

Does Fast-Track Extubation in Congenital Heart Defect Surgery Lead to Improved Patient
Outcomes?

A quality improvement project

A DNP Project Presented to the Faculty of the
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ABSTRACT

Background: Congenital heart surgery for the pediatric patient has evolved tremendously in the last several decades. The development of new surgical techniques for repair and palliation has revolutionized the long-term outcomes in this patient population. Anesthetic management of the patient undergoing congenital defect surgery has followed similar trends in transforming and improving the patient's perioperative experience. Fast track extubation is practiced in pediatric centers worldwide and has become a vital component in optimizing perioperative management.

Aims: This systematic review aims to determine if fast-track extubation compared to standard extubation will improve patient outcomes such as reduced hospital and intensive care unit length of stay, rate of reintubation, and mortality.

Results: A total of six studies were assessed and included in the systematic review. Fast track extubation (in the operating room or less than six hours after surgery) was associated with reduced ICU and hospital length of stays. There was no difference in the rate of reintubation and mortality in those pediatric patients who were extubated early.

Discussion: Despite the slight heterogeneity in results amongst the included studies, the systematic review findings are consistent with previous research that found that fast track extubation improved several patient outcomes during the perioperative period.

Conclusion: Fast track extubation appears to be safe and has demonstrable improvements in patient perioperative outcomes. There remains a need for homogeneous, large multicenter randomized control trials to determine a causal effect and demonstrate the potentially significant benefits of fast-track extubation.

INTRODUCTION

Description of the Problem

Congenital heart surgery patients are routinely mechanically ventilated for as long as 12 to 24 hours following most cardiac surgeries.¹ Prolonged and elective mechanical ventilation was thought to optimize the patient's cardiac output, promote diuresis, and improve pulmonary function and mechanics before extubation.¹ High-dose opiate-based anesthesia was also commonplace and believed to be beneficial in decreasing the stress response patients experienced following surgery.² Evidence-based research has shown that prolonged mechanical ventilation has been associated with multiple risk factors and increased morbidity, mortality, and hospital resource utilization.³

Background

The evolution of scientific evidence and technological advancements in both cardiac surgery and anesthesia have given rise to the concept of fast-track anesthesia. This revolutionary practice has allowed for essential changes in the anesthetic management of pediatric patients requiring surgery for congenital heart defects. Fast track cardiac anesthesia first appeared in the literature several decades ago. The technique involves a multimodal approach to anesthetic management where fundamental elements such as; early extubation, adequate analgesia, and appropriate sedation are essential components.⁴ Early extubation generally involves rapid weaning of mechanical ventilation and may occur in the operating room or within a few hours of surgery. Ultrafast cardiac anesthesia is also called on-table extubation and refers to tracheal extubation in the operating room itself. The advent of fast-track cardiac anesthesia brought forth a host of desirable outcomes for patients following cardiac surgery. Fast-track anesthesia protocols have led to decreased intensive care unit length of stay, reduced hospitalization cost, and decreased morbidity and mortality.⁵

Systematic Review Rationale

Congenital heart defects affect 1% or 40,000 births per year, making it the most common birth defect in the USA.⁶ The Center for Disease Control and Prevention reported that 25% of these neonates have critical congenital heart defects that require surgical intervention or procedures in the first year of life. Additionally, approximately 1,000,000 infants, children, and adolescents living with congenital heart disease, all of whom may require one or several surgical interventions at some point in their lives.⁶

The economic ramifications of congenital heart disease on the United States' health care system are substantial. In 2013, hospital costs for individuals with cardiovascular defects were approximately 6.1 billion dollars, with hospitalizations involving critical congenital heart defects associated with the highest mean and median cost of birth defect categories.⁶ In 2009, pediatric congenital heart defect hospitalizations were responsible for approximately 5.6 billion dollars in hospital costs, representing 15.1% of costs for all pediatric hospitalizations. Critical congenital heart defects accounted for 26.7% of all costs for congenital heart defect hospitalizations.⁶ The economic impact of congenital heart disease goes beyond the medical costs of care. Significant out-of-pocket expenses and increased caregiving hours competing with work demands can lead to financial stress and decreased mental health in families of children with congenital heart disease.⁶

Objectives of the Systematic Review

Fast-track anesthesia protocols have been proven effective in adult cardiac surgery and in developing countries where economic constraints are present and scarce resources are likely.⁷ Early extubation is a critical component of fast-track anesthesia protocols and is increasingly common in congenital heart surgery.⁷ As such, the effectiveness and safety outcomes of anesthetic management involving early extubation should be reviewed to highlight potential

important outcome parameters such as; extubation failure, length of stay, and cost-effectiveness. A synthesis of this information could be practical in developing a protocol for on-table extubation or standardization of care relevant to early extubation that anesthesia providers could more widely use in more economically developed countries such as the USA.

