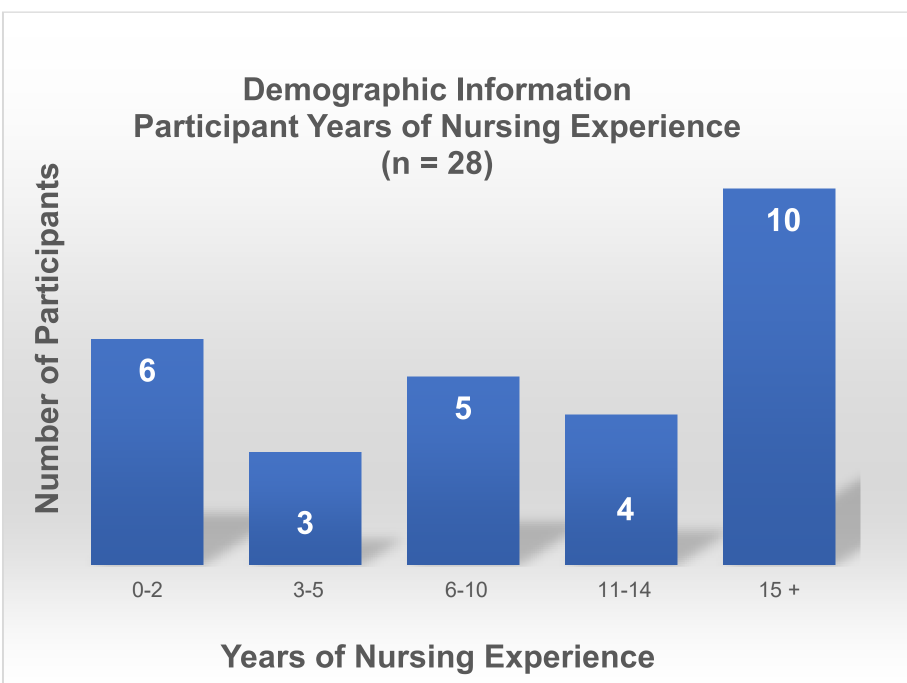


Figure 1

Results of the pretest questions for both perceived competence and self-efficacy are displayed in Table 1 and *Figure 2*. Results of the posttest questions for perceived competence and self-efficacy are displayed in Table 2 and *Figure 3*. The most notable results are seen in *Figure 3,* where all of the posttest survey responses, in both perceived competence and self-efficacy, were either Strongly Agree or Agree.

Table 1
5-point Likert scale Pretest responses in count (top) and percentage (bottom) (n=28)

Pre Survey Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Competence: I am competent in…					
Recognizing signs of hypoxia in a pediatric patient	1	0	1	18	8
Placing an appropriately sized oral airway	2	4	3	9	10
Recognizing signs and symptom of laryngospasm	1	4	2	13	8
Performing airway maneuvers to improve ventilation	0	0	1	17	10
Mask-ventilating a pediatric patient using an appropriately sized bag valve mask	1	3	6	8	10
Self-efficacy: I can…					
Perform an effective chin-lift and jaw thrust on a pediatric patient	1	3	2	14	8
Determine the appropriate size oral airway for a pediatric patient	0	6	4	12	6
Determine which pediatric airway adjuncts may be useful to manage ventilation	0	4	8	13	3
Recognize signs and symptoms of hypoxia in a pediatric patient and intervene appropriately	0	1	1	16	10
Determine the correct size bag valve mask to appropriately mask-ventilate a pediatric patient	0	3	7	13	5

Pre Survey Statements (%)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Competence: I am competent in…					
Recognizing signs of hypoxia in a pediatric patient	3.5%	0	3.5%	64%	29%
Placing an appropriately sized oral airway	7%	14%	11%	32%	36%
Recognizing signs and symptom of laryngospasm	4%	14%	7%	46%	29%
Performing airway maneuvers to improve ventilation	0	0	3%	61%	36%
Mask-ventilating a pediatric patient using an appropriately sized bag valve mask	3%	11%	21%	29%	36%
Self-efficacy (Intentionality): I can…					
Perform an effective chin-lift and jaw thrust on a pediatric patient	3%	11%	7%	50%	29%
Determine the appropriate size oral airway for a pediatric patient	0	21%	14%	43%	21%
Determine which pediatric airway adjuncts may be useful to manage ventilation	0	14%	29%	46%	11%
Recognize signs and symptoms of hypoxia in a pediatric patient and intervene appropriately	0	3.5%	3.5%	57%	36%
Determine the correct size bag valve mask to appropriately mask-ventilate a pediatric patient	0	11%	25%	46%	18%

