

EDUCATION MODEL FOR PEDIATRIC TRACHEOSTOMY MANAGEMENT:
IMPROVING NURSING KNOWLEDGE AND CONFIDENCE

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Amy A. Ashburn, titled Education Model for Pediatric Tracheostomy Management: Improving Nursing Knowledge and Confidence and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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Final approval and acceptance of this DNP project is contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

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DEDICATION

To all the children living with a tracheostomy.

TABLE OF CONTENTS

LIST OF FIGURES	8
LIST OF TABLES	9
ABSTRACT	10
INTRODUCTION.....	12
Background Knowledge and Significance	13
Local Problem	15
Intended Improvement	17
Project Purpose	17
Project Question	18
Project Objectives	18
Theoretical Framework	18
Lewin’s Change Theory	18
Concepts	19
<i>Unfreezing</i>	20
<i>Moving</i>	21
<i>Refreezing</i>	22
Literature Synthesis	22
Evidence Search	23
Comprehensive Appraisal of Evidence	24
<i>Need for Tracheostomy Education</i>	24
<i>Confidence Performing Tracheostomy Management</i>	25
<i>Knowledge Performing Tracheostomy Management</i>	26
Strengths of Evidence	27
Weaknesses of Evidence	27
Gaps and Limitations	28
METHODS	28
Project Design	28
Model for Implementation	29

TABLE OF CONTENTS - *Continued*

Plan-Do-Study-Act (PDSA) Cycle	31
<i>Plan</i>	31
<i>Do</i>	32
<i>Study</i>	32
<i>Act</i>	33
Setting and Stakeholders	34
Planning the Intervention	35
Participants and Recruitment	35
Consent and Ethical Considerations	36
Timeline	37
Data Collection	37
Data Analysis	38
RESULTS	39
Outcomes	39
Sample Size and Demographics	39
Data Analysis and Outcomes	41
<i>Knowledge</i>	42
<i>Confidence</i>	43
<i>Qualitative Findings</i>	45
DISCUSSION	46
Summary	46
Interpretation	47
Knowledge	47
Confidence	47
Summary of Implementation Framework	48
Implications	48
Practice	48
Education	49

TABLE OF CONTENTS - *Continued*

Research	49
Policy	50
Limitations	50
DNP Essentials Addressed	51
DNP Essential II	51
DNP Essential III	52
DNP Essential VI	52
DNP Essential VIII	52
Conclusion	53
Plan for Sustainability and Dissemination	53
APPENDIX A: PHOENIX CHILDREN’S HOSPITAL SITE APPROVALS / THE UNIVERSITY OF ARIZONA INSTITUTIONAL REVIEW BOARD APPROVAL LETTER.....	55
APPENDIX B: RECRUITMENT MATERIAL (FLYER INCLUDING DISCLOSURE, NEWLETTER DESCRIPTION, AND EMAIL INCLUDING DISCLOSURE)	61
APPENDIX C: EVALUATION INSTRUMENTS (CONFIDENCE SURVEY, MULTIPLE- CHOICE QUESTIONNAIRE, DEMOGRAPHIC SURVEY).....	64
APPENDIX D: PARTICIPANT MATERIAL (EDUCATIONAL POWERPOINT PRESENTATION, SIMULATION SESSION OUTLINE).....	70
APPENDIX E: PROJECT TIMELINE.....	79
APPENDIX F: LITERATURE REVIEW GRID.....	82
APPENDIX G: OTHER DOCUMENTS AS APPLICABLE TO THE PROJECT (KEY DRIVER DIAGRAM, FLOW DIAGRAM OF LITERATURE SEARCH AND POSTER PRESENTATION)	94
REFERENCES	98

LIST OF FIGURES

Figure 1	<i>Lewin's Change Theory in Implementing a Tracheostomy Education Program</i>	19
Figure 2	<i>The Model for Improvement</i>	30
Figure 3	<i>Confidence in Tracheostomy Management Pre- and Post-Education</i>	45

LIST OF TABLES

Table 1	<i>Tracheostomy Education Participant Demographics</i>	40
Table 2	<i>Tracheostomy Knowledge Pre- and Post-Tracheostomy Education</i>	43
Table 3	<i>Tracheostomy Confidence Pre- and Post-Tracheostomy Education</i>	44

ABSTRACT

Purpose: The purpose of this quality improvement project was to increase knowledge and confidence for nurses and nurse practitioners performing pediatric tracheostomy management in the pediatric intensive care unit, utilizing targeted tracheostomy education.

Background: Pediatric tracheostomy prevalence continues to increase in our organization, along with adverse airway events and complications; most events were preventable. A literature review demonstrated quality tracheostomy education improved knowledge and confidence in tracheostomy management for healthcare professionals. Most healthcare professionals do not receive formal tracheostomy care education and no standardized tracheostomy education exists.

Methods: All pediatric intensive care unit nurses and nurse practitioners were invited to participate. This project provided a confidence survey and an objective knowledge multiple-choice questionnaire before and after attending a comprehensive pediatric tracheostomy education program. The program used didactic and case-based simulation methods. Confidence was measured on a 5-point Likert Scale and knowledge was measured as the percentage of correct questions.

Results: Three subjects participated; two nurses and one nurse practitioner. Participants had varying levels of tracheostomy management experience. Participants self-reported a mean confidence of 3.2 in tracheostomy management in 10 categories, which improved to 4.1 after completing the program. The mean multiple-choice questionnaire scores were 0.8 (80%) prior to the program. Post-education program multiple-choice questionnaire scores were 0.77 (77%), which did not demonstrate an increase knowledge. Two participants volunteered comments that the program was “very informative” and one requesting additional education.

Conclusions: This project had a small sample size that could not be statistically analyzed. No improvement in tracheostomy knowledge was observed, however, confidence performing tracheostomy care improved following tracheostomy education. Nurses, hospitalist attendings, and nursing educators from other units have requested access to the tracheostomy education program since closure of the quality improvement project, demonstrating a need for comprehensive tracheostomy education. A larger sample size needs to be obtained for additional data collection to determine tracheostomy program effectiveness.

INTRODUCTION

A tracheostomy is a surgical procedure providing a direct opening to the trachea, subsequently leading to possible complications and death in children. Performing pediatric tracheostomy management requires quality education that few nurses receive, leading to a lack of knowledge and decreased confidence when caring for tracheostomy patients. Providing targeted education for nurses may improve knowledge of tracheostomies, particularly management in emergent scenarios. Increased nursing knowledge and confidence may lead to less life-threatening airway events and increased quality care for pediatric tracheostomy patients (Agarwal et al., 2016).

In the United States (US), approximately 4,800 pediatric tracheostomies are performed annually, and more than 33% of children are under the age of one year at the time of surgery (Esianor et al., 2020). A global estimation of 25,000 pediatric tracheostomies are completed annually, with a majority occurring in prosperous countries (Brenner et al., 2020). While the mortality rate for children with tracheostomies is approximately 8%, death is usually secondary to underlying medical disease processes (Watters, 2017). The mortality rate increases in children ten years old or older; however, the US has a lower rate of hospital inpatient mortality due to adverse tracheostomy events than in other countries (Brenner et al., 2020). In children two years old and younger, the rate of tracheostomy complications is approximately 24% (Esianor et al., 2020). Many tracheostomy complications are preventable, and education is essential to improving patient outcomes in the US and globally.

Background Knowledge and Significance

A tracheostomy is one of the oldest surgical procedures, with illustrations noted earlier than the fourth century Before the Common Era (BCE) (Brenner et al., 2020). A tracheostomy creates an opening from the front of the neck to the trachea and bypasses the upper airway (Global Tracheostomy Collaborate, n.d.). An artificial airway alleviates the need for long-term endotracheal tube use, which may cause additional anatomical issues in the airway (GTC, n.d.). A tracheostomy is performed in a hospital setting to establish a safe airway and requires comprehensive patient management (Dorton et al.; Agarwal et al., 2016).

Pediatric tracheostomies are increasingly prevalent due to long-term ventilation needs (Agarwal et al., 2016). Premature newborns are born before 37 weeks of pregnancy, while micro-preemies, or extremely preterm, are born before 26 weeks of pregnancy (World Health Organization, 2018). Many preterm newborns require respiratory support while growing and a tracheostomy provides long-term ventilation needs. In newborns, congenital facial abnormalities, bronchopulmonary dysplasia (BPD) due to extreme prematurity, congenital airway abnormalities, and respiratory failure are medical conditions that may require respiratory support (Agarwal et al., 2016). In children, medical conditions that may require a tracheostomy include chronic respiratory failure, severe obstructive sleep apnea, neurological disorders, trauma, and progressive muscular disease. The mortality rate for tracheostomy-related life-threatening events in children is 3% (Agarwal et al., 2016; Mehta et al., 2020). Despite mortality risk, tracheostomies also provide benefits such as increased pulmonary hygiene compared to intubation, increased patient mobility, increased patient comfort, and at times, may be reversed if the child's medical condition improves (Pritchett et al., 2016).

Due to the severity of life-threatening tracheostomy adverse events in hospitals internationally, the Global Tracheostomy Collaborative was established in 2012. Their purpose is to unite multidisciplinary teams from global healthcare systems to collaborate on best practices to improve the quality of care and tracheostomy patient outcomes (Global Tracheostomy Collaborate, 2020). Adverse tracheostomy events include accidental decannulation, tracheostomy tube obstruction due to mucus plugging, hemorrhage, and incorrect tracheostomy tube positioning (Dorton et al., 2014). Tracheostomy complications may include tracheitis, stoma wounds, skin breakdown, pneumonia, granuloma formation, and cardiopulmonary arrest (Esianor et al., 2020). Adverse tracheostomy events and complications are, in general, preventable with quality tracheostomy care (Agarwal et al., 2016).

The otolaryngology head and neck surgery (OTO-HNS) team perform the tracheostomy procedure. When an adverse airway event occurs, there is rarely an OTO-HNS provider present (Mehta et al., 2020). The first responders to tracheostomy emergency events are nurses, non-surgical healthcare providers, or caregivers (Mehta et al., 2020; Davis et al., 2019). Approximately 2% of non-surgical healthcare professionals feel confident in performing emergent tracheostomy management (Brenner et al., 2020). Formal tracheostomy education is not provided to non-surgical medical residents or newly graduated nurses (Mehta et al., 2019). Nurses use “on-the-job” learning to build their foundation of tracheostomy knowledge and skill (Dorton et al., 2014). Healthcare professionals require specific tracheostomy education to implement quality tracheostomy care and improve patient outcomes. Multiple studies support the hypothesis that targeted tracheostomy education using didactic and simulation methods increase

tracheostomy knowledge, skills, and confidence for healthcare professionals (Agarwal et al., 2016; Brenner et al., 2020; Dorton et al., 2014; Mehta et al., 2020).

Local Problem

Phoenix Children's Hospital (PCH) is the leading tertiary children's hospital in the state of Arizona. Due to the variety of pediatric specialties at PCH, most children with airway abnormalities and respiratory failure are transported to PCH from outlying facilities, including hospitals in New Mexico and Mexico. The vision of PCH is to "be recognized for providing advanced education and training for clinical providers" and using innovative research to support the goal of excellent health care for children (PCH, 2021, "Mission & Values"). Targeted education and simulation can improve tracheostomy management and supports the values and mission at PCH.

Many families live in rural areas without medical resources such as home health nursing, tracheostomy supplies, or ventilator equipment. These barriers must be considered when making tracheostomy surgical decisions for a child living in a remote area. If a family does not have access to tracheostomy resources, other surgical options may need to be considered, or the family may be required to relocate.

On average, PCH performs 60 pediatric tracheostomies in a year and has 20 or more established tracheostomy patients in the hospital per day (Meliska, 2020). Pediatric intensive care unit (PICU) registered nurses (RNs) and nurse practitioners (NPs) provide tracheostomy management and decision-making post-operatively, which is why targeted tracheostomy education is essential. In late 2018, the tracheostomy team at PCH completed a needs assessment with a goal to reduce the number of adverse events occurring in the inpatient setting. An

employee survey was distributed to nurses to obtain feedback on comfort level when performing tracheostomy care. The survey revealed that nurses did not feel confident with all components of tracheostomy management. In 2019, the number of tracheostomies performed increased significantly; however, documented adverse tracheostomy events also doubled from 2018. Several initiatives were developed, such as standardized tracheostomy orders, a labeled tracheostomy information sheet at the head of the bed/crib, and a two-person verification of having the correct sized tracheostomy tube in place. Despite the implementations, adverse events still occur with minimal improvement noted. After a data analysis of adverse event occurrences at PCH by the tracheostomy team, it was determined that providing targeted pediatric tracheostomy education to inpatient registered nurses and nurse practitioners may reduce adverse airway events, as most were preventable.

Stakeholders such as hospital administrators, OTO-HNS division members, inpatient unit managers, respiratory therapists, inpatient nurses, healthcare providers, and families are invested in improving tracheostomy care and decreasing airway adverse events. Stakeholders recognize that providing healthcare professionals quality tracheostomy education may prevent adverse events in our organization and lead to improved teaching methods to the families who care for the patients at home. Nurse practitioners in primary care or the hospitalist setting will encounter tracheostomy patients and benefit from additional education on management. Adverse events happen more frequently at home than in the hospital setting (Global Tracheostomy Collaborative, 2020). Therefore, it is vital that caregivers also receive comprehensive tracheostomy education provided by the nurses and other healthcare providers.

Intended Improvement

Project Purpose

The purpose of this quality improvement (QI) project was to increase knowledge and confidence for nurses and nurse practitioners performing pediatric tracheostomy management in the inpatient setting utilizing targeted tracheostomy education. To evaluate this goal, PICU nurses and nurse practitioners completed a pre-education self-assessment and an objective multiple-choice questionnaire (MCQ) to identify gaps in confidence and knowledge regarding tracheostomy management. A targeted, evidence-based tracheostomy education program was developed using didactic and simulation methods. This doctoral of nursing practice (DNP) project equipped inpatient nurses and nurse practitioners with the knowledge and confidence they need to perform quality tracheostomy care for patients.

The ability to provide quality tracheostomy care and improve outcomes for patients are essential for the inpatient nurse. The PICU nurses contribute to and reinforce tracheostomy care teaching to the caregivers (Pritchett et al., 2016). The PICU nurse practitioners' diagnosis and treat children with tracheostomies. Therefore, inpatient nursing needs to have a thorough knowledge of tracheostomy care and emergency management. Quality tracheostomy care also prevents complications and airway adverse events that may be life-threatening (Roof et al., 2020). Comprehensive tracheostomy education for nurses is invaluable and will promote quality tracheostomy care.

Project Question

Does completing a targeted pediatric tracheostomy education program increase knowledge and confidence for PICU nurses and nurse practitioners when providing tracheostomy management for children in an inpatient setting?

Project Objectives

- Aim 1: Assess current tracheostomy knowledge and confidence of PICU nurses and nurse practitioners by identifying gaps using a confidence survey and an objective knowledge test.
- Aim 2: Develop a targeted pediatric tracheostomy education program using didactic and simulation methods.
- Aim 3: Implement the tracheostomy education program for PICU nurses and nurse practitioners.
- Aim 4: Provide post-education knowledge MCQs and confidence surveys to analyze if PICU nurses' and nurse practitioners' knowledge and confidence of tracheostomy management improve.

Theoretical Framework

Lewin's Change Theory

Lewin's change theory provides a sound framework to implement change and education programs within an organization. Kurt Lewin was a social psychologist and humanitarian who focused his research on resolving conflict, dynamics within groups, disparities of disadvantaged groups, and organizational development (Burnes, 2004). In the early 20th century, Lewin studied behavioral effects within ethnic, cultural, racial, and political groups and how to change learned

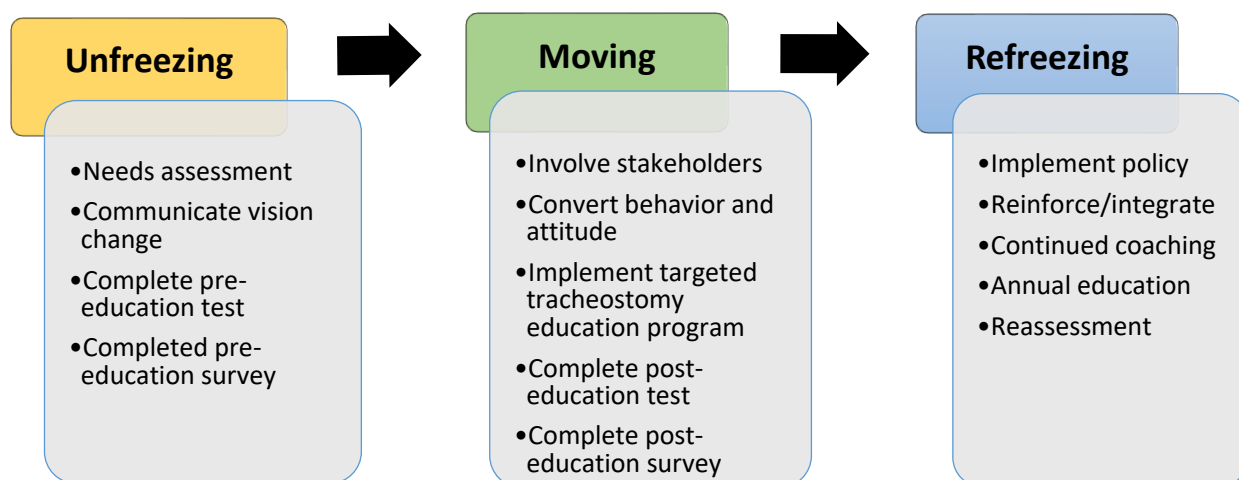
behavior (Shirey, 2013). His work included field theory, group dynamics, action research, and the 3-step model known as his change theory (Burnes, 2004). These processes are viewed as separate themes; however, Lewin felt they were intertwined (Burnes, 2004).