As a perioperative anesthesia provider, the certified registered nurse anesthetist (CRNA) plays a vital role in fast-track surgery and anesthesia. Their choice of perioperative medications, anesthetics, and techniques is fundamental in limiting factors that could delay extubation. The DNP project will seek to determine if on-table extubation compared to standard extubation will genuinely lead to improved patient outcomes such as a reduction in hospital and intensive care unit stay and a decrease in the rate of reintubation and mortality in pediatric congenital defect surgery patients. A protocol can be created based on the research evidence to guide the anesthesia provider in providing an ideal anesthetic technique when implementing fast-track extubation in pediatric congenital heart defect surgery patients.

PICO Question

In pediatric cardiac surgery patients, does fast-extubation compared to standard extubation in 6 hours or greater lead to improved patient outcomes demonstrated as reduced; ICU length of stay, hospital length of stay, rate of reintubation, and mortality?

MEHODOLOGY OF THE LITERATURE REVIEW

Search Strategy and Sources

The database search and review were conducted by utilizing the Preferred Reporting Items for Systematic Reviews (PRISMA) recommendations.⁸ The databases searched were CINAHL, MEDLINE, and EMBASE and included studies published from 1980 to 2020. The Medical Subject Headings (MESH) search query used were as follows: (On table extubation OR

fast track extubation OR ultra-fast track anesthesia OR early extubation OR extubation in the operating room) AND (Congenital heart surgery OR pediatric cardiac surgery OR pediatric congenital cardiac surgery) AND (pediatric anesthesia OR pediatric cardiac anesthesia OR anesthetic protocol). The reference lists of eligible studies were reviewed to identify any supplementary pertinent studies. The records were screened by title and abstract primarily and by full texts thereafter.

Study Selection and Screening of Evidence

The six studies' level of evidence was appraised using the John Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool.⁹ Based on the appraisal tool, the Preisman et al. and Xu et al. studies can be considered level 1 evidence. The remaining studies can all be considered as level 2 evidence.

The preliminary PICO question was used to select relevant article titles and abstracts. Inclusion and exclusion criteria were used thereafter. The inclusion criteria were; randomized controlled trials; prospective and retrospective cohort studies; observational studies; pediatric patients age < 21 years old with congenital heart disease or defects requiring surgery; any congenital defect repair surgery; anesthesia that included "fast-tracking" (extubation \leq 6 hours after surgery); fast track anesthesia that was compared to conventional anesthesia (extubation > 6 hours after surgery); trials with primary or secondary outcomes related to hospital and ICU length of stay, cost, morbidity, and mortality.

The exclusion criteria were: unsuitable literature such as; narrative literature reviews, conference papers, periodicals, abstracts, and preliminary studies; studies exclusively involving adults; non-cardiac surgeries; studies not published in English; studies with outcomes measures that did not include at minimum one of the outcomes in the inclusion criteria.

RESULTS OF THE LITERATURE REVIEW

Study Selection

The methodology of studies in this literature review can be grouped into three categories. Preisman et al. and Xu et al. both conducted randomized controlled trials that were observational in nature. Yu et al. and Ono et al. both conducted quasi-experimental studies that are retrospective in nature. Garg et al. and Alam et al. conducted quasi-experimental studies that were prospective and observational. The study by Garg et al. used historical controls. The similarities in the level of evidence allowed for uncomplicated comparison in methodology. The Preisman et al. and Garg et al. studies were the only ones to state the research personnel explicitly. Xu et al. utilized the same team of surgeons, anesthesiologists, and post-operative physicians, while the research was being conducted. Garg et al. outlined the intended goals for the surgeons, anesthesiologists, perfusionists, and intensive care unit intensivists. All of the studies detailed the anesthetic technique or protocol utilized for both the study and control group patients. The anesthetic technique included information on the medications given during the perioperative period and invasive line placement. Intraoperative anesthesia management included details of the volatile anesthetic gases used, medication dosing and timing, and mechanical ventilation settings. All of the studies explicitly described their definition of what was considered early extubation for their studies. The patients in the Preisman et al., Garg et al., and Xu et al. studies were all extubated in the operating room theater after completion of surgery. The patients in the Yu et al., Ono et al., and Alam et al. studies were all extubated within the first six hours after surgery. All of the studies utilized early extubation as an independent variable and compared this to conventional anesthesia or prolonged ventilation as the second independent variable. The authors performed data collection in five of the studies. Preisman et al. were the only group with their data collected by an independent investigator not participating in the patients' care. Additionally, this was the only study that used computer-generated codes to assign intervention and control