Table 2

5-point Likert scale Posttest responses in count (top) and percentage (bottom) (n=28)

POST Survey Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Competence: I am competent in…					
Recognizing signs of hypoxia in a pediatric patient	0	0	0	7	21
Placing an appropriately sized oral airway	0	0	0	8	20
Recognizing signs and symptom of laryngospasm	0	0	0	10	18
Performing airway maneuvers to improve ventilation	0	0	0	4	24
Mask-ventilating a pediatric patient using an appropriately sized bag valve mask	0	0	0	9	19
Self-efficacy: I can…					
Perform an effective chin-lift and jaw thrust on a pediatric patient	0	0	0	4	24
Determine the appropriate size oral airway for a pediatric patient	0	0	0	7	21
Determine which pediatric airway adjuncts may be useful to manage ventilation	0	0	0	9	19
Recognize signs and symptoms of hypoxia in a pediatric patient and intervene appropriately	0	0	0	3	25
Determine the correct size bag valve mask to appropriately mask-ventilate a pediatric patient	0	0	0	8	20

POST Survey Statements (%)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Competence: I am competent in…					
Recognizing signs of hypoxia in a pediatric patient	0	0	0	25.0%	75.0%
Placing an appropriately sized oral airway	0	0	0	29.0%	71.0%
Recognizing signs and symptom of laryngospasm	0	0	0	36.0%	64.0%
Performing airway maneuvers to improve ventilation	0	0	0	14.0%	86.0%
Mask-ventilating a pediatric patient using an appropriately sized bag valve mask	0	0	0	32.0%	68.0%
Self-efficacy (Intentionality): I can…					
Perform an effective chin-lift and jaw thrust on a pediatric patient	0	0	0	14.0%	86.0%
Determine the appropriate size oral airway for a pediatric patient	0	0	0	25.0%	75.0%
Determine which pediatric airway adjuncts may be useful to manage ventilation	0	0	0	32.0%	68.0%
Recognize signs and symptoms of hypoxia in a pediatric patient and intervene appropriately	0	0	0	11.0%	89.0%
Determine the correct size bag valve mask to appropriately mask-ventilate a pediatric patient	0	0	0	29.0%	71.0%

Figure 2

Visualization of Likert scale Pretest responses in a stacked bar chart based on Table 1.