Concepts

Lewin supported a democratic culture that could learn, be creative, and have planned or purposeful change as a group (Burnes, 2004). His three-step model addresses behavioral changes, evaluating what needs changing in the organization, and sustaining the change effectively to build knowledge (Shirey, 2013). Lewin's change theory, displayed in Figure 1, includes the three steps of unfreezing, moving, and refreezing (Burnes, 2004). The continuous need to implement evidence-based practice and quality care in an organization requires a theoretical framework that promotes ongoing change.

Figure 1

Lewin's Change Theory in Implementing a Tracheostomy Education Program



Note: Modified from "How does authentic leadership influence planned organizational change? The role of employees' perceptions: Integration of theory of planned behavior and Lewin's three step model," by Bakari, H., Hunjra, A. I., & Khan Niazi, G. S., 2017, *Journal of Change Management*, 17(2), p. 158 (<http://dx.doi.org/10.1080/14697017.2017.1299370>). Copyright 2017 by Journal of Change Management.

Lewin described restraining forces as obstacles to change that are multifactorial (Shirey, 2013). Barriers to change in health care organizations include increasing financial costs, frequent evidence updates, workforce shortages, unmotivated employees, restrictive leadership, and organization red tape (Mitchell, 2013). These restraining forces often contribute to failure when implementing system change. To avoid failure in planned change, Lewin (1947) states the investigator must identify the individual social components of the group for the research to be successful. The key benefactors to Lewin's change theory are collaboration and planned change. Lewin proposed that organizational change is possible in his three-step change theory (Burnes, 2004).

Unfreezing

Unfreezing is the first stage of Lewin's change theory. A change agent is essential in this organizational process. In health care, a change agent is an individual in the system with the knowledge and influence to identify a problem in the process and implement transformation (Bahamon et al., 2006). The change agent may complete a needs assessment or have a vision for change. Unfreezing occurs when organizational restraining forces are identified, and a coalition is formed to address these obstacles (Shirey, 2013). Part of creating a solution for the change is eliminating old behaviors. Lewin believed that replacing old behaviors with new attitudes occurs by disrupting the system's equilibrium (Burnes, 2004).

Members of the team or group may have resistance to change, leading to frustration and anxiety (McGovern & Rodgers, 1986). Participants in the group may be concerned about additional workload and little financial reward. To unfreeze a group, causing disturbance of what is normal may motivate change and initiate deliberation (Shirey, 2013). Attempting to obtain

group members' perspectives will validate their concerns, leading to a democratic process of reversing the status quo (Lewin, 1947).

For the purpose of this quality improvement (QI) project, the unfreezing process included a previous needs assessment completed by the organization's tracheostomy team to determine the factors leading to an increase in airway adverse events. The change agent determined a targeted pediatric tracheostomy education program for nurses providing patient care may increase knowledge and, therefore, decrease airway adverse events. A pre-education knowledge MCQ and confidence survey addressed the concerns of the health care professionals in this group. To set up the second step of Lewin's change theory, assessing the current behaviors in the organization helped customize an education program that may lead to the successful uptake of the change in practice.

Moving

Using evidence to convert a restraining force to knowledge motivates movement in an organization (McGovern & Rodgers, 1986). Evidence may consist of improved patient outcomes, increased confidence for the employee, or financial gain. The organization's stakeholders provide support for the evidence and increase behavior adaptation to change. Lewin proposed the moving phase as an opportunity to research and implement change using education for the targeted group (Burnes, 2004). *Moving* is more successful if the group or individuals feel involved, feel motivated, and see the change as beneficial (McGovern & Rodgers, 1986). Providing a customized tracheostomy education plan provided a framework for the organizational change and validated the participants' needs. The learners needed to move from behavior of resistance to acceptance of the change.

Refreezing

Refreezing is the third step where change has been successfully implemented and a state of equilibrium has been rebalanced (Shirey, 2013). Lewin (1947) hypothesized that change is transformed when a group is unified in behavior and acceptance. Organizations make the change permanent at the refreezing stage by establishing policies and protocols if the transformation is effective. In this step of the QI process, the change agent and stakeholders evaluated the data and determined if the pediatric tracheostomy education program noted improved outcomes. If the program is beneficial, the organization may mandate biannual or annual participation for health care professionals that provide tracheostomy care. Antagonists of the theory state that refreezing suggests a permanent change that may leave organizations stagnant. However, Lewin proposed that the change may only be present for the desired time and a new problem will eventually exist and the process will be repeated (Lewin, 1947).

Literature Synthesis

Current education curriculums focused on increasing knowledge and confidence for nurses performing pediatric tracheostomy management were reviewed. Nurses included all registered nursing professionals who perform pediatric tracheostomy management; for this project specifically, PICU nurses and nurse practitioners. Educational tracheostomy programs may consist of simulation scenarios and didactic programs such as interactive online modules, PowerPoint presentations, and videos. The outcome measures were knowledge and confidence. Knowledge is information, practical understanding, and skills that are acquired after the intervention, or tracheostomy education program, is applied. Confidence is a feeling of trusting one's ability to perform tracheostomy management after the intervention. The outcome

measurements of knowledge and confidence were obtained by MCQs, self-assessment surveys, and observation during simulation training.

Evidence Search

A literature search was conducted to explore current tracheostomy education curriculums for health care professionals. For this literature search, multiple databases were utilized, including PubMed with MeSH database, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Google Scholar. Also, articles were reviewed and selected from the reference section of relevant studies. Keywords or phrases that were used to search the databases included: “Tracheo*,” “nurs*,” “pediatr*,” “simulat*,” “learn*,” “teach*,” “train*,” and “educat*.” Filters applied when searching databases were publication dates “from 2015-2020,” species “humans,” language “English,” and “full text available.” Results noted 147 articles, total, that were reviewed by title and abstract. After reviewing systematically and including only peer-reviewed articles, 13 studies were reported to be relevant to targeted tracheostomy education for healthcare professionals with measured outcomes. Additional articles were included from searching reference lists, despite being dated before 2015, as they pertained to the project, totaling 14 articles. No systematic reviews or meta-analyses were noted in the results.

Inclusion criteria included articles that focused on tracheostomy educational programs for health care professionals. The educational programs could consist of simulation courses, “hands-on” classes, or didactic methods. Exclusion criteria were articles that discussed tracheostomy education programs for caregivers only and percutaneous tracheostomy education programs, as that procedure is not commonly performed in the pediatric population.

Comprehensive Appraisal of Evidence

Need for Tracheostomy Education

Several organizations noted recurrent complications and poor outcomes following tracheostomy adverse events, which prompted a need for provider tracheostomy education (Dorton et al., 2014; Khademi et al., 2011; McDonough et al., 2016; Roof et al., 2020; Yelverton et al., 2015). Complications following a tracheostomy are typically preventable but may end in death (Ahmed et al., 2021; Davis et al., 2019; Hsieh et al., 2020; Mehta et al., 2020). Mortality rates due to tracheostomy emergencies are approximately 3% (Agarwal et al., 2016; Mehta et al., 2020). Several studies emphasized a global component of discomfort with tracheostomy management by health care professionals, including nurses (Davis et al., 2019; Dorton et al., 2014; Hsieh et al., 2020; McDonough et al., 2016; Yelverton et al., 2015). Without comprehensive tracheostomy education, patient mortality and morbidity increase. In Davis et al. (2019), outcomes demonstrated decreased mortality rates and tracheostomy readmissions due to simulation education programs.

Multiple articles expressed a need for targeted tracheostomy education for health care professionals (Agarwal et al., 2016; Ahmed et al., 2021; Davis et al., 2019; Dorton et al., 2014; Hsieh et al., 2020; Khademi et al., 2011; McDonough et al., 2016; Mehta et al., 2020; Ramsey et al., 2017; Roof et al., 2020; Twose et al., 2019; Yelverton et al., 2014). Studies had a wide variety of participants including attending physicians, fellows, residents, medical students, advanced practice providers, registered nurses, licensed practical nurses, and respiratory therapists. Training staff in tracheostomy management was essential to improve patient outcomes and led to developing structured tracheostomy education programs for organizations (Twose et

al., 2019). However, organizations such as home health agencies are not required to provide annual training for tracheostomy and ventilator management (Ramsey et al., 2017). Home health agencies are not reimbursed well, making it difficult for nurses to have paid time to complete tracheostomy education. Ramsey et al. (2017) conducted a study to address the educational needs of home health nurses performing tracheostomy care, which noted improvement after a four-hour education session. Many studies used Dorton et al. (2014) to guide educational programs by using self-assessment evaluations, objective testing, and observational data during simulation exercises to measure outcomes of targeted tracheostomy education.

Confidence Performing Tracheostomy Management

Confidence is essential when performing tracheostomy care and is present when a health care professional has knowledge of a subject and has the certainty of completing a task. To measure confidence with performing tracheostomy care, 10 studies distributed pre- and post-education self-assessments using a Likert scale and included pre-and post-education objective tests, measuring knowledge (Agarwal et al., 2016; Ahmed et al., 2021; Davis et al., 2019; Dorton et al., 2014; Mehta et al., 2019; Mehta et al., 2020, McDonough et al., 2016; Ramsey et al., 2017; Roof et al., 2020; Yelverton et al., 2015). All ten studies noted improvement in confidence levels following tracheostomy education. Two studies completed simulation education and confidence self-assessment surveys pre- and post-education intervention without objective knowledge testing (Bolsega & Sole, 2018; Twose et al., 2019). Both studies noted improvement in confidence after targeted tracheostomy education. Davis et al. (2019) reported retention of confidence at a six-month follow-up. In contrast, Dorton et al. (2014), Mehta et al. (2019), and Yelverton et al. (2015) did not have a statistical significance at the six-month follow-up for

confidence compared to post-education results. Overall, studies that completed a self-assessment survey for confidence or comfort with performing tracheostomy management noted statistical significance for improvement from pre- to post-tracheostomy education.

Knowledge Performing Tracheostomy Management

When performing tracheostomy management, knowledge of proper technique, patient anatomy, pathophysiology, and equipment is essential. Twelve studies completed a pre-education objective test and followed with a post-education test using MCQ for both. Tracheostomy education was provided using simulation and didactic methods such as a PowerPoint presentation or online module. Simulation scenarios included routine tracheostomy care and tracheostomy emergency management. All twelve studies noted a significant improvement in post-education intervention scores (Agarwal et al., 2016; Ahmed et al., 2021; Davis et al., 2019; Dorton et al., 2014; Hsieh et al., 2020; Khademi et al., 2011; McDonough et al., 2016; Mehta et al., 2020; Mehta et al., 2019; Ramsey et al., 2017; Roof et al., 2020; Yelverton et al., 2015). Five studies completed a six-month follow-up objective test, which noted no statistical significance from the post-education scores and few participants completed the test (Davis et al., 2019; Dorton et al., 2014; Mehta et al., 2020; Mehta et al., 2019; Yelverton et al., 2015). Hsieh et al. (2020) completed a three-month follow-up that noted retention of the educational material. Studies did not address knowledge retention past six months. Knowledge increased significantly after targeted tracheostomy education leading to some organizations implementing annual competencies (Dorton et al., 2014; McDonough et al., 2016).

Strengths of Evidence

All studies concluded that health care professionals' knowledge and confidence improved following a comprehensive tracheostomy education program. Most of the studies reported similar outcome measurement tools, such as utilizing a Likert scale for confidence self-assessments and MCQ for knowledge assessments. Similar methods allowed for a detailed comparison between studies and organizations as well as improved homogeneity. The Clinical Consensus Statement on Tracheostomy Care by the American Academy of Otolaryngology-Head and Neck Surgery (2013) was published to help decrease variation in tracheostomy care. This consensus was incorporated into several of the tracheostomy educational programs (Ahmed et al., 2021; Mehta et al., 2020; Yelverton et al., 2015). Studies agreed that increased knowledge and confidence might decrease poor outcomes during a tracheostomy emergency event and continued tracheostomy education is critical.

Weaknesses of Evidence

Several limitations were present in all 14 studies and were considered when interpreting the data. Nine studies had small sample sizes, less than 100 participants (Agarwal et al., 2016; Bolsega & Sole, 2018; Dorton et al., 2014; Khademi et al., 2012; Mehta et al., 2020; Ramsey et al., 2017; Roof et al., 2020; Sandler et al., 2020; Yelverton et al., 2015). Several studies mentioned participants who did not complete a post-tracheostomy education self-assessment or post-objective test directly after the program or the six-month follow-up period, which alters data. Self-assessments scores are subjective, and some participants may initially self-score higher than their knowledge or comfort actually is. Significant limitations to the studies were that participants had scheduling conflicts, were unable to take time off work, lacked transportation to

the education program site, or residents completed their rotations before the six-month follow-up (Ramsey et al., 2017). Most of the studies completed a similar study to Dorton et al. (2014) as there is no valid tool to measure tracheostomy knowledge nor how long a tracheostomy education program should be. Three studies were specific to pediatric tracheostomy management education.

Gaps and Limitations

Currently, there is no gold standard or guidelines for tracheostomy care or management (Agarwal et al., 2016; Ahmed et al., 2021). In the US, there is a wide variety in the care of tracheostomies, which may cause confusion among health care professionals (Ahmed et al., 2021). Few studies address tracheostomy emergency management (McDonough et al., 2016). In Davis et al. (2019), only one participant, a medical school graduate from another country, had previously attended a tracheostomy education course. There are no validated tools to assess knowledge or a provider's level of tracheostomy management skills (Mehta et al., 2020). There is a need to establish global guidelines using an evidence-based approach to decrease tracheostomy complications and provide consistent education for tracheostomy management.

METHODS

Project Design

This DNP project used a prospective observational cohort study design with electronic confidence surveys and knowledge MCQs distributed to participants before and after completing the pediatric tracheostomy education program. The eligible participants were selected for this project before applying the intervention (Schultz & Grimes, 2019). The intervention consisted of both a didactic presentation and a simulation session on pediatric tracheostomy education. The

participants were followed over time until the established follow-up period. Data analysis of the dependent variables, confidence, and knowledge were obtained from the same participant group when comparing the pre-tracheostomy education survey and MCQ to the post-education program survey and MCQ. This observational study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for transparent reporting (von Elm et al., 2007). Both theoretical and implementation frameworks supported the DNP project design.

Model for Implementation

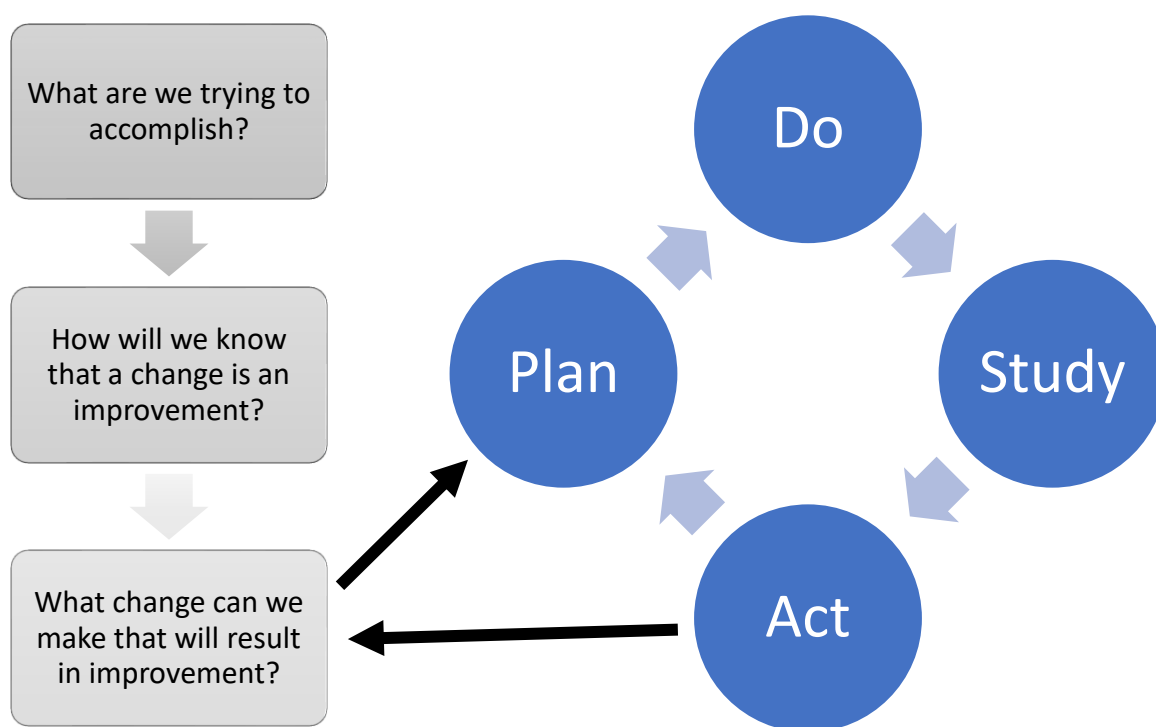
The theoretical framework to assist with behavioral adaptation of change was based on Lewin's change theory. The implementation framework used for improved change was the Model for Improvement (MFI) (Figure 2). MFI consists of two parts to implement change; three improvement questions and the Plan-Do-Study-Act (PDSA) Cycle (Langley et al., 2009). The three principal questions guide the change agent in developing a focused and thorough improvement process for an organization. MFI is designed to improve a system process or outcome, not to implement change to sustain a practice (Institute for Healthcare Improvement [IHI], 2021). The PDSA Cycle allows for trial and error by encouraging continuous analysis and repeating cycles to reach the project objectives. The MFI supported this QI project by allowing testing on a smaller platform, to evaluate the impact of the intervention, and identify barriers that existed before implementing on a larger scale (Langley et al., 2009).