groups randomly. All of the studies used some form of statistical analysis tests and/or data analysis computer software.

Study Characteristics

The six studies in the literature review included; a prospective cohort study, a prospective randomized observational study, a retrospective non-randomized study, a prospective randomized controlled trial, a retrospective cohort study, and a prospective observational study.^{10,11,12,13,14,15} When combined, the review contained a total of 2028 pediatric patients that underwent a form of corrective or palliative surgery to repair a congenital heart defect. Two of the six studies evaluated outcomes for specific cardiac defects (ventricular septal defect and extracardiac total cavopulmonary connection)^{11,13} only. The other four studies included a wide range of surgical procedures for various congenital cardiac defects.^{10,12,14,15} The studies' publication dates ranged from 2009-2019 and were all in the English language. The duration of each study varied from as little as four months to as long as 18 years.

Demographics of Samples

All the patients enrolled in the studies were scheduled to undergo elective cardiac surgery for congenital heart disease with or without cardiopulmonary bypass (CPB). The sample sizes in each study range anywhere from 82 patients to 1000 in a single study. The patients were all pediatric, with an average age range of 1- 5 years. The Preisman et al. and Garg et al. studies included older patients 15-18 years old and as young as one day to 6 months old. All the studies provided inclusion and exclusion criteria to support the sample choice. Xu et al. was the only study that included the American Society of Anesthesiologists (ASA) status information about their patients.

Hospital Demographics

The Preisman et al. study was conducted at a single university hospital for approximately two years. As per the website, on November 18th, 2020, the Edmond and Lily Safra Children's Hospital at the Sheba Medical Center in Tel Hashomer, Israel, performs congenital cardiothoracic surgery on about 400 pediatric patients annually.

The Yu et al. study was conducted at Union Hospital Fujian Medical University in Fuzhou, China, from September to December 2017. This hospital had the smallest sample size of 82 patients, and outcomes-focused exclusively on patients undergoing surgery for ventricular septal defects.

The Xu et al. study was conducted at the China Emergency General Hospital in Beijing. No further information was listed or could be found regarding hospital demographics or the study's time frame.

The Ono et al. retrospective study examined the medical records of patients spanned from the German Heart Center in Munich from 1999-2017. As per the website, this university-affiliated hospital is one of the leading specialized centers in treating cardiovascular disorders in adults and children.

The Garg et al. study was conducted in Bangalore, India, at the Narayana Institute of Cardiac Sciences, Division of Pediatric Cardiac Sciences from October 2012- May 2013. Historic controls were used for surgeries that occurred between February 2012 and September 2012. As per the website, the Narayana Institute of Cardiac Sciences performs heart surgeries on adults & children. This cardiac center has 80 beds dedicated to pediatric cardiac ICU, the largest in the world.

The Alam et al. study was conducted in a 65-bed pediatric cardiac ICU in India between June and November 2015. The hospital demographic information was not provided in the article.

Definitions and Outcomes

Four outcomes were evaluated for this literature review. Intensive Care Unit (ICU) length of stay, hospital length-of-stay, reintubation rate, and mortality. All of the studies evaluated the ICU length of stay. Four of the six studies evaluated reintubation rates,^{10,12,13,15} and three out of the six studies evaluated hospital length of stay^{10,11,12} and mortality^{10,13,15}. ICU length of stay is defined as the length of time in either hours or days that the patient remains in the ICU's care. Hospital length of stay is defined as the number of days the patient remains in the hospital before being discharged. Reintubation rate is defined as either the percentage or number of patients requiring reintubation following early extubation. Mortality is characterized as the number of patients who died either during the perioperative period, in the ICU, or within thirty days postoperatively.

Intensive care unit length of stay

All six studies demonstrated a decrease in the number of hours or days spent in the ICU for patients who underwent early extubation versus patients in the conventional anesthesia groups. Preisman et al. considered a difference of one day for ICU length of stay to be clinically significant. They concluded, along with Garg et al., that ICU stay was decreased with early extubation.