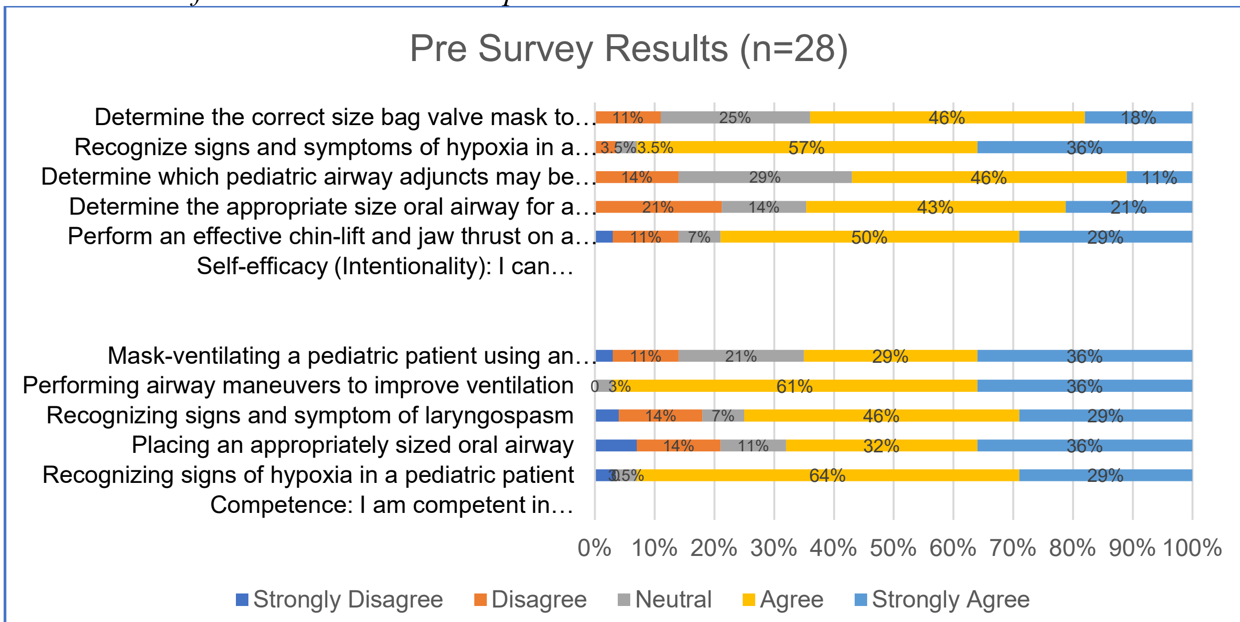
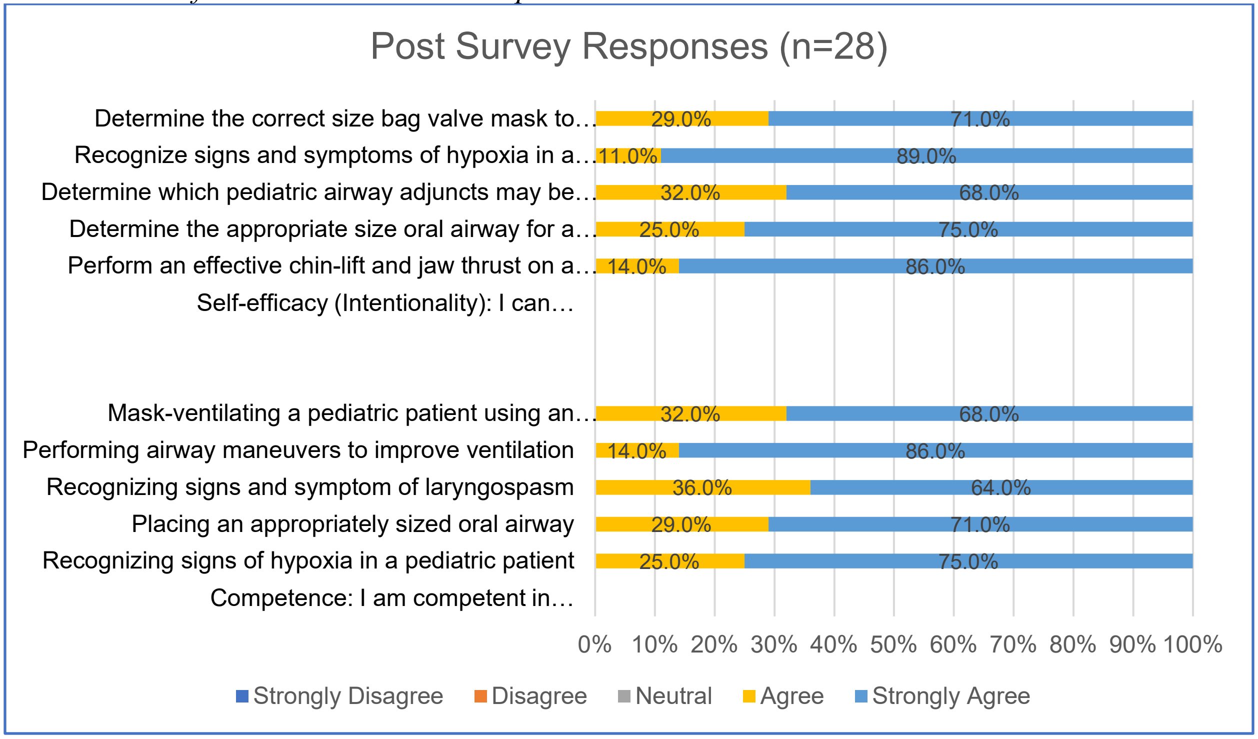


Figure 3

Visualization of Likert scale Posttest responses in a stacked bar chart based on Table 2.



A Paired t-test was used to examine bivariate statistical differences between pre and posttest groups for both average perceived competence and self-efficacy. The test revealed a statistically significant difference in pre and posttest competence scores ($p < 0.05$). The perceived competence scores increased by 20% with a pretest mean of 4.0 and posttest mean of 4.8 on a 5-point Likert scale, with (1) indicating strongly disagree and (5) strongly agree (*Figure 4* and *Figure 6*). Results for pre and post self-efficacy scores also demonstrated statistical significance ($p <0.05$). The perceived self-efficacy scores increased by 26% with a pretest mean of 3.8 and posttest mean of 4.8 on a 5-point Likert scale (*Figure 5* and *Figure 6*).