The principal questions focus on the objectives of the project. To improve the system process, the project investigator (PI) developed aims and how the outcomes were measured (Langley et al., 2009). The objectives included the population participating in the change, the project's timeframe, and the setting the QI project will occur (Langley et al., 2009). Forming a

team of experts or organization members contributed new ideas and recognized potential barriers that assisted with the project's planning process (IHI, 2021). An improvement can be measured using quantitative data. The PI reviewed change before and after the intervention using measurement tools such as a Likert scale and MCQ test. After analysis, the PI evaluated whether improvements occurred and if the change should be permanent.

Figure 2

The Model for Improvement



Note: Modified from "How to Improve," by the Institute for Healthcare Improvement, 2021, (<http://www.ihl.org/resources/Pages/HowtoImprove/default.aspx>). Copyright 2021 by the Institute for Healthcare Improvement.

Plan-Do-Study-Act (PDSA) Cycle

Plan

The first step in the PDSA Cycle is developing aims or objectives to improve a process (IHI, 2021). Planning requires assessing organizational readiness, including forming a team with expertise on the project objective. The use of flyers, emails, or other data may be necessary to explain and communicate to participants and stakeholders why the change is needed. The objectives should include the timeframe, the target population, how data will be collected, and the project setting (Langley et al., 2009). This step allows the team to make hypotheses, predict the outcomes, and decide how the data will be stored and analyzed (Zann et al., 2021).

During the planning phase, the PI attended routine tracheostomy team meetings to assess pediatric adverse airway event recurrence. The team completed a driver diagram and used a previous employee survey on tracheostomy care to determine how to decrease airway events and identify a cause. The surveys revealed nurses did not have the same level of knowledge of tracheostomy management. Multiple process changes were identified; however, for this QI project, providing targeted pediatric tracheostomy education was the objective.

The PI implemented a pilot education program in the PICU at the children's hospital. The target population was PICU nurses and nurse practitioners who clinically managed care for pediatric tracheostomy patients. The stakeholders were identified as the PICU educator, the tracheostomy nurse, the OTO-HNS providers, and the PICU manager. The project intervention was to be completed during the PICU annual training sessions and new employee PICU orientation. The approximated time of participant involvement was two hours in total. Data was

collected and analyzed from the pre- and post-tracheostomy education surveys and MCQs to determine if the change demonstrated improvement.

Do

The second step in the PDSA Cycle is implementing the plan, recording observations, identifying barriers, and revising the intervention as needed (Langley et al., 2009). The project PI briefed the participants on the change or intervention, increasing the participants' readiness. The PI documented observation and process flaws that may need to be resolved during this second step or integrated into the next PDSA Cycle (IHI, 2021).

During this implementation phase, the PI proceeded with PICU nurse and nurse practitioner recruitment and informed the volunteers of the intended process change. The project was a pilot program limited to one hospital unit. The participating nurses and nurse practitioners completed pre-education confidence surveys and knowledge MCQs. During the annual PICU education session, the participating nurses and nurse practitioners were to attend an additional pediatric tracheostomy education program. The program included a one-hour PowerPoint presentation and a 20-minute simulation session on tracheostomy education and management. The participants completed a post-education confidence survey and knowledge MCQ to measure outcomes. An example of an anticipated barrier may include the time required to complete the education program and the number of participants volunteering.

Study

The third step in the PDSA cycle evaluates and analyzes the data from the measured outcomes (IHI, 2021). The data analysis helps the PI gain knowledge on the change implemented and to compare processes for improvement. The study phase of the PDSA Cycle includes

evaluating if the change can be implemented in various settings or if the change needs altering to meet environmental differences (Langley et al., 2009). The measured outcomes are assessed to determine if the change supports the hypothesis or if a relationship exists between the outcomes and intervention (Zann et al., 2021).

For this project's purpose, the study phase included analyzing the results of the self-assessment surveys for confidence levels and the MCQ for knowledge measurements. The PI noted observations from the simulation scenarios and overall intervention process. Data was examined to determine if the tracheostomy education program improved knowledge and confidence for PICU nurses and NPs or was deemed ineffective. The PI used the results to discuss if the process change is compatible across all hospital units or if adjustments need to be considered to improve outcomes.

Act

The fourth step of the PDSA Cycle reflects on what was learned and interpreted in the previous actions (Langley et al., 2009). The PI evaluated parts of the process that were effective and areas that need to be modified. This phase of the PDSA cycle determines if the change demonstrated improvement for the system and if the change can be implemented on a larger scale (Langley et al., 2009). An example of a barrier that may arise from a new process being implemented across a hospital is providing the pediatric tracheostomy education program on alternating work shifts, including weekends. If new barriers or possible sustainability are identified from the previous steps, the PDSA Cycle may need to be repeated to address additional process changes.

Setting and Stakeholders

This DNP project's setting was the PICU at PCH in Phoenix, Arizona. PCH is a standalone, tertiary hospital and receives trauma and airway patients from Arizona, New Mexico, and Mexico. The PICU is a 48-bed unit in a 433-bed hospital with multiple pediatric specialties available. Children who receive tracheostomies for respiratory failure or airway abnormalities are placed in the PICU after surgery for three to seven days. The PICU nurses and nurse practitioners provide tracheostomy care for post-operative patients. This DNP project aimed to provide targeted pediatric education to nurses and nurse practitioners who provide tracheostomy management; therefore, the PICU was an ideal setting and was accessible for a pilot program.

The authorization was obtained from PCH's nursing governance committee to implement this DNP project for PICU nursing tracheostomy education. Key stakeholders included the PICU nurses, PICU nurse practitioners, the tracheostomy nurse, the PICU manager, the PICU educator, and the division chief of OTO-HNS. Additional stakeholders that were utilized for expertise in tracheostomy education were the members of the tracheostomy team and OTO-HNS providers. The PI consulted with the chief of OTO-HNS regarding research guidance and tracheostomy education material recommendations. The PICU manager authorized recruitment material to be submitted to the PICU nurses and nurse practitioners; input was received to implement the tracheostomy education program. After this discussion, the PI chose to complete this project during the annual PICU education session to provide the least interruption of work and personal time.

Planning the Intervention

This project's intervention was a one-hour PowerPoint presentation on tracheostomy management and a 20-minute simulation session on tracheostomy emergencies (Appendix D). Volunteers were recruited using flyers, announcements in the PICU education newsletter, and the hospital email system (Appendix B). Recruitment material included details on informed consent and that consent was implied if participating in the tracheostomy education program. Each PICU nurse and nurse practitioner included in the study received a pre-education program confidence survey and knowledge MCQ on tracheostomy management via Typeform. A demographic survey was included in the pre-education program email. The PowerPoint presentation was emailed to the participants with an attached link for viewing prior to the simulation sessions being scheduled. The PowerPoint presentation contained airway anatomy, when to consider a tracheostomy, the procedure, post-operative care, routine care, patient follow-up, decannulation, and family teaching education. The simulation session was to occur on the same day as the participants' PICU annual education day. The simulation session included three tracheostomy emergency scenarios addressing accidental decannulation, tracheostomy tube obstruction, and hemorrhage. Following the educational program, the same confidence survey and MCQ were emailed to the participants to be completed via Typeform. The participants had one week to complete the post-survey and knowledge MCQ.

Participants and Recruitment

For this project's purpose, included participants were PICU nurses and nurse practitioners who provide tracheostomy care to inpatient pediatric patients. Project participants were not randomized as this was voluntary. Homogeneity of the sample was met due to the inclusion

criteria. Multiple healthcare professionals expressed interest in participating in a tracheostomy education program; however, for this pilot program, inclusion criteria were limited to PICU nurses and nurse practitioners employed by PCH, who completed all sections of the project. Exclusion criteria included healthcare professionals who were not PICU nurses or NPs and participants who did not complete all the project components. Components included pre- and post-education surveys, MCQs, a demographic survey, a PowerPoint presentation, and the simulation session.

PICU nurses and NPs were invited to participate in a targeted pediatric education program via unit flyers, the PICU education monthly newsletter, and hospital-based emails. The invitation included how to contact the PI when interested in volunteering to participate and the time commitment that was required. Information also included that the simulation sessions were to be completed during the annual skills lab or prior to their scheduled shift to use minimal to no additional personal time. The goal was to achieve a minimum of ten participants to volunteer for this tracheostomy education program.

Consent and Ethical Considerations

Research ethical guidelines ensure study integrity and protect the participants throughout the study (National Institute of Health [NIH], 2016). Volunteers of the study were informed of the project objectives, the time commitment required, outcomes measured, and changes that occur throughout the study. Respecting the participants' privacy and allowing them to withdraw at any point of the study was essential (NIH, 2016). Throughout this DNP project, non-maleficence was a primary principle incorporated to find a standard of nursing care that would prevent harm to pediatric patients with tracheostomies (Schröder-Bäck et al., 2014). Supporting

PICU nurses and NPs by increasing their knowledge of tracheostomy management attempts beneficence for both nurses and the patients (Schröder-Bäck et al., 2014). Justice was met with the inclusion of offering tracheostomy education to all PICU nurses and NPs who volunteered (Schröder-Bäck et al., 2014).

Participation in this QI project was voluntary and implied consent was stated in the recruitment material before starting the pre-education material. The informed consent was described in writing and included the purpose, method, risks, and benefits of the project. The volunteers were healthcare professionals; therefore, the population was not considered vulnerable.

Timeline

A timeline was started once the application to complete a QI project was submitted to PCH IRB (Appendix E). The timeline documented PCH IRB approval, the University of Arizona College of Nursing approval, and important dates until the completion of the project.

Data Collection

The PI collected quantitative and qualitative data using the Typeform platform. The confidence survey and the knowledge MCQ were reviewed by two pediatric otolaryngologists for validity and content. A 10-question survey measured confidence using a Likert scale ranked strongly disagree (1 point) to strongly agree (5 points) (Appendix C). Questions included comfort level with performing certain tracheostomy tasks. Additional quantitative data measuring knowledge was obtained using ten questions with multiple-choice answers labeled “a” through “e” (Appendix C). The MCQ questions focused on anatomy, equipment knowledge, and patient scenarios. The survey and MCQ were the same pre- and post-education program for

comparison. The post-education confidence survey included one open-ended question asking for recommendations for education program improvement. This qualitative data was collected to guide further PDSA cycles. Demographic questions were collected pre-intervention and included highest nursing degree obtained, years of experience in the profession, number of tracheostomy tubes change in the past year, and any participation in formal tracheostomy education in the past (Appendix C).

The data acquired was transferred from the electronic platform Typeform to an Excel spreadsheet. One week after the last education session, the link to the post-education survey and MCQ were closed. This ended additional incoming data as this was a fixed data set (Rothers, 2021a). The data was stored on a password-protected computer and required a password to access the Typeform and the Excel spreadsheet. After submission of this QI project, the data set was submitted to the University of Arizona and stored in a cloud service by the University.

Data Analysis

The data set included quantitative and qualitative data. The confidence survey and knowledge MCQ answers were ordinal data. The demographic survey data contained categorical data except for the last question which is categorical dichotomous data. The final question in the post-education confidence survey was qualitative data.

Data collected in this QI project was non-parametric. The Wilcoxon matched-pairs signed-rank test was to be used as this method compares the pre- and post-education program results from the same participant. The results determine if attending a tracheostomy education program changes confidence and knowledge for nurses and nurse practitioners. Descriptive statistics was be used to measure central tendency of the data obtained. Data may be calculated

using statistical websites such as Social Science Statistics (Stangroom, 2021). The results were visually displayed using bar charts and tables to demonstrate changes and comparisons.

After receiving the surveys and MCQ data, the PI planned to consult with a biostatistician at PCH to ensure results were trustworthy and statistically significant. Data was analyzed within an Excel spreadsheet, once transferred from Typeform. Statistical analysis of the data from the surveys and MCQ were to be completed using a Wilcoxon matched-pairs signed-rank test to compare pre-and post-education results. The Social Science Statistics (2021) website calculator was used. Confidence levels were calculated by finding the mean for each category and each survey completed by the participant. Strongly disagree had a score of one, disagree had a score of two, neutral had a score of three, agree had a score of four, and strongly agree had a score of five. The null hypothesis was the mean or score from the pre- and post-education data was identical or zero. The significance level was to be measured less than 0.05. Qualitative data was reviewed for themes for education program improvement.

RESULTS

Outcomes

Sample Size and Demographics

A total of nine participants from the PICU volunteered to complete the tracheostomy education program. Nine individuals completed the pre-education confidence survey and knowledge MCQ by October 29, 2021. Seven participants completed the demographic survey by October 29, 2021. Three participants completed all parts of the education curriculum, including posttesting, and were included in the study. Two participants rescheduled their simulation sessions to a time after the end of the project due to mandatory quarantine from positive COVID-

19 testing. Two participants rescheduled simulation sessions after the project was closed as they were called in to work due to staffing issues. Two participants have not responded to reminder emails to schedule the simulation sessions. Sample size was limited due to staffing shortages and more than 50 new PICU nurses that were completing orientation during this period. Three additional nurses have requested to participate in the tracheostomy education program after the study closed.

Of the three participants, each degree was represented with varying levels of nursing experience (Table 1). Two participants had formal tracheostomy education in the past, while the nurse with the least experience had none. Within the past year, the nurse with more than 10 years of experience has changed more than 50 tracheostomy tubes, the nurse practitioner has changed 10-20, and the least experienced nurse has changed less than five.

Table 1

Tracheostomy Education Participant Demographics

Participants (N=3)	
Highest Nursing Degree	
Associate Degree	1 (33.3%)
Bachelor	1 (33.3%)
Doctorate	1 (33.3%)
Years of Experience	
< 1 year	1 (33.3%)
1 – 2 years	0 (0%)
2 – 4 years	0 (0%)
5 – 10 years	1 (33.3%)
> 10 years	1 (33.3%)

Table 1 – Continued

Participants (N=3)	
Years of Experience (Prior to NP degree)	
< 1 year	0 (0%)
1 – 2 years	0 (0%)
2 – 4 years	0 (0%)
5 – 10 years	1 (33.3%)
> 10 years	0 (0%)
N/A	2 (66.7%)
Trach Tube Changes (Past Year)	
< 5	1 (33.3%)
5 – 10	0 (0%)
11 – 20	1 (33.3%)
21 – 50	0 (0%)
> 50	1 (33.3%)
Formal Tracheostomy Education	
Yes	2 (66.7%)
No	1 (33.3%)

Note: Data for each demographic group was presented in percentages due to low sample size.

Data Analysis and Outcomes

The Plan-Do-Study-Act (PDSA) portion of the Model for Improvement (MFI) guided the intervention, data collection, and data analysis, especially with unforeseen complications.

Appendix E demonstrates the timeline. The participants completed the pre-education confidence survey, knowledge MCQ, and demographic survey prior to viewing the PowerPoint and attending the simulation session. Initially, the simulation session was to be incorporated into the annual PICU skills labs starting in June 2021. However, the annual skills lab was moved to small group sessions, scattered throughout the fall and winter months, due to staffing shortages and an increase in PICU patient census. Also, approval for this QI project from the study site was not

received until September 9, 2021, which caused a subsequent delay in receiving IRB approval from the University of Arizona on October 22, 2021. The simulation sessions had to be conducted with no more than three people in a room due to COVID-19 restrictions, limiting participant numbers. The study was restricted to eight days and did not fall on a scheduled annual skills lab day. Therefore, individual simulations sessions were conducted, which became difficult to schedule.