Yu et al., Xu et al., and Alam et al. found that the ICU stay was significantly shorter in the early extubation group than in the conventional anesthesia group. Ono et al. concluded that ICU stay was shorter even in patients with unstable hemodynamics.

Hospital length of stay

Three of the six studies all concluded that there was some degree of reduction in length of hospital stay for patients treated with early extubation. The study by Preisman et al. found that although the hospital length-of-stay was generally shorter in the early extubation group, in children younger than three years old, there was no difference in the length of hospital stay when compared to the conventional anesthesia group.

Need for reintubation

In the Preisman et al. study, there were a total of four patients from the early extubation group who required reintubation. The reasons included; ventricular tachyarrhythmias and cardiac arrest, hemodynamic instability due to surgical bleeding requiring mediastinal re-exploration, pulmonary edema, and respiratory failure due to pneumothorax and pleural effusion. Three of the four were eventually successfully weaned from mechanical ventilation and discharged from the hospital, and one patient passed away. The Xu et al. study's reintubation rate was deemed to be similar between the two groups differing only by a one-patient increase in the conventional anesthesia group. Ono et al. found that the reintubation rate did not differ significantly between the groups. Nineteen patients were re-intubated in the early extubation group primarily for the following reasons; respiratory insufficiency in twelve patients, low arterial oxygen saturation and for patients, and hemodynamic instability in three patients. Six patients were successfully re-extubated without intervention thereafter. The remaining patients underwent various procedures such as catheter interventions, interventional occlusions of aortopulmonary collateral (APC), stent implantation, and closure of persistent left superior vena cava. Thirteen out of nineteen of the patients who required reintubation had a history of APC closure. Lastly, the Alam et al. study similarly concluded that there was no significant difference between groups when comparing reintubation rates. Although the reintubation rate was lower in the group that was extubated early, the difference could not reach statistical significance. Thirty-nine patients in all required

reintubation, with the majority being due to cardiac reasons such as pulmonary artery hypertension, left heart failure, cardiac arrhythmias, and unexplained cardiac arrest. Other non-cardiac reasons are required patients to be reintubated included; ventilator-associated pneumonia, diaphragmatic palsy, and septic shock.

Mortality

Regarding mortality as an outcome, all three studies found no difference in mortality between the study groups. In the Preisman et al. study, two patients in the early extubation group died. The patient's immediate post-operative course was complicated by severe cardiogenic shock requiring extracorporeal membrane. The patient also develops multi-organ failure. The second patient remained stable and conscious for four hours after extubation and then developed sudden cardiac arrest during a blood transfusion. The patient underwent prolonged resuscitation but developed severe ischemic brain damage and died of multi-organ failure seven days later. In the Alam et al. study, the overall mortality was lower in patients extubated earlier, yet the statistical significance was not reached. Twelve patients died of cardiac complications, with the most common being right ventricular failure secondary to refractory pulmonary hypertension. Other deaths were related to; left ventricular failure, refractory ventricular arrhythmias, suspected blocked Blalock Taussig shunt, and unexplained cardiac arrest. Amongst the most common non-cardiac causes of death were; ARDS secondary to ventilator-associated pneumonia and septic shock. However, the study does not delineate the cause of the three deaths that occurred in the early extubation group.

Risk of Bias

Assessing the risk of bias in the studies helps address the likelihood of accuracy present in estimating causal effect in that particular study. The Cochrane risk of bias tool was used to assess potential bias in selection, performance, attrition, and reporting.¹⁶ Selection bias could only

be assessed for the Preisman et al. and the Xu et al. studies as they are the only randomized trials in the literature review. Preisman et al. was the only study that described the method used to generate the allocation sequence for the patient sample. The patients were randomly allocated according to a computer-generated code to either the early group where fast track anesthesia was performed for the conventional group or conventional anesthesia was performed. Therefore, this study can be considered as having a low risk of selection bias. Selection bias for the Xu et al. study could not be assessed due to a lack of information regarding random sequence generation. Reporting bias was not easy to assess due to insufficient information that would allow a proper judgment. Performance bias was nearly impossible to accomplish as blinding study participants of blinding study participants and personnel from the intervention received was not feasible. In the Preisman et al. study, the radiologist assessing the daily chest x-rays was blinded to the patients' location; however, the endotracheal tube's presence in the chest x-ray was suggestive of the allocation of the patient. The investigator that was responsible for data collection did not participate in the process of the patient's care. As such, detection bias can be deemed low risk for this study. The Preisman et al. study excluded deceased patients from the length of stay analysis. For example, the authors excluded one patient in the control group from the analysis. They believed the inclusion of this moribund patient could introduce bias to the study in favor of the early extubation group. None of the other studies reported attrition and exclusions from the analysis. Therefore, it was not possible to assess attrition bias for these studies.