Figure 4

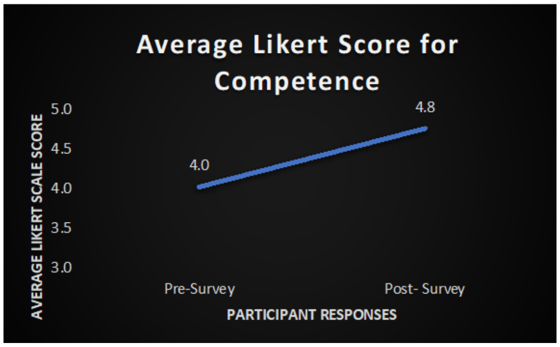


Figure 5

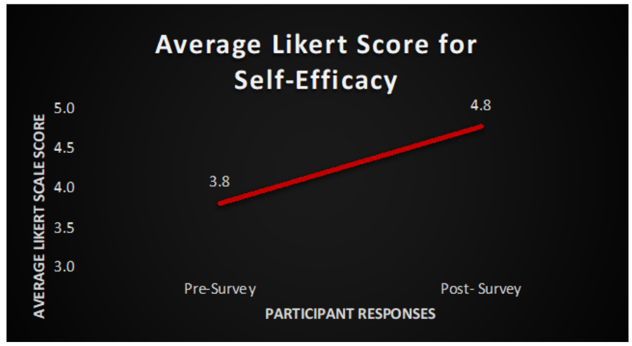
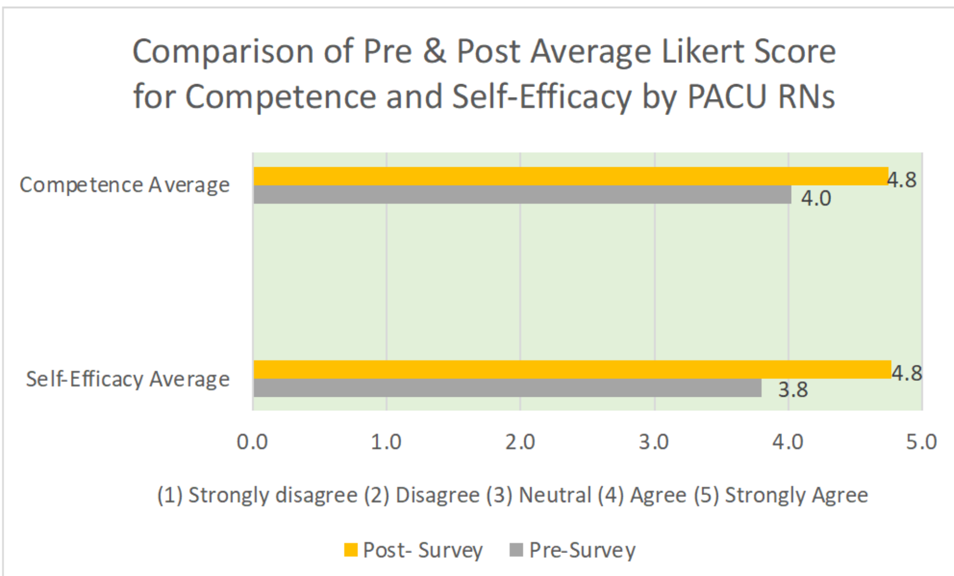


Figure 6



Limitations. A limitation of this study was sample size (n = 28). While there were flyers and an email dispersed one-week prior to the project implementation, more recruiting efforts could have been made, such as making an announcement at the monthly staff meeting. The timing could have been a limitation for attendance for day or off shift nurses to better accommodate both different shift schedules in order to maximize sample size. Further research could be done with a larger sample size to ensure results. A larger sample size could be obtained by broadening the sample setting to RNs at other PACU sites.

Discussion. The results gathered and analyzed show an overwhelming positive result regarding pediatric airway management training and education. There were no participants who answered unfavorably in the posttest survey for the Likert-style questions, which would have been considered strongly disagree or disagree. All of the participants answered both the posttest survey competence and self-efficacy Likert-style questions favorably, with agree and strongly agree. Based on the results, the assumption can be made that didactic education, along with low-fidelity simulation, can successfully increase the nurse's perception of competence and self-efficacy for managing the pediatric airway.