Implementation of the project began on October 22, 2021 by sending the recruitment email to PICU nurses and nurse practitioners. Pre-education material was completed via Typeform by the participants, followed by viewing the PowerPoint didactic education. Simulation sessions were scheduled prior to the participants shift and lasted 25 minutes to allow five minutes to answer questions or review material per participant request. Post-education material was sent to participants upon finishing the simulation session. Data collection was completed on October 29, 2021 and analyzed on October 30, 2021. Due to a small sample size, planned statistical analysis was not utilized, including the use of a biostatistician. The data received were reviewed by faculty. Results were described in narrative format due to small sample size and visually demonstrated using a bar chart or table.

Knowledge

Participants completed a pre- and post-education MCQ on tracheostomy knowledge (Appendix C). A Wilcoxon signed-rank test was to be utilized, but due to an extremely small sample size, percentages were used for statistical analysis (Table 2). The Social Science Statistics website (2021) confirmed the sample size was too small for calculation. Two participants scored worse on the post-education knowledge MCQ. Of those two participants, one

scored 10% less than the pretest, while the other scored 30% less than the pretest. One participant answered all posttest questions correctly, scoring 100%, which was a 30% improvement.

The most incorrectly answered questions were a patient scenario referring to a tracheo-innominate fistula, “the following physiological changes occur with a tracheostomy except,” and “what should not be done when you attempt to change a tracheostomy tube and it cannot be replaced with the same size tube” (Appendix C). Two of these questions focus on a negative option as the answer and can be distracting or confusing for participants; however, other questions in this format were answered correctly. The results demonstrate with a high degree of confidence, that the null hypothesis can be rejected as a difference was noted between the pre- and post-education MCQ percentages, albeit a decrease in knowledge. The primary objective was not achieved as the data shows there was no increase in knowledge in many of the participants.

Table 2

Tracheostomy Knowledge Pre- and Post-Tracheostomy Education

	Pre-MCQ	Post-MCQ	Difference
Participant 1	0.9 (90%)	0.8 (80%)	- 0.1 (- 10%)
Participant 2	0.8 (80%)	0.5 (50%)	- 0.3 (- 30%)
Participant 3	0.7 (70%)	1.0 (100%)	0.3 (+ 30%)

Note: Data was presented in percentages due to low sample size.

Confidence

Participants rated their confidence and comfort in tracheostomy care using a Likert scale with a range from “1” being “strongly disagree” to “5” being “strongly agree” (Appendix C).

Again, the sample size was too small to complete a Wilcoxon signed-rank test; therefore, pre-, and post-education ratings were compared using scores and percentages (Table 3). Two participants reported an increase in confidence by at least 30%, while one participant reported a minimal decrease in confidence by 4%. The results suggest the null hypothesis is rejected as a difference was demonstrated between pre- and post-education surveys scores and percentages.

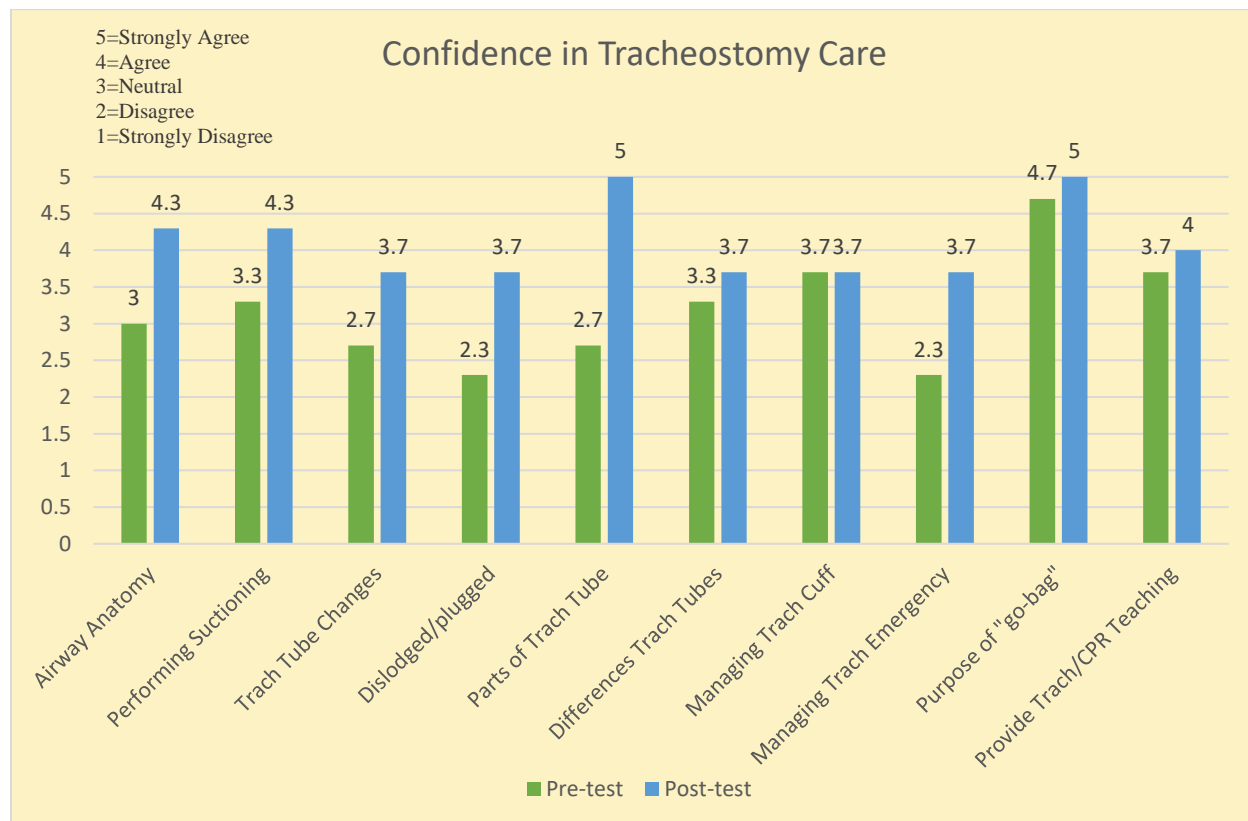
Table 3

Tracheostomy Confidence Pre- and Post-Tracheostomy Education

	Pre-Survey	Post-Survey	Difference
Participant 1	2.3 (46%)	3.9 (78%)	1.6 (32%)
Participant 2	2.9 (58%)	4.4 (88%)	1.5 (30%)
Participant 3	4.3 (86%)	4.1 (82%)	- 0.2 (- 4%)

Note: Data was presented in scores and percentages due to low sample size.

The means of the participants pre- and post-confidence surveys, by category, are demonstrated in Figure 3. Lack of confidence was higher in categories that involved emergency tracheostomy management and with management of a plugged or dislodged tracheostomy tube. There is an overall increase in confidence for each tracheostomy management category, except for confidence in managing a trach tube cuff. The project objective of increasing confidence in tracheostomy management for nurses and nurse practitioners was met, overall.

Figure 3*Confidence in Tracheostomy Management Pre- and Post-Education*

Note: The legend shows the scoring for each answer on the Likert Scale. Scores of confidence levels from all participants were combined for each category and the mean of all participant answers are displayed for each bar.

Qualitative Findings

An additional question was added to the post-education confidence survey asking participants to write in thoughts on the tracheostomy curriculum or recommendations on how to improve the education program. One participant wrote “great presentation, very informative.”

One participant did not answer. One participant stated:

“I found this education very informative and helpful. As a new grad, this was very valuable. I feel like many nurses do not know the various types of trach emergencies or what to do for them besides call the provider. I think that it would be helpful to have more education related to trach emergencies and troubleshooting available to us.”

The theme of the answers received was “very informative,” which supports the project’s objective of increasing knowledge and confidence for nursing professionals.

DISCUSSION

Summary

A tracheostomy is a surgical procedure that provides a safe airway in the pediatric population but also requires comprehensive medical management by healthcare professionals (Dorton et al.; Agarwal et al., 2016). In the US, pediatric tracheostomies are increasing in prevalence due to patients’ long-term ventilation needs. In the past year, the number of tracheostomy patients has increased significantly at Phoenix Children’s Hospital. An increase in tracheostomy patients in the organization has led to an increase in patient adverse events and complications, which are preventable based on events reviewed.

Nurses and NPs do not typically receive formal pediatric tracheostomy education. A literature review revealed all studies demonstrated an increase in knowledge and confidence in tracheostomy management for a variety of healthcare professionals, following tracheostomy education using didactic and simulation methods. These positive outcomes prompted this QI project to develop an increase in knowledge and confidence for PICU nurses and nurse practitioners following participation in a comprehensive pediatric tracheostomy curriculum. Benefits of targeted tracheostomy education for PICU nurses and nurse practitioners were observed in the simulation sessions as participants asked follow-up questions, verifying content presented. Key findings were pre- and post-education surveys noted improvement in confidence of tracheostomy management. Pre- and post-education MCQs did not show knowledge improvement following tracheostomy education. The sample size was not adequate to determine

if the intervention was statistically significant. The tracheostomy education program was described as “very informative,” indicating education was beneficial.

Interpretation

Knowledge

The outcomes evaluated did not support increased knowledge following tracheostomy education. Two of the three participants decreased in knowledge following the intervention. The questions with incorrect answers had negative distraction words such as “not” and “except” that may confuse participants if they are reading quickly. The most missed questions also contained material that participants are least exposed to such as tracheo-innominate fistulas, swallowing assessment with tracheostomies, and emergent tracheostomy tube changes. In the future, the knowledge MCQ should be written as positive options; meaning, removing the negative distraction words so there is no confusion by the reader, leading to accurate data. These findings did not correlate with study results from the literature review. Those studies contained at least 14 or more participants, with most of the studies reporting over 40 subjects. This QI project would have had statistical data on knowledge following a tracheostomy education if the sample size was larger and the implementation was extended to six months.

Confidence

The outcomes evaluated for level of confidence following tracheostomy education improved in nine out of ten categories. The largest increase in confidence using the mean of all participants was noted in “tracheostomy tube parts” followed by “managing trach emergency” and “dislodged/plugged” tracheostomy tubes. The increase in these categories is encouraging as the simulation sessions focused on tracheostomy emergency management.

Summary of Implementation Framework

The PDSA cycle includes planning of the QI project, including anticipating barriers. Information on the QI project was provided to the participants; however, despite utilizing the theoretical framework of Lewin's change theory, behavioral acceptance of the benefits of tracheostomy education was not overwhelming achieved. During the "do" phase, barriers occurred with a staffing shortage and high hospital patient census, which decreased participation. PICU nurses and nurse practitioners were working extra shifts during this time. After evaluating outcomes in the "study" phase, a plan of developing unit specific tracheostomy education was deemed to be beneficial; some units provide more teaching with caregivers for established tracheostomy patients. Due to the small sample size and barriers that were experienced, the "act" phase was used to consider additional changes to the intervention for an additional PDSA cycle. For instance, does attending a tracheostomy simulation session via video or zoom, increase knowledge and confidence when participants cannot attend in person?

Implications

Practice

Despite the QI project having too small of a sample size to be statistically significant, there is a need for pediatric tracheostomy education in our organization. Since the completion of this project, three additional PICU nurses have requested to complete the tracheostomy education program. In addition, several unit educators and two hospitalist attendings within the organization have requested access to the PowerPoint presentation for staff education, demonstrating an education need on tracheostomy care. This education program can be reformatted to an online module for an annual or new hire requirement. Barriers include more

time to implement this education project during a time of staff shortages and the PowerPoint presentation was long. Practice implementation within the organization can be further discussed by including stakeholders such as the nursing governance council and the tracheostomy team.

Education

Tracheostomy education and emergency management is essential to quality patient care. Decreasing adverse events and complications in tracheostomy patients in the organization and when the patients are at home can be lifesaving. The outcomes from Dorton et al. (2014) demonstrating increased knowledge and confidence following tracheostomy education, influenced additional studies that obtained similar results. Further studies are needed on retention of knowledge and confidence one year after tracheostomy education and a large study including various nursing units. Nurses are required to teach tracheostomy care and emergency management to the caregivers of the tracheostomy patients. Therefore, nurses and NPs must be knowledgeable and confident in tracheostomy care.

Research

This PI developed a didactic and simulation tracheostomy education program based on existing literature to pilot a QI project. To obtain precise and accurate outcomes, a longer implementation time, preferably six months, is needed to capture a larger sample. If data is statistically significant, a follow-up study should include the number of adverse events and complications that occur before and after the QI project. Another area of further research is providing a tracheostomy education program to home health nurses within the community and to the medical professionals in rural Arizona.

Policy

During implementation of this QI project, dated or lack of tracheostomy policies were found within the organization. These policies and protocols will need to be updated and more specific regarding tracheostomy care. The process of change can be initiated by reviewing current policy and protocols with the tracheostomy team prior to submitting for committee review. Davis et al. (2019) and Dorton et al. (2014) discussed that annual tracheostomy education would be beneficial as post-education test scores decreased after a six-month period. Annual tracheostomy education should be implemented in the future to provide updates to current staff and educate new hires.

Limitations

There were limitations noted during this QI project. The most significant limitations were the small sample size and short duration of time for implementation. Causes of these limitations may be high patient census and limited staffing during the time of the project, leading to lack of participants. Several people expressed interest in participating but contacted this PI after completion of the project. A barrier that may affect small sample size was many PICU nurses expressed to this PI that they did not feel they needed additional education at this time. Therefore, this PI was not able to initiate the unfreezing stage of behavioral acceptance that change would be beneficial. Reminder emails to encourage completion of the tracheostomy program were sent to participants who started pre-education surveys and MCQ, but the short implementation time did not allow the participants to complete the program, leading to a small sample size.

An additional limitation was the delay in QI project and IRB approval. During the summer of 2021, the organization had a change in research leadership and electronic IRB submission methods. This project did not require IRB approval at the implementation site and was submitted to the nursing governance council for review, which met monthly. Approval was obtained seven weeks later, delaying the QI project.

This QI project was implemented on one unit of a single site, making it not generalizable. Additional project design flaws include restrictions on the number of people in one room due to COVID-19. Scheduling the simulation sessions had to occur on an individual basis, around the shift of the participant which was difficult to coordinate.

Bias was noted during the QI project. Recruitment was completed via emails and fliers. However, the pre- and post-education material and PowerPoint presentation required access to a computer, which may limit participants. This method of implementing the intervention was to allow participants to watch the PowerPoint presentation and access material at home versus a distracting setting, such as the PICU. The small sample size and data obtained did not allow for validity.

DNP Essentials Addressed

The Doctor of Nursing practice (DNP) program is guided by the eight competencies of the DNP Essentials (American Association of Colleges of Nurses [AACN], 2006). This QI project integrated four essentials.

DNP Essential II

DNP Essential II, *Organizational and Systems Leadership for Quality Improvement and Systems Thinking* (AACN, 2006), was addressed in this QI project. The project was formulated

with a goal of improving patient outcomes and safety for pediatric tracheostomy patients by providing education for nurses and nurse practitioners. Developing and implementing a tracheostomy curriculum within a large medical organization required navigation and approval from multiple committees.

DNP Essential III

Essential III, *Clinical Scholarship and Analytical Methods for Evidence-Based Practice* (AACN, 2006), was incorporated by conducting a scholarly literature review to guide this QI project. Analytical methods were used to evaluate the literature and determine best practice in pediatric tracheostomy care.

DNP Essential VI

Essential VI, *Interprofessional Collaboration for Improving Patient and Population Health Outcomes* (AACN, 2006), guided the process when performing a needs assessment and driver diagram by the tracheostomy team. Using interprofessional collaboration and communication, this PI formed a tracheostomy curriculum to address organizational patient safety concerns.

DNP Essential VIII

DNP Essential VIII, *Advanced Nursing Practice* (AACN, 2016), prepares the advanced practice nurse to complete a comprehensive assessment to address health outcomes of pediatric tracheostomy patients. This nurse practitioner reviews evidence-base practice to address complex patient concerns. Best practice is used to develop and provide tracheostomy education to improve nursing practice and address organizational needs.

Conclusion

These outcomes indicated that participating in a tracheostomy program can increase confidence in tracheostomy management, even in a small sample size. Literature supports that tracheostomy education using didactic and simulation methods increases both confidence and knowledge for healthcare professionals. The sample size in this QI project was not statistically significant, but participants were engaged during the simulation sessions and commented that the program was “very informative.” This QI project required more implementation time to evaluate effectiveness of the intervention. The organization is committed to improving patient outcomes and decreasing tracheostomy complications.

This QI project opened doors for additional research and found policies that require updating. New projects have been discussed within the tracheostomy team following the completion of this project, such as patient sedation following a tracheostomy and unit guided tracheostomy education. Gaining a larger sample size will give the institution data on the effectiveness of a tracheostomy education program and where more changes may need to be made during implementation. Adverse tracheostomy airway events and complications are preventable; quality tracheostomy education for healthcare professionals will improve patient outcomes and safety.

Plan for Sustainability and Dissemination

Following the completion of this QI project, several hospital units reached out to the PI requesting access to the program. This prompted discussions of the unit’s goals of tracheostomy care. The tracheostomy PowerPoint presentation can be tailored to address each unit’s goals. An education application was submitted at PCH to open the tracheostomy curriculum to all

healthcare professionals. More data will be collected using pre- and post-education confidence surveys and knowledge MCQs with a goal to obtain a larger data sample of more than 40 participants. If the outcomes are statistically significant, attendance of a tracheostomy education program may become an annual requirement.