DISCUSSION OF LITERATURE REVIEW

Summary of Evidence

The systematic review included six studies with a combined sample size of 2408 patients. During the initial literature search, many articles were excluded for reasons such as; inappropriate literature for a systematic review, unsuitable population or surgery, and non-English studies and studies with unrelated outcome measures. Based on the John Hopkins Evidence Appraisal tool,

one of the articles was deemed level one evidence while the remaining five were qualified as level two evidence ⁹. Below is a summary of the results from the systematic review:

- All six studies demonstrated a decrease in the number of hours or days spent in the ICU for patients who underwent early extubation versus patients in the conventional anesthesia groups ^{10, 11 12 13 14 15}.
- Three studies concluded that there was some degree of reduction in length of hospital stay for patients treated with early extubation ^{11,12}.
- Four studies concluded that there was no significant difference between groups when comparing reintubation rates ^{10,12,12,15}.
- Three studies found that there was no difference in mortality rates between the study and control groups ^{10, 13, 15}.

Limitations of the Systematic Review

This systematic review endeavored to identify, evaluate, and summarize the findings of the studies in the most rigorous and transparent manner possible. In doing so, the author must also acknowledge the limitations of the systematic review. There was a small degree of heterogeneity in the results of individual studies. However, because the amount was not significant, it was appropriate to pool the data. There was considerable heterogeneity in the researchers' methods of investigation, the number of participants and length of the study were not consistent in all six studies. There were also essential variances between the groups regarding the operative anesthetic management of the patient. Discrepancies in the results could have occurred since the individual studies differed concerning diagnostic criteria, comorbidities, severity of the disease, and perhaps even geographic region. This rendered the target population of these studies to be more limited. Some of the included studies were limited with respect to sampling and generalizability. Some

studies were conducted on a smaller scale and used non-randomized samples. This could potentially limit the extent to which the findings can be generalized.

Most of the studies were of a similar type. However, there may still have been significant differences between the studies. The subjectivity in choosing studies from the literature search for the systematic review and having only one assessor may also have inadvertently affected its results. Similarly, publication bias may also overestimate the magnitude of the outcomes. Every effort was made to identify all relevant studies to avoid this effect. Potential gaps in the evidence were identified such as the length of cardiopulmonary bypass in patients and how data such as blood gas measurements were monitored and managed.

Recommendations for Future Research

The observations and results from the systematic review should prompt further investigative controlled clinical trials where the effects of fast track extubation on a variety of outcomes can be tested. The implications and impact of fast-track extubation on the cost of therapy were not assessed in this review but are important for future research. Given that congenital heart disease is diagnosed in utero or shortly after birth, further studies that could potentially identify factors that prevent fast-track extubation in various pediatric populations, such as in neonates, would also be highly recommended. Future large trials involving multiple centers and standardized techniques could provide valuable evidence on the superiority and suitability of fast-track extubation.

CONCLUSION OF THE LITERATURE REVIEW

Fast track extubation is practiced in pediatric cardiac surgery all over the world. When fast-track extubation is used appropriately and with the correct support mechanisms, resources,

and training, it can greatly impact the patient's post-operative outcome. Fast track extubation encourages a decrease in ICU and hospital length of stay ^{10,11,12,13,14,15}. Additionally, patients undergoing fast track extubation are not subjected to higher rates of reintubation or mortality. ^{10,12,13,15}. With careful forethought and planning in choosing the appropriate cases, fast-track extubation can be a powerful technique utilized by the anesthesia provider when considering airway management and early emergence after pediatric cardiac surgery.

METHODOLOGY OF QUALITY IMPROVEMENT

To ensure that the quality improvement project's aims are met, a sequence of actions will be carried out involving a specified group of study participants who will receive the intervention. The following sections will outline these actions in detail and further explain the results of the quality improvement project. This will be imperative in determining the study outcomes and assessing the value and effectiveness of the quality improvement project.