The results of this study did not lead to any unexpecting findings. Based on the current literature, the researcher was expecting the targeted, educational experience simulation to be effective in increasing nurses' competence and self-efficacy level with pediatric airway management. The results of this study support the current research that both targeted education and low-fidelity simulation training is an effective method for increasing competence, skill-set, and self-efficacy level of nurse providers. The current research reviewed had limitations. The current research had not specifically looked at PACU RNs role in pediatric airway management.

This study helps fill in the gaps of current research and establishes that unique, targeted training, using didactic education coupled with simulation, is effective specifically for educating PACU RNs in management of the pediatric airway. The results also help validate the conceptual and translational framework used in this study. The results data may imply effectiveness in using Bandura's SCT as a theoretical framework, as PACU RNs developed stronger self-efficacy and competence regarding pediatric airway management. Successful results lead to the conclusion that the PDSA model is an appropriate model to plan a productive and beneficial session for PACU RNs in the area of pediatric airway management. Interventions aimed at improving nurses' competence and self-efficacy may create immediate changes in the clinical practice environment with the potential for lasting change in the quality of care provided.

Act

The Act phase addresses what changes are to be made and the next cycle (Langley et al., 2009). Participant feedback indicated participants appreciated the opportunity to improve skills through various methods. Given the positive participant feedback and successful data results in the findings of this project, two immediate actions were rationally made based on what was learned. The study site's PACU Manager and Clinical Educator of Surgical and Perioperative Services requested, and were given permission by the principal investigator, to disseminate and use the project presentation for a sister healthcare institution site and new graduate PACU nurse education. The initial PowerPoint presentation was then extensively narrated by the principal investigator for use and dissemination for the site's new graduate PACU nurse education and sister site PACU nurse education.

Conclusion

Recommendations for Future Study

Survey results indicate PACU RNs benefit from receiving didactic education and hands-on simulation in pediatric airway management. While the study results were positive for this sample population in pediatric airway management, future studies should be conducted to determine the frequency of such educational training required to ensure competency amongst staff. Furthermore, this population was very targeted and specific. Further research could be done in order for the results to be generalized. For example, studies could target a broader population of nurses such as those at other PACU sites or in the emergency department. Further research could also be conducted at a wider range of hospital settings, including rural and community hospitals.

Survey results show pediatric airway management training improves nurses' perceived competence and self-efficacy in caring for this unique and high-risk pediatric patient population. This study specifically looked at nurse's perception of their competence and self-efficacy levels. Future studies could look at more quantitative aspects, such as if similar simulation training can help improve patient outcomes and safety. Specifically, pediatric airway complications could be analyzed before and after simulation training to determine if pediatric airway management simulation helps improve patient outcomes. Suggestions for further research may be warranted to determine frequency and using a larger sample size.

Relevance and Recommendations for Clinical Practice

This project and future research regarding this topic have the potential to have a great clinical impact. Enhancing PACU RN competency and self-efficacy in pediatric airway management could lead to greater staff skill set and confidence. Ultimately this can lead to improving patient safety and outcomes during a high-risk situation, such as pediatric respiratory events. Simulation training, in conjunction with didactic education, in pediatric airway management should be implemented into routine training for PACU nurses in order to encourage and maintain clinical competencies.

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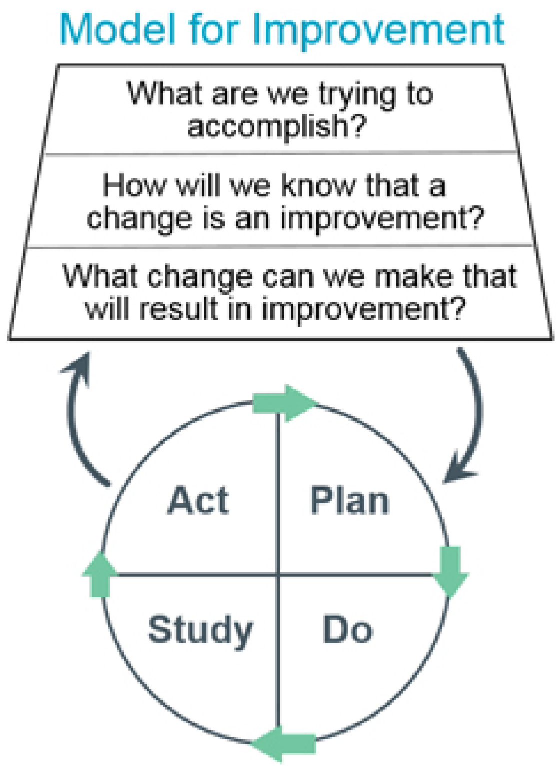
Appendix A