APPENDIX A:

PHOENIX CHILDREN'S HOSPITAL SITE APPROVALS / THE UNIVERSITY OF
ARIZONA INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

Phoenix Children's Hospital
1919 E Thomas Rd
Phoenix, AZ 85016

September 3, 2021

University of Arizona Institutional Review Board
c/o Office of Human Subjects
1618 E Helen St
Tucson, AZ 85721

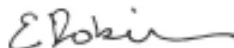
Please note that Mrs. Amy Ashburn, UA Doctor of Nursing Practice student, has the permission of Phoenix Children's Hospital to conduct a quality improvement project at our facility for her project, "Education Model for Pediatric Tracheostomy Management: Improving Nursing Knowledge and Confidence."

Mrs. Ashburn will conduct a tracheostomy education program, which includes a pre- and post-survey, a pre- and post-multiple-choice questionnaire, a PowerPoint presentation, and simulation session for pediatric intensive care unit nurses at Phoenix Children's Hospital. She will recruit providers through an email and a flier. The email will provide a description of the project, what they will be asked to do, the time involved, and a link to the online survey, questionnaire, and online PowerPoint. Participation is voluntary and will be completed on the nurse's own personal time; participation time is not paid. The simulation sessions will occur after watching the PowerPoint presentation and sessions will be provided to accommodate the volunteer's personal schedule. Mrs. Ashburn's activities will be completed by *November 12, 2021*.

Mrs. Ashburn has agreed to present aggregate results to the pediatric intensive care unit manager, nurse educator, and the tracheostomy team.

If there are any questions, please contact my office.

Signature



Erin Robinson
602-933-4481

V 2013-01



June 16, 2021

Amy Ashburn, Nurse Practitioner, DNP student
Phoenix Children's Hospital
Otolaryngology
1919 E. Thomas Road
Phoenix, AZ 85016

PCH IRB # IRB-21-145: Education Model for Pediatric Tracheostomy Management: Improving Nursing Knowledge and Confidence

Dear Ms. Ashburn:

After review of the above project the Phoenix Children's Hospital (PCH) Institutional Review Board has determined that this project does not meet the definition of research; therefore, the approval of the PCH Institutional Review Board is not required. Your project may be considered quality improvement. Please submit a new quality project application at <http://servicedesk/servicedesk/customer/portal/41>. Please contact the Quality Management Department at the following email address quality@phoenixchildrens.com with any questions. As a reminder, any intent to publish would involve not classifying this project as research.

If you have any IRB questions please contact Shy Walker at swalker@phoenixchildrens.com


Sincerely,

A photograph of a handwritten signature in black ink on a white background. The signature reads "Robert B. Rosenberg, MD, PhD".

Signature applied by Robert Rosenberg on 06/16/2021 01:59:48 PM MST

Robert B. Rosenberg, MD, PhD
Chair, PCH Institutional Review Board #2

cc: Mark Evan Gerber, MD

 **"Education Model for Pediatric Tracheostomy Management: Improving Nursing Knowledge and Confidence"**

Polach, Andrea commented:

Hi Amy - I apologize for my delay in getting back to you. Your project is approved. You may recruit volunteers to participate in the education sessions. Please be aware, these sessions should follow the skills labs, and the nurse participants' time is unpaid. Please let me know if you have any questions.


Polach, Andrea changed the status to Department Review.

Polach, Andrea changed the status to In Progress.

While you're waiting you can:

- Reply to this email for questions, concerns, or to include additional information.
- Click ([NG-177](#)) to view your ticket for updates.
- If your issue is not being addressed to your satisfaction, and you would like to escalate it to Connie McGinness , please contact cford@phoenixchildrens.com.
- To provide any feedback regarding the support you have received, please take a moment to complete this quick [survey](#).

Respectfully,
Nursing Governance

 **Education Model for Pediatric Tracheostomy Management: Improving Nursing Knowledge and Confidence**

Wellnitz, Chasity commented:

Your project is approved by Quality, however you must obtain further approval from Nursing Education with Erin Robinson.

Wellnitz, Chasity changed the status to In Progress.

While you're waiting you can:

- Reply to this email for questions, concerns, or to include additional information.
- Click ([QUALITY-144](#)) to view your ticket for updates.

Respectfully,
Quality

Ticket Number: QUALITY-144



THE UNIVERSITY OF ARIZONA

Research

Innovation & Impact

845 N Park Ave., Suite 537A

Tucson, AZ 85719

Fax: 520-621-9810

VPR-IRB@arizona.edu

NOT HUMAN RESEARCH

October 22, 2021

Amy Ashburn

Dear Amy Ashburn:

On 10/22/2021, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	Education Model for Pediatric Tracheostomy Management: Improving Nursing Knowledge and Confidence
Investigator:	Amy Ashburn
IRB ID:	STUDY00000215
Sponsor:	None
Prime Sponsor:	None
IND, IDE, or HDE:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Amy Ashburn, Category: Institutional Approval; • Amy Ashburn, Category: IRB Protocol; • Amy Ashburn, Category: Recruitment Materials; • Demographic Survey Pre-test, Category: Data Collection Tool; • Multiple-choice Questionnaire Pre- and Post, Category: Data Collection Tool; • Recruitment email with implied consent, Category: Consent Form; • Recruitment email with implied consent, Category: Recruitment Materials; • Recruitment Flyer, Category: Recruitment Materials; • Self-efficacy Survey Pre- and Post, Category: Data Collection Tool; • Site-IRB-QI Approval, Category: External Site Authorization; • Trach Education PowerPoint Outline, Category: Participant Material; • Tracheostomy Educational Simulation Session Outline, Category: Participant Material;



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VPR-IRB@arizona.edu

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

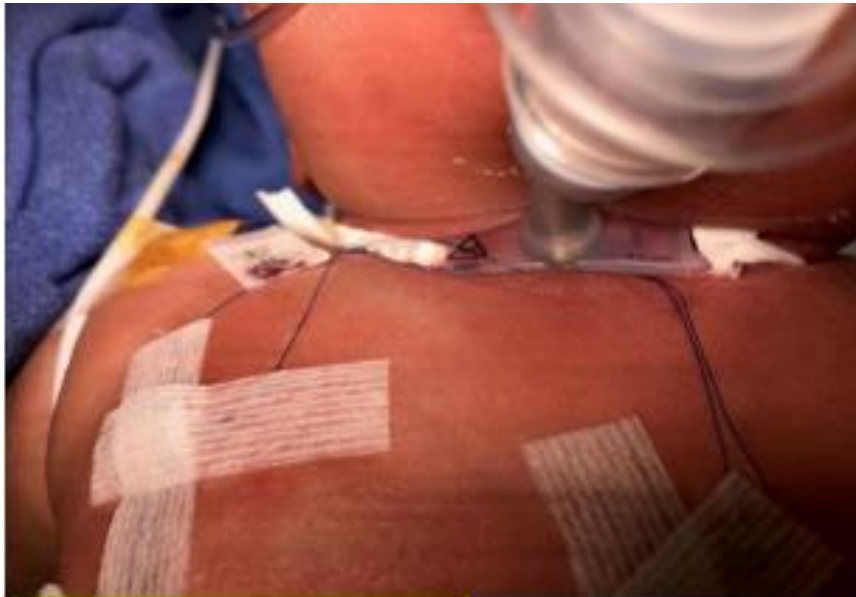
IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving humans in which the organization is engaged, please submit a new request to the IRB for a determination. You can create a modification by clicking **Create Modification / CR** within the study.

We value your feedback and would appreciate you taking the time to complete our survey about your experience with the IRB staff:

https://uarizona.co1.qualtrics.com/jfe/form/SV_dgOSVxqsiPhiiLd.

If questions arise at any time during your study, please email the general IRB inbox at VPR-IRB@arizona.edu.

APPENDIX B:
RECRUITMENT MATERIAL (FLYER INCLUDING DISCLOSURE, NEWLETTER
DESCRIPTION, AND EMAIL INCLUDING DISCLOSURE)



TRACHEOSTOMY EDUCATION PROGRAM

Principal investigator: Amy Ashburn, FNP-BC

CONTACT INFORMATION

To find out more about this study, please contact:

- Amy Ashburn, FNP-BC
- aashburn1@phoenixchildrens.com
- aashburn1@email.arizona.edu

The purpose of this research study is to measure the effectiveness of tracheostomy education.

To participate in this research study you must:

- Be a PCH employee
- Be a RN or APRN in the PICU

Participation in this study involves:

- Completing pre- and post-education program surveys and multiple choice tests
- Watch a 1 hour tracheostomy presentation
- Attend a 20 minute simulation session
- Consent is implied

Pediatric Intensive Care Unit Newsletter

The PICU newsletter is distributed monthly by the PICU manager and educator. The previous flyer will be included in the newsletter with no additional verbiage.

Recruitment Via Phoenix Children's Hospital Email

To: (PICU Nurse or PICU Nurse Practitioner)

From: aashburn1@phoenixchildrens.com; PICU manager/PICU educator

Subject: Comprehensive Tracheostomy Education Opportunity

Comprehensive tracheostomy education has shown to increase health professionals' knowledge and confidence when providing tracheostomy care. Quality tracheostomy care decreases tracheostomy complications, adverse airway events, and death in children.

The purpose of this project is measure confidence and knowledge before and after participating in a comprehensive tracheostomy education program using didactic and simulation methods.

If you choose to participate in this project, you will be asked to complete a survey and a multiple-choice questionnaire via Typeform, watch a 60-minute online PowerPoint presentation, and attend a 20-minute simulation session. Following the education program, you will be asked to complete a posttest and a survey to evaluate the effectiveness of the tracheostomy program.

The PowerPoint presentation will include detailed information on airway anatomy, airway abnormalities, the surgery, post-operative complications, and routine care. The simulation session will include scenarios such as accidental decannulation, trach tube obstruction, and hemorrhage. Please review the flyer below.

There are no foreseeable risks associated with participating in this quality improvement project. Your responses are anonymous, and your name will not be collected or linked to your answers. Participation is voluntary. Refusal to participate will involve no penalty or loss of job. You may withdraw at any time from the project. By signing up for the education program, consent to participate is implied and you agree to have your anonymous responses used for this project.

If you are interested in participating in the tracheostomy education program, please email me at aashburn1@phoenixchildrens.com. A link to the multiple-choice questionnaires, surveys, and online PowerPoint Presentation will be emailed to you. For questions, concerns, or complaints regarding the project, you may email Amy Ashburn FNP-BC, CORLN at aashburn1@phoenixchildrens.com. Correspondence will be kept confidential.

(Copy of the flyer inserted)

Amy Ashburn, FNP-BC, CORLN, DNP Student

APPENDIX C:
EVALUATION INSTRUMENTS (CONFIDENCE SURVEY, MULTIPLE-CHOICE
QUESTIONNAIRE, DEMOGRAPHIC SURVEY)

Confidence Pre- and Post-Tracheostomy Education Program

Please answer the following honestly. All answers are anonymous.

1. I understand airway anatomy and airway anomalies as it relates to a tracheostomy.

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

2. I am confident performing in-line and open suctioning of tracheostomy tubes (depth and size of suction catheter, frequency).

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

3. I am confident in performing routine uncuffed and cuffed tracheostomy tube changes.

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

4. I recognize the indications when the tracheostomy tube is dislodged or obstructed.

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

5. I understand the different parts of a tracheostomy tube.

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

6. I understand the differences between tracheostomy tube types, sizes, and lengths (neonatal/pediatric/adult/fenestrated, custom, and Bivona/Shiley/Tracoe).

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

7. I am confident in managing a tracheostomy cuff (determining air leak, how much the cuff holds, checking for a defective cuff, and what to instill in the cuff based on the tube type).

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

8. I feel comfortable evaluating and managing an airway emergency in a patient who has a tracheostomy.

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

9. I understand the purpose of a “go-bag” and what it should contain.

Strongly disagree
Disagree
Neutral
Agree
Strongly Agree

10. I am comfortable providing tracheostomy teaching and CPR to caregivers.

Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

Multi-Choice Questionnaire Pre- and Post-Tracheostomy Education Program

Please answer the following questions without any outside resources or help for this project. All answers are anonymous.

1. A patient was admitted over 1 month ago to the PICU for acute respiratory failure. After initial stabilization, weaning off ventilator support failed on multiple occasions, so a tracheostomy was placed 3 weeks ago. In the last 24 hours about 10 mLs of frank blood was suctioned from the tracheostomy tube on two separate occasions. Which of the following is most likely associated with the bleeding?
 - a. High placement of tracheostomy tube
 - b. Infection
 - c. Tracheo-esophageal fistula
 - d. Granulation tissue
 - e. **Tracheo-innominate fistula**

2. The following physiological changes occur with a tracheostomy except:
 - a. The anatomical dead space of respiratory system is reduced by up to 30- 50%
 - b. Humidification of inspired air is reduced
 - c. Sense of taste and smell can be diminished
 - d. Temperature of the inspired air is reduced
 - e. **The patient's ability to swallow is severely affected**

3. Tracheotomy patients can't speak without finger occlusion because:
 - a. **Air which would normally pass through the vocal cords is now bypassed to the tracheotomy**
 - b. Tracheostomy tubes pass through the vocal cords thus obstructing cord movement
 - c. Vocal cords are paralyzed during the surgical placement of tracheostomy tubes
 - d. The recurrent laryngeal nerve is often injured during the tracheostomy tube placement.
 - e. Tracheostomies cause vocal cord edema thus interfering with vocal cord movement

4. Which of the following is a false statement regarding tracheostomies?
 - a. Tracheostomies can relieve an upper airway obstruction.
 - b. Tracheostomies provide less trauma to surrounding airway structures than ET tubes.
 - c. **Tracheostomies pass through the vocal cords thus allowing for mechanical ventilation.**
 - d. Tracheostomies allow for decreased sedation and pain medication requirements.
 - e. Tracheostomies make weaning from ventilator easier than endotracheal tubes.

5. Which of the following is not an indication for tracheostomy?
 - a. Facilitate ventilation weaning in chronic respiratory failure
 - b. Relieve obstruction of the upper airway from cancer or trauma
 - c. Secure the airway from bleeding in the upper aerodigestive tract
 - d. Obstructive sleep apnea
 - e. **Mechanical ventilation for 2 days**

6. Your patient is ventilated and had an accidental decannulation of his tracheostomy tube. The tube was urgently replaced; however, your patient is still having desaturations in the 80's despite increased FiO₂ and PEEP. You notice crepitus in the neck, distant breath sounds, and decreased tidal volume. What is the most likely cause of the respiratory compromise?
 - a. Mucus plugging
 - b. Deflated cuff
 - c. False passage
 - d. Incorrect tube size
 - e. Tracheo-innominate fistula

7. What should **not** be done when you attempt to change a tracheostomy tube and it cannot be replaced with the same size tube?
 - a. Force the same size tracheostomy tube back into the stoma
 - b. Apply a bag-valve mask to face device to ventilate the patient after covering stoma with gloved hand
 - c. Call rapid response team
 - d. Try replacing tracheostomy with a size smaller than current trach size
 - e. Suction stoma and place oxygen

8. A patient is started on a Passy-Muir valve trial after a recent tracheostomy placement but is having difficulty with phonation. Which of the following would improve phonation attempts?
 - a. Changing to a cuffed tracheostomy tube to improve airway pressures
 - b. Gradually increasing amount of time using valve to acclimate patient to device
 - c. Ensuring appropriately sized tracheostomy tube to increase air flow around the tube
 - d. B and C
 - e. All of the above

9. What is the most common cause of tracheostomy tube obstruction?
 - a. Tracheostomy tube end positioned against back wall of trachea
 - b. Mucus plug
 - c. Over-inflation of tracheostomy cuff
 - d. Tracheostomy tube malfunction
 - e. False passage

10. An advantage of a cuffed tracheostomy tube over a cuffless tracheostomy tube is it:
 - a. Allow for better swallowing function
 - b. Causes lower risk of damage to tracheal wall mucosa
 - c. Permits better delivery of positive pressure ventilation
 - d. Allows for better voice, as patient can produce more subglottic pressure
 - e. Has as lower risk of mucus plugging

Demographic Survey for Pre-Tracheostomy Education Survey

1. What is the highest nursing degree you have obtained?
 - a. Associate degree
 - b. Bachelor's degree
 - c. Master's degree
 - d. Doctoral degree

2. How many years of experience do you have as a registered nurse?
 - a. Less than 1 year
 - b. 1 – 2 years
 - c. 2 – 4 years
 - d. 5 – 10 years
 - e. More than 10 years

3. If you are a nurse practitioner (NP), how many years did you work as a registered nurse prior to practicing as a NP?
 - a. Less than 1 year
 - b. 1 – 2 years
 - c. 2 – 4 years
 - d. 5 – 10 years
 - e. More than 10 years
 - f. N/A

4. Approximately how many tracheostomy tube changes have you completed **in the past year**?
 - a. Less than 5
 - b. 5 – 10
 - c. 11 – 20
 - d. 21 – 50
 - e. More than 50

5. Have you participated in a formal tracheostomy curriculum previously?
 - a. Yes
 - b. No

APPENDIX D:
PARTICIPANT MATERIAL (EDUCATIONAL POWERPOINT PRESENTATION,
SIMULATION SESSION OUTLINE)

Tracheostomy Educational PowerPoint Outline

Slide 1

- Title and Introduction

Slide 2

- Objectives of the Pediatric Tracheostomy Course

Slide 3

- Definition and Anatomy

Slide 4

- Tracheostomy Indications

Slide 5

- Tracheostomy Indications

Slide 6

- Tracheomalacia

Slide 7

- Craniofacial Anomaly

Slide 8

- Laryngeal Anomaly

Slide 9

- Airway Mass

Slide 10

- Airway Obstruction

Slide 11

- Subglottic Stenosis

Slide 12

- Timing of Tracheostomy

Slide 13

- Tracheostomy Contraindications

Slide 14

- Pre-tracheostomy Evaluation

Slide 15

- Tracheostomy Placement

Slide 16

- Tracheostomy Technique

Slide 17

- Tracheostomy Technique

Slide 18

- Tracheostomy Variations

Slide 19

- Post-Operative Care

Slide 20

- Post-Operative Care

Slide 21

- Safety Rules

Slide 22

- Physiologic Changes - Benefits

Slide 23

- Physiologic Changes - Concerns

Slide 24

- Tracheostomy tube Parts

Slide 25

- Identifying a Tracheostomy Tube

Slide 26

- Identifying a Tracheostomy Tube

Slide 27

- Types of Tracheostomy Tubes

Slide 28

- Types of Tracheostomy Tubes

Slide 29

- Ideal Trach Tube Size

Slide 30

- Trach Tube Size Guidelines

Slide 31

- Tracheostomy Sizes

Slide 32

- Routine Trach Care – Why is it needed?

Slide 33

- Routine Trach Care – Suctioning

Slide 34

- Routine Trach Care – Stoma Care

Slide 35

- Routine Trach Care – Trach Tube Changes

Slide 36

- Routine Trach Care – Trach tube Changes

Slide 37

- Routine Trach Care – “Go Bags”

Slide 38

- Accessory Equipment – Passy Muir or Speaking Valve

Slide 39

- Accessory Equipment – Trach Collars

Slide 40

- Accessory Equipment – Heat and Moisture Exchanger

Slide 41

- Complications – Early

Slide 42

- Complications – Tube Obstruction
Slide 43
- Complications – Accidental Decannulation
Slide 44
- Complications – Infection
Slide 45
- Complications – Bleeding
Slide 46
- Complications – Tracheo-innominate Artery Fistula
Slide 47
- Complications – Pneumothorax, Pneumomediastinum
Slide 48
- Complications – Wound Breakdown
Slide 49
- Complications – Tracheocutaneous Fistula/Death
Slide 50
- Complications - Late
Slide 51
- Emergency Tracheostomy Management Algorithm
Slide 52
- Caregiver Education
Slide 53
- Outpatient Follow Up
Slide 54
- Planned Decannulation
Slide 55
- Planned Decannulation
Slide 56
- References

Tracheostomy Educational Simulation Session Outline

Scenario 1: Tracheostomy Tube Obstruction

- Objectives
 - Identify a cause of respiratory distress in a simulated child with a plugged tracheostomy tube
 - Safely exchange a tracheostomy tube
- A 16-year-old female with a history of a traumatic brain injury secondary to a motor vehicle accident. She was admitted to the PICU for hypoxemia and a positive viral panel. She is tracheostomy dependent secondary to poor neurological status. The RT calls you to the bedside for cyanosis and decreased air movement. *History that must be requested: The tracheostomy is three months old, 4.0 DCT cuffed Shiley (disposable inner cannula).*
- Vitals: Temp 36.3 C, HR 120, RR 32, BP 114/82, O₂ sat 85%
- Physical exam: Respiratory distress, trach with home ventilator in place

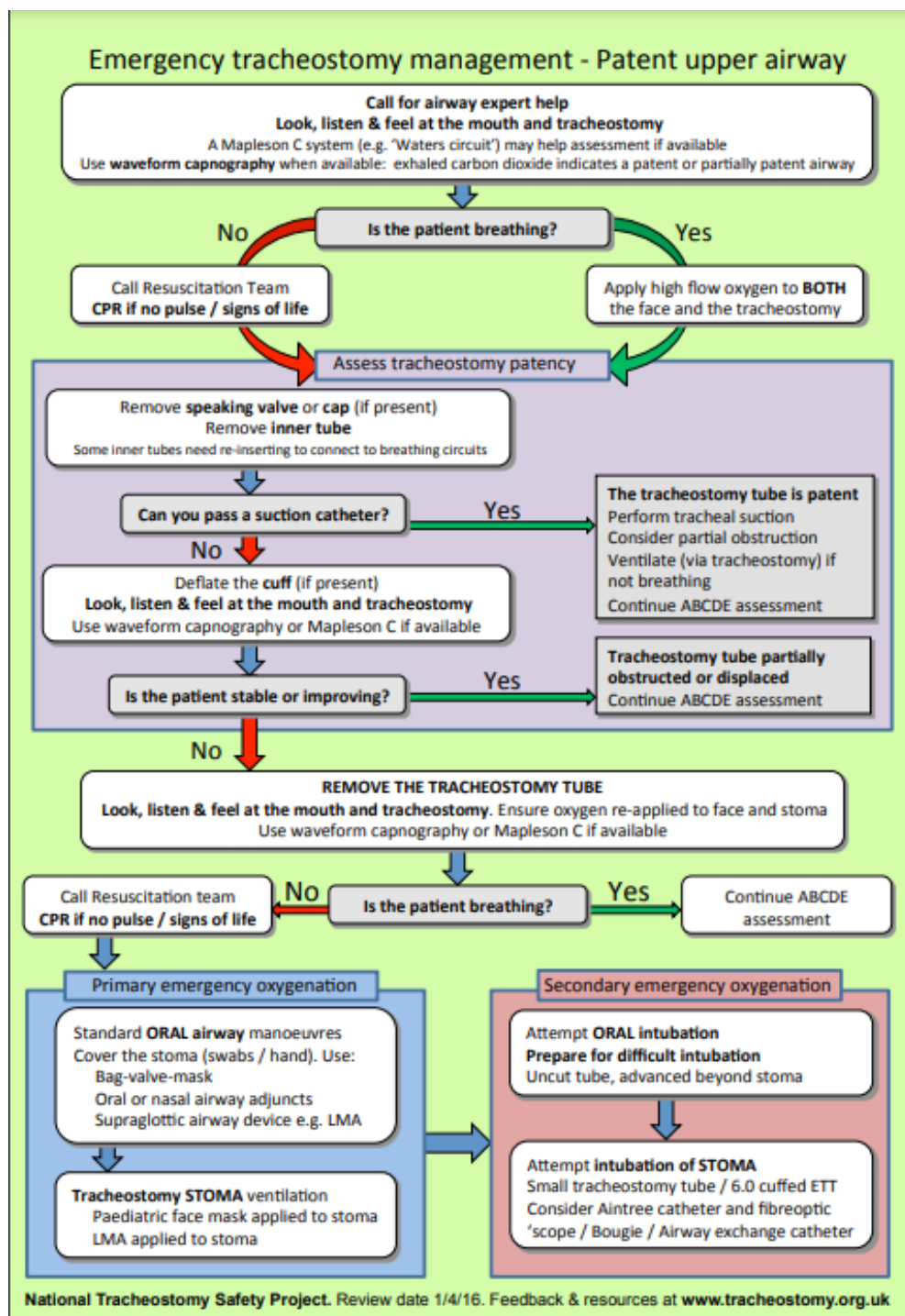
<p style="margin: 0;">Equipment</p> <ul style="list-style-type: none"> • Suction catheter • Cuffed Shiley trach tube in place • Plugged inner cannula in place • Clean, replacement inner cannula • Ventilator with tubing

Expected Intervention	Results
Pulse Ox	85%
Ask RT additional history	Was beginning to administer an Albuterol nebulizer when the patient started to desat. Some secretions suctioned five minutes ago.
Auscultate chest	Severely diminished air movement
Attempt to pass suction catheter / suction	Unable to pass catheter, minimal secretions
Identify trach size / cuff vs. cuffless	Cuffed Shiley with inner cannula
Positive pressure ventilation via tracheostomy	Difficult to bag, No improvement in saturations
Positive pressure ventilation via mask	Oxygen saturations to 89%
Ask about age of tracheostomy	Trach has been in place for months
Remove inner cannula	Vitals improve; HR 100, O ₂ sat 92%, RR 20
Reinsert clean inner cannula and bag	O ₂ sats improve to 98%

Unexpected Intervention	Results
CXR	No acute process

Discussion:

Plugged tracheostomy is the most common complication.
 Plugged tracheostomy is dangerous but typically an easy fix.
 Discuss mucus plug versus granulation tissue.
 Cover Algorithm



Scenario 2: Accidental Decannulation (including false passage)

- Objectives
 - To manage respiratory distress in a simulated child who accidentally decannulated
 - Demonstrate replacing an established and fresh tracheostomy
 - Based on anatomy, know when the upper airway may be utilized for ventilation

- A one-year-old male with a history of acquired subglottic stenosis secondary to prolonged intubation following a heart transplant. He remains in the PICU due to pulmonary hypertension. He is tracheostomy dependent secondary to respiratory failure. You respond to a monitor alarm suggestion hypoxemia. *History that must be requested: The tracheostomy is 2 days old, 3.5 pediatric Bivona TTS Flextend, and the patient is active as sedation is being weaned.*

- Vitals: Temp 37.3 C, HR 178, RR 56, BP 90/52, O₂ sat 81%

- Physical Exam: Your patient appears agitated with perioral cyanosis, tracheostomy tube appears in place, but is being pulled to the side by the ventilator tubing; retractions present.

Equipment

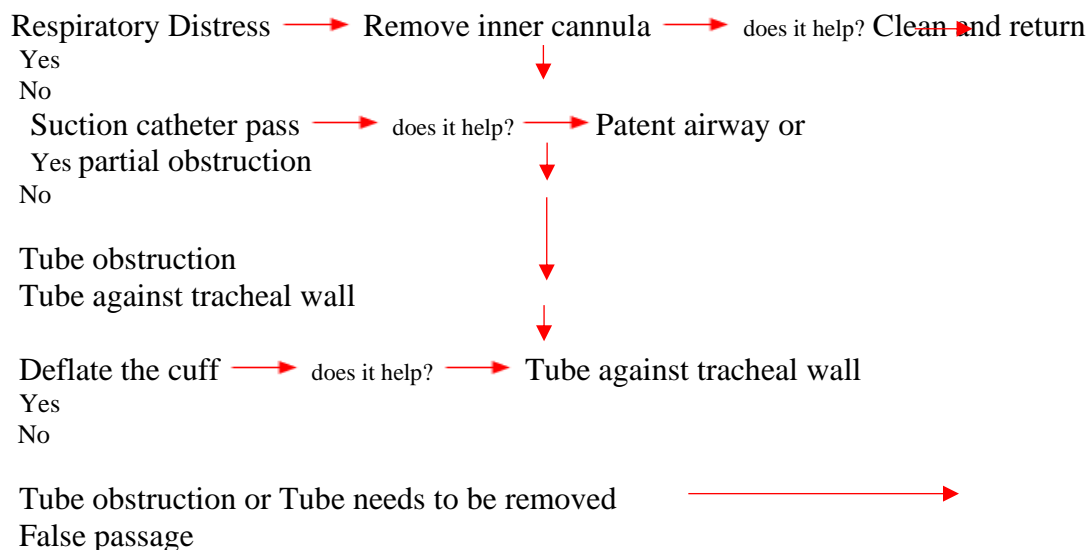
- Ventilator
- Cuffed Bivona trach tube in place
- In-line suction
- Bag w/ Mask
- Endotracheal Tube
- Crash cart

Expected Intervention	Results
Continuous Pulse Ox	81%, slowly dropping
Call for help	RN, RT, resident, fellow, attending
Additional history	RN assessed 15 minutes prior; sats were >94%; patient was asleep.
Auscultation	No air movement
Check ventilator circuit	Good connections, high pressure alarm triggered
Suction tube	Minimal secretions suctioned, suction catheter difficult to pass, no improvement
Attempt Bag/Mask ventilation	sats up to 87% (via trach tube or nose/mouth with trach covered)
Auscultate lung fields, after bag/mask ventilation	Decreased breath sounds when bagged via trach, bilateral breath sounds when bagged via nose mouth
Check tracheostomy size / cuff vs. uncuffed	Cuffed Bivona, trach tube is moving and appears partially extruded
Deflate cuff	No change
Pull out tracheostomy tube and check	Tube not plugged, extruded from stoma, attempt tube reinsertion using stay sutures if needed. If unsuccessful and not ventilating...
Endotracheal intubation	--

Insert red catheter into lumen, await ENT	--
False passage, reinsert, call ENT	

Unexpected Interventions	Results
CXR	Pneumomediastinum
Attempt Bag/Trach ventilation	Difficult to bag
Re-insertion of trach	--

Discussion: How would the scenario be different if the indication for tracheostomy was for an upper airway obstruction such as mass?



Scenario 3: Tracheostomy Hemorrhage

- Objectives
 - To manage bleeding from the tracheostomy site in a simulated child
- A 2-year old male with a history of prematurity, born at 25 weeks, bronchopulmonary dysplasia, pulmonary hypertension, developmentally delayed, G-tube dependency, ventilator dependent, and tracheostomy dependent. She was admitted 2 days ago following a routine inguinal hernia repair. *History that must be requested: The tracheostomy was placed over a year ago, 4.0 pediatric Bivona TTS Flextend.*
- Vitals: Temp 36.9 C, HR 132, RR 36, BP 90/52, O₂ sat 93%
- Physical Exam: Oozing frank blood from the tracheostomy stoma, approximately 10 mL, tracheostomy tube appears in place, no retractions, patient is coughing. You note the stoma has a faint pulsing motion.

Equipment

- Ventilator
- Cuffed Bivona trach tube in place
- In-line suction
- Bag w/ Mask
- Endotracheal Tube
- Crash cart

Expected Intervention	Results
Continuous Pulse Ox	93%
Call for help	RN, RT, resident, fellow, attending, ENT for evaluation and scope
Additional history	Has a history of blood-tinged secretions x 1 week
Auscultation	+ rales
Check ventilator circuit	Good connections, high pressure alarm triggered
Suction tube	Minimal secretions suctioned, no improvement
Check tracheostomy size / cuff vs. uncuffed	Cuffed Bivona
Hyperinflate the cuff	No change
Pull out tracheostomy tube	Direct compression of the artery against the sternum with finger (Utley maneuver). Go to OR.
Endotracheal intubation	With bronchoscope beyond the fistula

APPENDIX E:
PROJECT TIMELINE

Completion Date	Planning	Pre-Implementation	Implementation	Evaluation
September 23, 2020	Request sent for 3 rd committee member			
April 12, 2021	Meeting with PICU manager			
April 17, 2021	Develop self-efficacy survey questions			
April 26, 2021	Submit proposal to project chair	Approval of 3 rd committee member		
April 29, 2021	Meeting with tracheostomy coordinator			
May 11, 2021	Received access to PCH iRIS (IRB) system			
May 21, 2021		Proposal Defense Presentation		
May 24, 2021	Received Human Subjects Research Credentialing from PCH	Obtain proposal approval from chair		
June 16, 2021		Received letter from IRB that project is not research. Submitted request to the PCH Quality Leadership team for project approval.		
June 17, 2021		Notified annual skills lab will be moved to September through December 2021.		
June 23, 2021		Project approved as QI project at PCH.		
August 3, 2021		Requested site approval letter but need further approval from Nursing Education.		
August 10, 2021		Project submitted to Nursing governance Council.		
August 20, 2021		Annual skills labs in September and October are canceled due to high patient census.		
August 29, 2021		PCH approved QI project.		

Completion Date	Planning	Pre-Implementation	Implementation	Evaluation
September 9, 2021		Obtained site authorization letter		
October 22, 2021		Obtain IRB approval from the U of A	Recruitment emails distributed.	
October 23, 2021			Received requests to participate. Email with links to pre-education material sent.	
October 23-29			Participants completed pre-education material, viewed PowerPoint presentation, and completed simulation sessions. Emailed post-education material to participants that completed the simulation sessions.	
October 29, 2021			Closed study	
October 29-31, 2021				Evaluated data and reviewed outcomes.