Model for Improvement & PDSA Cycle



Appendix B

Project Recruitment Flyer

Appendix C

Data Instrument: Pre/Post Survey

To help this project generate a de-identified code to keep your responses confidential, please answer the following: (If for any of the following, you are unwilling or unable to answer, please fill in with a 0).

- What is your mother's first initial? _____
- What is your father's first initial? _____
- What is your first initial? _____
- What year were you born (4 digits)? _____

Demographic information: *Please circle your answer(s) for the following:*
Years of experience practicing as a registered nurse:

- 0-2
- 3-5
- 6-10
- 11-14
- 15+

Which (if any) of the following do you currently hold (select all that apply):

- TNCC
- ACLS
- PALS
- NRP
- CAPA

For each of the scale questions below, please answer honestly as these surveys are completely anonymous.
Check the box for the response that best characterizes how you feel about the statement:

Q1: Competence					
I am competent in…	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
...Recognizing signs of hypoxia in a pediatric patient					
...placing an appropriately sized oral airway					
...Recognizing signs & symptoms of laryngospasm					
...Perform airway maneuvers to improve ventilation					
...Mask-ventilating a pediatric patient using the appropriately sized bag-valve mask					

Q2: Self-efficacy/Intentionality					
I can…	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
......Perform an effective chin-lift and jaw thrust on a pediatric patient					
...determine the appropriate size of an oral airway for a pediatric patient					
…determine which pediatric airway adjuncts or maneuvers may be useful to manage ventilation					
…recognize the signs and symptoms of hypoxia in a pediatric patient and intervene appropriately					
...determine the correctly sized bag-valve mask in order to appropriately mask-ventilate a pediatric patient					

Appendix D

The General Self-Efficacy Scale (GSE)

The General Self-Efficacy Scale (GSE) was developed in 1995 by Matthias Jerusalem and Ralf Schwarzer. The original German version developed in 1979 by Matthias Jerusalem and Ralf Schwarzer, and later revised and adapted to 26 other languages by various co-authors. The scale is composed of only 8 items, rated on a scale, from strongly disagree to strongly agree.

1. "I will be able to achieve most of the goals that I have set for myself."
2. "When facing difficult tasks, I am certain that I will accomplish them."
3. "In general, I think that I can obtain outcomes that are important to me."
4. "I believe I can succeed at most any endeavor to which I set my mind."
5. "I will be able to successfully overcome many challenges."
6. "I am confident that I can perform effectively on many different tasks."
7. "Compared to other people, I can do most tasks very well."
8. "Even when things are tough, I can perform quite well."

Purpose	The scale was created to assess a general sense of perceived self-efficacy with the aim in mind to predict coping with daily hassles as well as adaptation after experiencing all kinds of stressful life events.
Population	The scale is designed for the general adult population, including adolescents. Persons below the age of 12 should not be tested.
Administration	The scale is usually self-administered, as part of a more comprehensive questionnaire. Preferably, the 10 items are mixed at random into a larger pool of items that have the same response format. Time: It requires 4 minutes on average. Scoring: Responses are made on a 4-point scale. Sum up the responses to all 10 items to yield the final composite score with a range from 10 to 40. No recoding.
Description	The construct of Perceived Self-Efficacy reflects an optimistic self-belief (Schwarzer, 1992). This is the belief that one can perform a novel or difficult tasks, or cope with adversity -- in various domains of human functioning. Perceived self-efficacy facilitates goal-setting, effort investment, persistence in face of barriers and recovery from setbacks. It can be regarded as a positive resistance resource factor. Ten items are designed to tap this construct. Each item refers to successful coping and implies an internal-stable attribution of success. Perceived self-efficacy is an operative construct, i.e., it is related to subsequent behavior and, therefore, is relevant for clinical practice and behavior change.
Citation	Schwarzer, R., & Jerusalem, M. **(1995)**. Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). Windsor, UK: NFER-NELSON.