APPENDIX F:
LITERATURE REVIEW GRID

Author, Date, & Title	Study Design	Research Question	Sample (N), Setting	Data Collection, Outcomes Measured	Support for and or link to project
<p>Agarwal, Marks, Wessel, Willis, Bai, Tang, Ward, Schellhase, & Carroll. (2016). Improving Knowledge, Technical Skills, and Confidence Among Pediatric Health Care Providers in the Management of Chronic Tracheostomy Using a Simulation Model</p>	<p>Prospective observational</p>	<p>To assess the knowledge and confidence levels of pediatric providers in routine and emergency tracheostomy care. To assess the efficacy of a comprehensive simulation-based tracheostomy educational program.</p>	<p><u>Sample</u>: 48 participants responded, 33 did simulation portion; pediatric residents, pediatric hospitalist physicians, and advanced practice registered nurses.</p> <p><u>Setting</u>: a large tertiary care children's hospital</p>	<ul style="list-style-type: none"> • Simulation training: 60 minutes with manikin • Didactic training: 60 minutes with slides • Demographic data survey • Pre- and post-course surveys based on 5 pt Likert scale measuring confidence; 5 questions • Pre- and post- course MCQ scores measuring knowledge; 9 questions • Observational data from the simulation sessions. • Post-course evaluations by participants • Descriptive statistics used (mean, median, and interquartile range for all • Comparison of median scores using Wilcoxon Rank-Sum Test. • Two sample proportion <u>test</u> compared pre and post MCQ scores. • Analysis performed in SAS v. 9.4 	<ul style="list-style-type: none"> • A tracheostomy educational program including simulation was effective in improving knowledge, confidence, and skills for all participants. • Can be transferable to caregivers and home health nursing • Uses similar methodology to my project and obtained statistically significant outcomes measuring improvement. • Rates of mortality depend on well trained caregivers and providers. • 85% have never had training in tracheostomy care • Post-course evaluation showed that 83% strongly agreed and 17% agreed that the course helped them to understand the physiological implications of a tracheostomy • Concerns: small sample size; did not have a follow up test in 6 <u>month</u> to measure retention of education; area of when to suction did not improve; need for improved tracheostomy education among pediatric healthcare providers; no standard tracheostomy guidelines.

<p>Ahmed, Yang, Deng, Bottalico, Matta-Arroyo, Cassel-Choudhury, Yang. (2021). Effect of Multimedia educational module on provider attitudes</p>	<p>Prospective observational</p> <p>Mayer's cognitive theory of multimedia</p>	<p>To investigate the effect of a multimedia educational module on provider attitudes toward pediatric tracheostomy care.</p> <p>To addressing clinical knowledge gaps and improving provider attitudes regarding pediatric tracheostomy care.</p>	<p><u>Sample:</u> Included healthcare professionals -nurses, residents, fellows, attendings, RT, PAs, and APRN from pediatric ward, PICU, ED and NICU. N = 422. 275 completed the pre-module survey, 385 completed the pre-module quiz, 253 completed the post-module survey, and 233 completed the post-module quiz.</p> <p><u>Settings:</u> urban tertiary care center for children.</p>	<ul style="list-style-type: none"> • Based on Clinical Consensus Statement on Tracheostomy care 2013 AAO-HNS On-line module of interactive slides with audio instruction • Pre- and post-course surveys based on 5 pt Likert scale measuring confidence; 3 questions • Pre- and post- course MCQ scores measuring knowledge; 7 questions • Demographic data survey (role, unit, years of practice) • Descriptive statistics (mean, standard deviation) • Kruskal-Wallis H test used to measure Likert scale for multiple groups • Mann-Whitney U-test was used to compare pre and post Likert scale values • T-test was used to compare pre and post quiz scores. 	<ul style="list-style-type: none"> • Evidence shows that educational interventions can promote significant improvements in trach care knowledge and patient outcomes/safety • Module was effective tool to improve provider perception of their confidence and knowledge with management of pediatric tracheostomies • The organization made it widespread education. The program later added simulation for enhancement. • <u>Concerns:</u> Over time there was decreased motivation to complete the module; need protected time to participate for the employees; lack of knowledge and training can contribute to significant patient morbidity and mortality related to loss of airway; Wide variation in tracheostomy care nationally; no standardize training for healthcare providers who provide trach care; no gold standard
<p>Benjamin, Roy, Pual Kumar, Charles, Miller, Narsi-Prasja, Mahan, and Thannasitboon. (2020). Improving Resident Self-Efficacy in Tracheostomy Management Using a Novel Curriculum</p>	<p>Quality Improvement Project</p> <p>Used social learning theory by Bandura</p>	<p>Improving residents' SE by teaching hands-on skills for routine care of tracheostomy and using a stepwise approach for managing tracheostomy emergencies.</p>	<p><u>Sample:</u> medical students and pediatric residents during ICU rotation. N=107 total; 40 completed the simulation training</p> <p><u>Setting:</u> 2 children's tertiary hospitals</p>	<ul style="list-style-type: none"> • Simulation training: 10-15 minutes with mannikins • Video-based module curriculum: 9-minute video and 15-minute didactic session • Curriculum included trach tube change, suctioning, and trach emergencies. • Pre-and post-course self-efficacy survey using Likert scale 	<ul style="list-style-type: none"> • Module and simulation were effective tool to improve provider perception of their confidence and knowledge with management of pediatric tracheostomies • <u>Concerns:</u> Time constraints for the participants did not allow for repeat sessions; no sustainability retesting; testing right after course may yield higher results; many studies show a lack of knowledge in pediatric

		identify gaps in residents' curriculum and to simplify management of a patient with tracheostomy.		<p>measuring confidence – 14 questions</p> <ul style="list-style-type: none"> • Pre- and post- course MCQ scores measuring knowledge; 10 questions • REDCap used for data • Descriptive statistics (mean, median) • Wilcoxon rank sum test compared medians 	providers; formal education addressing this educational gap is limited; health care professionals report their lack of confidence and feeling underprepared to perform a tracheostomy change.
<p>Darr, Mughal, Siddiq, and Spinou (2016). Development and evaluation of an interprofessional simulation workshop on assessment and management of tracheostomy and laryngectomy emergencies.</p>	Quality Improvement Project; integrating a workshop	<p>The aim of the workshop was to address key components highlighted in the global tracheostomy collaborative. These included:</p> <ol style="list-style-type: none"> 1. improving multi-disciplinary care, 2. broadening staff education by facilitating interprofessional team working in simulation training 3. improving knowledge, skill and confidence of health care professionals involved in the care of tracheostomy patients. 	<p>Sample: nurses and physicians; N=14</p> <p>Settings: general district hospital in the UK.</p>	<ul style="list-style-type: none"> • Simulation training –70-minutes with manikins; 3 scenarios • Didactic training – 3 interactive lectures; 60-minutes • Pre- course MCQ measuring knowledge-10 questions; post-course test 15 MCQ • Post-course evaluation was completed of the program 	<ul style="list-style-type: none"> • All participants reported increased confidence and knowledge in assessing and managing patients with neck stomas. • The simulation workshop provided postgraduate clinical staff with safe and effective interprofessional training. • The participants gained knowledge and increased confidence in the early recognition, practical assessment and management of tracheostomy emergencies. • Concern: self-reporting bias; small sample size; they did not state their statistical analysis method; outcome measurements did not allow to determine if simulation or didactic methods were more effective; did not list statistical methods or study method.

<p>Davis, Edgar-Zarate, Bonilla-Velez, Atkinson, Tulunay-Ugur, & Agarwal. (2019). Using Didactics and Simulation to Enhance comfort, Knowledge, and Skills of Nonsurgical Trainees Caring for Patients With Tracheostomy and Laryngectomy</p>	<p>Prospective observational and quality improvement research project.</p>	<ul style="list-style-type: none"> Assess and improve comfort with, knowledge of, proficiency in tracheostomy and laryngectomy care. Purpose implement a training program using simulation with didactics to educate residents in nonsurgical specialties in routine and emergent trach management 	<p>Sample: Physician trainees from internal medicine, ED, and anesthesia programs; N=122</p> <p>Settings: University of Arkansas</p> <p>Only 1 participant had a tracheostomy course and they were a foreign medical graduate anesthesia resident</p>	<ul style="list-style-type: none"> Used UK's National Tracheostomy Safety Project Simulation training; with manikins; 3 emergency scenarios Didactic session-60-minutes Pre- and post-course surveys based on 5-pt Likert scale measuring confidence-10 questions Pre- and post- course MCQ scores measuring knowledge; 23 questions Post-course survey and MCQ test completed at 6 months Used Survey Monkey Descriptive statistics (mean, median) Comfort level and procedural proficiency data were nonparametric and analyzed using Kruskal-Wallis for preintervention and post-intervention comparisons. Wilcoxon signed-rank test was used for subgroup analysis. A χ^2 comparison of inpatient mortality from 2015 to 2016 (preintervention period) was compared with inpatient mortality from 2017 to 2018 (post-intervention period). 	<ul style="list-style-type: none"> Comprehensive trach education is an effective strategy in improving confidence, knowledge Retention noted 6 months later Having well trained health care professionals in trach care can be critical in managing life-threatening events. highly reliable (Cronbach $\alpha = 0.641$) and would be easily reproducible in other training institutions. Clinical outcome analysis shows an association between simulation education and decreased inpatient hospital mortality; a decreased amount of trach patients admitted. Concerns: Literature is limited for effective strategies for trach education; 6-month follow-up test had less participants; focused on nonsurgical specialties.
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<p>Dorton, Lintzanic, & Evans. (2014). Simulation Model for Tracheostomy Education for Primary Health-Care providers</p>	<p>Prospective observational</p>	<ul style="list-style-type: none"> To evaluate the competency of health-care providers managing patients with tracheotomies, and assess the need for, and efficacy of, a multidisciplinary educational program incorporating patient simulation. 	<p>Sample: Residents, fellows, midlevel providers, nurses; anesthesia residents, emergency medicine residents, pulmonary critical care fellows, ICU nurse practitioners, nurses, and medical students, N= 87</p> <p>Setting: Wake Forest School of Medicine and Medical Center-tertiary care center.</p>	<ul style="list-style-type: none"> Simulation training – 90 minutes with 3 emergent scenarios Didactic lecture: 30-minute voice lecture Demographic data survey Pre- and post-course surveys based on 5 pt Likert scale measuring confidence – 10 questions Pre- and post- course MCQ scores measuring knowledge; 15 questions Post-course self-assessment and MCQ test repeated 6 months later. Descriptive statistics (mean, median) Pre-course and post-course questionnaire and test scores were compared by use of paired two-tailed Student t-tests with GraphPad Calculator online software 	<ul style="list-style-type: none"> Can be transferable to nurses, caregivers and home health nursing; Obtained statistically significant outcomes measuring improvement. 6-month follow up noting no statistical difference compared to post education scores. Comfort level of the nurses had no correlation with the level of education or experience of the nurse. There is significant need for improved trach education among primary healthcare providers. Comprehensive trach educational program was effective in improving confidence, knowledge and skills. Concerns: pre self- assessment noted providers did not feel comfortable assessing trachs and knowledge was deficient. Became a mandatory part of curriculum
<p>Hsieh, Timbang, Kuhn, Brodie, & Squires. (2019). Assessment of Tracheostomy and Laryngectomy Knowledge among Non-Otolaryngology Physicians</p>	<p>Cross-sectional</p>	<ul style="list-style-type: none"> This study aims to quantify alternate airways knowledge among non-otolaryngology physicians and to determine whether an educational lecture can improve identified knowledge deficits. 	<p>Sample: Residents, fellows, and attendings from ED, family medicine, gen surgery, internal medicine, hospital medicine, and pediatrics, control was ENT participants; N = 25 ENT; 132 non-ENT</p>	<ul style="list-style-type: none"> Didactic training: 60-minute PowerPoint presentation Pre- and post- course MCQ scores measuring knowledge; 10 questions Post-course MCQ test repeated 3 months later. Data was analyzed using ANOVA and chi-squared analysis using SPSS 	<ul style="list-style-type: none"> All non-otolaryngology physicians improved their scores significantly Non-otolaryngology physicians are unfamiliar or uncomfortable with the care and management trachs Complications or emergencies involving surgical airways can be devastating and fatal. 97% of internists received little or no residency training There is now growing evidence that the care of patients with AAs can be

			Setting: University of California-Davis		positively affected through simple educational interventions such an educational lecture or module. <ul style="list-style-type: none"> Concerns: Low 3-month follow-up sample size; potential for biased responses
Hurley. (2020). High Fidelity Tracheostomy Simulation Quality Improvement Project		The purpose of this project is to improve RN's confidence and performance ability with obstruction and decannulation of a mature and fresh tracheostomy with the implementation of an effective high-fidelity simulation and education project.	Sample: Registered Nurses in the NICU Setting: The University of Chicago Comer Children's Hospital NICU	<ul style="list-style-type: none"> Simulation training – with emergent scenario Didactic lecture: PowerPoint Presentation Pre- and post-course surveys based on 5 pt Likert scale measuring confidence – 5 questions Pre- and post- course MCQ scores measuring knowledge; 15 questions Descriptive statistics used (mean) Pre- and post-course scores were compared using a z-test 	<ul style="list-style-type: none"> Simulation-based education improves communication, teamwork, clinical care, and confidence. Replacing traditional lecture-based training with emergency scenario simulations combined with lectures is more effective. Performance scores were assessed using the previously validated Creighton Competency Evaluation Instrument (C-CEI). The Simulation Design Scale (validated tool) was used to measure simulation effectiveness. Concerns: the time of the intervention was not mentioned; the study design was not mentioned; the team only had time to complete one simulation scenario; only 33% of the NICU nurses were able to participate due to work limitations

<p>Mehta, Moshka & Kavanagh. (2020). A Targeted Tracheostomy Care Educational Initiative to Augment Resuscitation Training in the Pediatric Setting</p>	<p>Prospective observational study</p>	<p>To implement a surgeon led initiative for tracheostomy education for non-surgical pediatric first responders in the hospital setting and to assess its efficacy.</p>	<p>Sample: non-surgical pediatric first responders; N = 44</p> <p>Setting: tertiary care children's hospital; Connecticut Children's Medical Center</p>	<ul style="list-style-type: none"> • Used AAO clinical consensus statement and UK national tracheostomy safety project • Simulation training: 60-minutes with 3 scenarios with mannequins • Didactic lecture: -minute; PowerPoint presentation • Demographic survey • Pre- and post-course surveys based on 5 pt Likert scale measuring confidence; 10 questions • Pre- and post- course MCQ scores measuring knowledge; 15 questions • Assessments were repeated at 6 months • Descriptive statistics used (mean, standard deviation, median, frequency) • Outliers assess using boxplots and Kolmogorov-Smirnov/Shapiro-Wilk testing • Knowledge tests analyzed by paired-sample t-test • A 2 tailed Wilcoxon Signed Rank test compared comfort level data • Cronbach's alpha score was computed for the pre- and post-intervention comfort level to assess consistency and reliability of the questionnaire. 	<ul style="list-style-type: none"> • There was improved knowledge among pediatric residents after a surgeon-led module for tracheostomy care and emergency management. • Significant increase in on the knowledge test • Can be transferable to nurses, caregivers and home health nursing; • Uses similar methodology to my project and obtained statistically significant outcomes measuring improvement • Concerns: There are no validated tools to assess tracheostomy care or knowledge; there is need for tracheostomy education and targeted education improves knowledge, confidence, and teaches skills; only 11 participants responded for 6-month tests
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<p>Mehta, Schwartz, Falcone, & Kavanagh. (2019). Tracheostomy Care Education for the Nonsurgical First Responder: A Needs-based Assessment and Quality Improvement Initiative</p>	<p>prospective observational study (needs assessment)</p>	<p>To perform a needs-based assessment for tracheostomy care education for nonsurgical first responders in the hospital setting and to implement and assess the efficacy of a targeted tracheostomy educational program.</p>	<p>Sample: Setting: tertiary care children's hospital</p>	<ul style="list-style-type: none"> • Didactic lecture: 60-minute; PowerPoint presentation • Pre- and post-course surveys based on 5 pt Likert scale measuring confidence: questions • Pre- and post- course MCQ scores measuring <u>knowledge; questions</u> • Post-course test at 6 months 	<ul style="list-style-type: none"> • Concerns: did not include the numeric values for outcomes clearly, this is a needs assessment • Results were statistically significant. However, the 6-month results were not statistically significant compared to post-test results. • There is need for tracheostomy education and targeted education improves knowledge and comfort; • Can be transferable to nurses, caregivers and home health nursing; • Tailoring education to a specific specialty allows the learner to "buy in" to the necessity of the session as well as conceptualize its relevance; • This study did not include nurses • This needs assessment demonstrated improvement in knowledge and comfort after a targeted educational module for tracheostomy care and management. •
<p>Ramsey, Brennan, Stricker, Riek, Brown, Gurtowsky, Sturza, & Filbrun. (2017). Emergency airway and ventilator procedures for <u>community based</u> home care staff validation of an educational program</p>			<p>Sample: 68% RN, 19% LPN, 12% RT; N=54; home care staff Setting:</p>	<ul style="list-style-type: none"> • Simulation training: 4-hour session, 2 scenarios • Pre- and post-course surveys based on 5 pt Likert scale measuring confidence: questions • Pre- and post- course MCQ scores measuring knowledge; 11 questions • 	<ul style="list-style-type: none"> • There are not standards for trach care for home health nurses • Simulation study demonstrated that nurses staffing home ventilators were unable to complete basic airway assessments and difficult with trach tube changes • If home health nurses are not well-prepared, there is a higher risk for adverse outcomes, readmission rates, and morbidity.

					<ul style="list-style-type: none"> • Skills and comfort scores improved after intervention for home health nurses. • Concerns: Limited financial resources and staffing for home health; difficult to attend course; no validated tool to measure efficacy of trach care, home health facilities do not get reimbursed high enough to let RNs have paid education days.
<p>Roof, Gray, Meyer, Ferrandino, Eden, Kirke, & Courcy. (2020). An Interactive Workshop to Increase Comfort and Knowledge Regarding Adult Tracheostomy Management: A Pilot Study</p>	<p>Cohort Study Bloom's taxonomy</p>	<p>To assess the knowledge and comfort level of non-otolaryngology healthcare providers in the care of adult patients with a tracheostomy.</p>	<p>Sample: residents and medical students; N=85 Setting:</p>	<ul style="list-style-type: none"> • Simulation training: 30-minutes with 3 emergent scenarios • Didactic lecture: 30-minute PowerPoint Presentation • Demographic survey • Pre- and post-course surveys based on 5 pt Likert scale measuring confidence; 7 questions • Pre- and post- course MCQ scores measuring knowledge; 8 questions • Descriptive statistics used (mean) • T-test and chi-squared tests used for statistical analysis 	<ul style="list-style-type: none"> • Noted provider deficiencies in tracheostomy care which improved post education • Transferable to nurses, caregivers, and home health • More targeted tracheostomy education is needed for medical staff. • Results were statistically significant for increase in comfort and knowledge for participants. • Concerns: small study size; no standard test or evaluation of trach management exists; little formal training for medical students

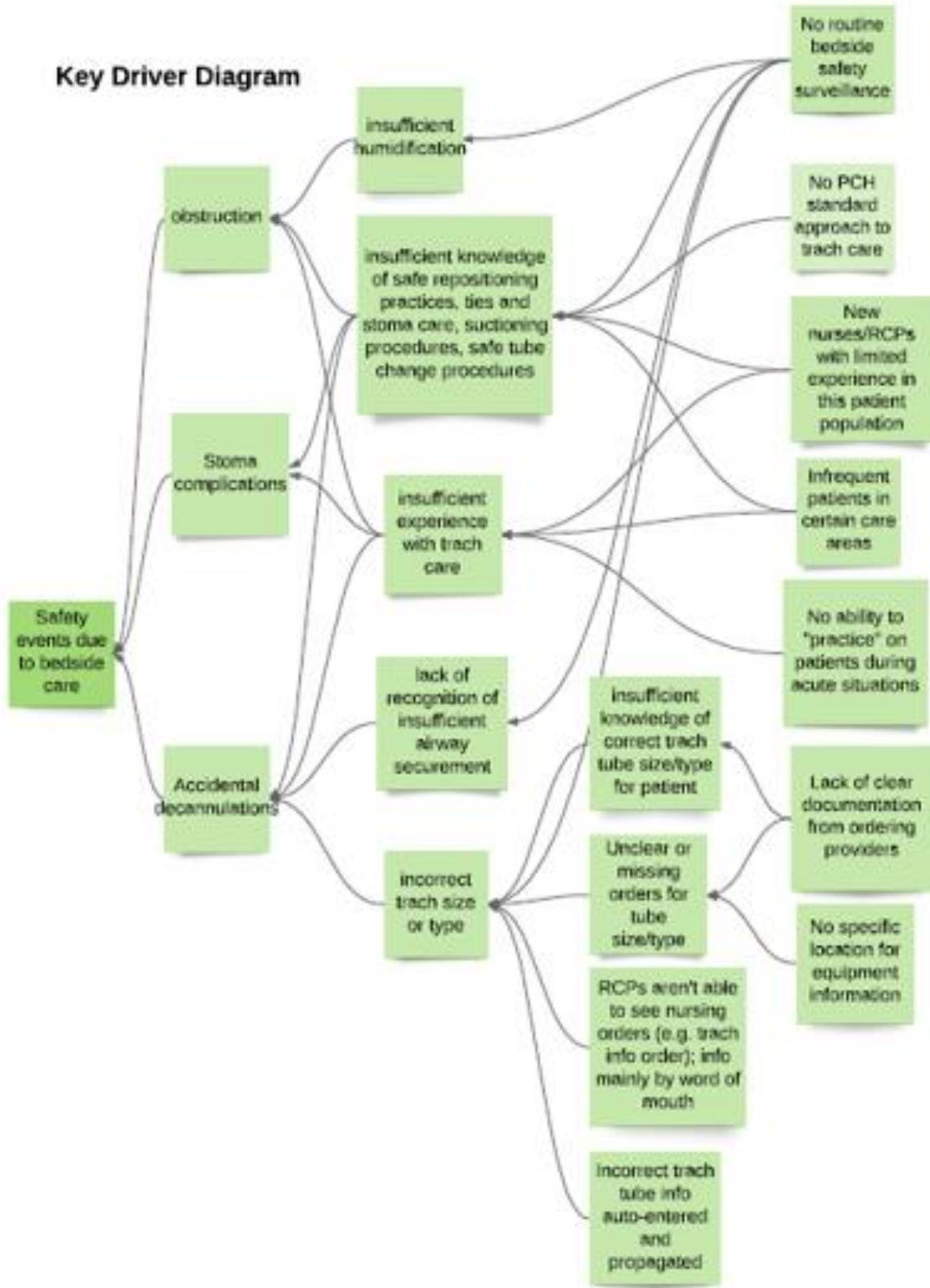
<p>Tokarz, Szymanowski, Loree, & Muscarella. (2020). Gaps in Training: Misunderstandings of Airway Management in Medical Students and Internal Medicine Residents</p>	<p>A before-and-after survey study</p>	<p>Evaluate baseline airway knowledge of medical students and internal medicine residents. Improve resident understanding of airway anatomy, general tracheostomy and laryngectomy care, and management of airway emergencies.</p>	<p>Sample: Medical students and internal medicine residents; N =90.</p> <p>Settings: 3 different university-affiliated hospitals</p>	<ul style="list-style-type: none"> • Based on UK National Tracheostomy Safety Project guidelines from 2012 for the management of tracheostomy and laryngectomy airway emergencies. • Didactic lecture: 60-minute PowerPoint Presentation • Demographic survey • Pre- and post-course objective test; labeling of trach tube components and 2 vignette questions measuring knowledge; • Descriptive statistics used (mean, standard deviation) 	<ul style="list-style-type: none"> • Less than half of residents were able to correctly address basic airway emergencies. Senior residents were no more proficient in addressing airway emergencies. • The lack of formal airway training places patients at risk with routine care and in emergencies. • Significant clinical improvement was represented by the ability of participants to correctly label a mean 4 of 6 tracheostomy components and by the mean number of participants answering clinical vignettes to increase by .40%. • Concerns: participants could choose to not complete post-course test and could leave early; finding that senior-level residents were no more knowledgeable than medical students with respect to their familiarity with tracheostomy components or addressing life-threatening scenarios
<p>Yelverton, Nguyen, Wan, Kenerson, & Schuman. (2015). Effectiveness of a Standardized Education Process for Tracheostomy Care</p>		<p>The primary objective of this standardized comprehensive tracheostomy care initiative was to create a safer environment for patients, with an intended reduction in tracheostomy-related morbidity</p>	<p>Sample: Non otolaryngology providers (residents, medical students, midlevel providers, nursing staff) who provide trach care. N = 94.</p> <p>Setting:</p>	<ul style="list-style-type: none"> • Based on Clinical Consensus Statement on Trach Care published in OTOHNS 2013. • Didactic lecture: 45-minute PowerPoint Presentation • Demographic Survey • Pre- and post- course objective test measuring knowledge; 25 MCQ and true/false • Post-course 6-month assessment • Used REDCap 	<ul style="list-style-type: none"> • Significant increase in knowledge and comfort with standardized education module • Varying levels of knowledge due to constant flux of professionals resulting in potential complications, including death. • Concerns: small sample size; only 6 completed the 6-month testing; no validated measure to measure trach knowledge. •

		and mortality within our hospital. To standardize provider and patient education within the organization.		<ul style="list-style-type: none">• One-paired student t test for pre- and post-assessments; one-factor analysis of variance to test to test effect.	
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APPENDIX G:

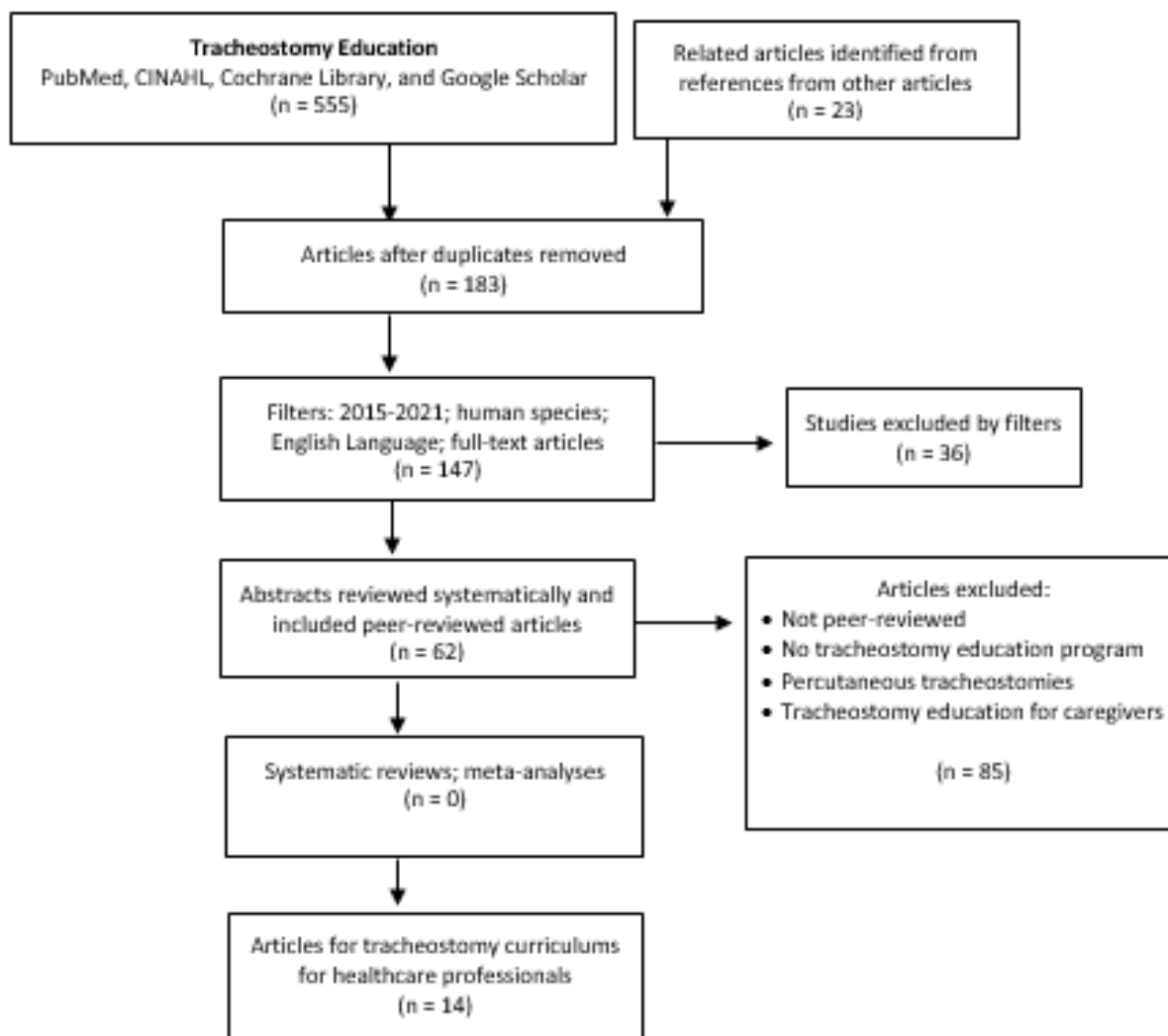
OTHER DOCUMENTS AS APPLICABLE TO THE PROJECT (KEY DRIVER DIAGRAM,
FLOW DIAGRAM OF LITERATURE SEARCH AND POSTER PRESENTATION)

Key Driver Diagram





PRISMA Flow Diagram for Comprehensive Tracheostomy Curriculums



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *BMC Med* 6(8): e1000097. doi:10.1371/journal.pmed.1000097

For more information, visit www.prisma-statement.org.



THE UNIVERSITY OF ARIZONA
College of Nursing

EDUCATION MODEL FOR PEDIATRIC TRACHEOSTOMY MANAGEMENT: IMPROVING NURSING KNOWLEDGE AND CONFIDENCE

Amy Ashburn, FNP-BC, DNP Candidate; Gloanna Peek, PhD, RN, CPNP; Allen Prettyman, PhD, FNP-BC, FAANP, FNAP; Mark Gerber, MD

Abstract

Purpose: To increase knowledge and confidence for nurses and nurse practitioners performing pediatric tracheostomy management using targeted tracheostomy education.

Background: Pediatric adverse airway events and complications are increasing at Phoenix Children's Hospital.

Methods: Pediatric intensive care unit nurses and nurse practitioners were recruited to complete pre- and post-education confidence surveys and knowledge tests after attending a didactic and simulation tracheostomy education program.

Results: N = 3. Mean confidence increased from 3.2 to 4.1 after completing the program. The mean knowledge scores were 0.8 (80%) decreasing to 0.77 (77%), following the program. Two participants commented that the program was "very informative".

Conclusion: No improvement in tracheostomy knowledge was observed, however, confidence performing tracheostomy care improved following tracheostomy education.



Purpose

The purpose of this quality improvement project was to increase knowledge and confidence for nurses and nurse practitioners performing pediatric tracheostomy management in the pediatric intensive care unit, using targeted tracheostomy education.

Does completing a targeted pediatric tracheostomy education program increase knowledge and confidence for PICU nurses and nurse practitioners when providing tracheostomy management for children in an inpatient setting?

Background/Significance

- A tracheostomy is a surgical procedure that provides a safe airway in children, especially for long-term ventilation needs.
- Mortality rate is 3% for tracheostomy life-threatening events.
- During an adverse airway event, non-surgical healthcare providers are present.
- 98% of non-surgical healthcare providers do not feel confident performing emergency tracheostomy management.
- Nurses do not receive formal tracheostomy education and there is no standardized tracheostomy education.
- Literature supports that targeted tracheostomy education increases knowledge and confidence for healthcare providers.

Methods

Design: Quality improvement project using Lewin's Change Theory and the Model for Improvement

Sample: PICU nurses and nurse practitioners recruited via hospital email and flyer

Pre-education demographic survey
Pre-education confidence survey
Pre-education knowledge multiple-choice test

1 hour PowerPoint tracheostomy presentation
20 minute tracheostomy simulation session

Post-education confidence survey
Post-education knowledge multiple-choice test

Instruments and Data Collected:

Quantitative

- Demographic survey – 5 questions, multiple choice
- Confidence survey – 10 questions, 5-point Likert Scale
- Knowledge test – 10 questions, multiple choice

Qualitative

- Question – 1 open-ended question

Results

Sample Size: N = 3 (2 nurses, 1 nurse practitioner)

Tracheostomy Knowledge Pre- and Post-Tracheostomy Education

	Pre-MCQ	Post-MCQ	Difference
Participant 1	0.9 (90%)	0.8 (80%)	-0.1 (-10%)
Participant 2	0.8 (80%)	0.5 (50%)	-0.3 (-30%)
Participant 3	0.7 (70%)	1.0 (100%)	0.3 (+30%)

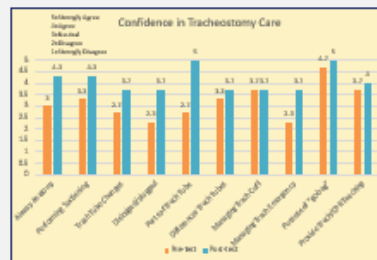
Tracheostomy Confidence Pre- and Post-Tracheostomy Education

	Pre-Survey	Post-Survey	Difference
Participant 1	2.3 (46%)	3.9 (78%)	1.6 (32%)
Participant 2	2.9 (58%)	4.4 (88%)	1.5 (30%)
Participant 3	4.3 (86%)	4.1 (82%)	-0.2 (-4%)

"I found this education very informative and helpful. As a new grad, this was very valuable. I feel like many nurses do not know the various types of trach emergencies or what to do for them besides call the provider. I think that it would be helpful to have more education related to trach emergencies and troubleshooting available to us." - Participant

Discussion/Conclusions

- The sample size was too small; not statistically significant
- Confidence improved in 9 out of 10 categories after education
- Knowledge did not increase after education
- "Emergency tracheostomy management" topics had the most missed questions, the most confidence improvement, and triggered the most questions following simulation.



- Limitations:**
 - Not generalizable – one unit
 - Small sample size
 - Short implementation period; delay in IRB
 - COVID-19 barriers
 - Bias – computer access
- Sustainability:**
 - Another PDSA cycle using larger sample size
 - Longer implementation period
 - Easier access for lecture and simulation sessions
 - Update PowerPoint to be meet unit specific needs

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