Setting

Due to the virtual nature of this quality improvement project, the actual study setting will be dependent on where the participant is located while completing the educational module and answering both the pre and post questionnaires. The primary study participants will include FIU alumni who have completed a Nurse Anesthesia program and are currently practicing anesthesia.

Recruitment and Participants

The participants will be recruited voluntarily and those who receive the proposed intervention will be asked to provide feedback regarding their experiences with the educational program. The anticipated sample size will be between 5-10 participants.

Intervention & Procedures

The primary methodology of the proposed project is to administer an online educational intervention to anesthesia providers that focuses on the benefits of fast-track extubation in the improvement of patient outcomes such as reduced hospital and intensive care unit length of stay, rate of reintubation, and mortality. The first phase of the project will consist of an online pre-assessment exam to assess the participant's understanding of fast-track extubation.

In the second phase of the project, an online PowerPoint presentation containing important information about fast-track extubation in pediatric cardiac surgery patients, will be used as the primary and sole mode of instruction. While current education on the use of fast-track extubation is available, this knowledge may not be widespread amongst providers and could be instrumental in bridging existing gaps in knowledge and supporting the use of alternate techniques for extubating pediatric cardiac surgery patients.¹² Several research findings suggest the feasibility and possible safety of an early extubation approach. Optimizing anesthesia and critical care management, as well as perioperative care, is crucial to improving the outcomes of patients with congenital heart disease.^{10,14} It is essential for anesthesia providers to have knowledge that will serve to improve patients' experience and outcomes. The delivery of the presentation will offer insight for providers regarding the importance of fast-track extubation. The current evidence supports the need for a project with comprehensive information regarding this alternate extubation technique and its benefits for pediatric patients undergoing cardiac surgery.

The third phase of the project will involve an online post-assessment exam to identify the provider's acquired knowledge, their perception of the intervention and the information that was delivered. This data will give further information on the impact of the educational intervention and how to best go forward in increasing the usage of fast-track extubation in pediatric cardiac surgery patients. The pre/post testing will offer important information about the success of the

online intervention and will also encourage anesthesia providers to consider utilizing fast-track extubation procedures more frequently.

Upon completion of the educational module, anesthesia providers will be given the opportunity to provide feedback. This feedback will be used to determine if such an educational module should be offered on a wider scale, so that additional providers could benefit from the information as well.

Protection of Human Subjects

For this study, the recruitment population will include anesthesia professionals who are FIU alumni. These Certified Registered Nurse Anesthetists will come from a variety of different clinical backgrounds and settings and with a diverse range of knowledge and experience. This population is important because they have direct knowledge and experience providing anesthesia for a variety of patient populations that may include the pediatric congenital heart disease patient as well. This will also be significant in determining if the education provided is adequate to support the intervention. Study participant recruitment will be conducted via email invitation and sent to approximately 40 Nurse Anesthesia FIU alumni. Participation will be on a voluntary basis and there will be no penalty if a participant should decide to withdraw from the QI project. There are no perceived risks to the study as it only requires the time spent by the participant to complete the pre and post-test and educational module.

Data Collection

The primary instruments used for the study will include a pre-assessment and post-assessment testing application to determine the effects of the educational module intervention. Both tests will be conducted using anonymous surveys that will determine if participants have a clear understanding of fast-track extubation in pediatric cardiac surgery. The survey will consist

of 12 questions that focuses on knowledge and practice. The surveys and educational module will be delivered using a web-based software program called Qualtrics that will be used to create the surveys and generate reports. The pre-test survey will assess baseline knowledge and interest, while the post-test survey will determine if the participants have gained any additional knowledge on the subject matter and if they are willing to apply this knowledge to their practice environment where applicable. The instrument reliability and validity will be measured in accordance with the intervention and its effectiveness for the providers. The data collected will be confidential and anonymous. No subject identifiers will be recorded during any component of the study.

Measurement and Analysis

The co-investigator for the project will be the DNP student who will be responsible for administering the survey. The responses provided on the pretest and posttest will be evaluated by the DNP student to determine any potential increase in knowledge, interest, and perception in response to the educational tool. Each question will be measured, and the responses will be recorded to identify the knowledge base before and after the intervention. No personal identifiers will be recorded for each of the study participants so their confidentiality will be protected, and the impact of the intervention will be based upon the results of the pre- and posttest survey instruments alone. Through data analysis, the study results should identify patterns that will be used to determine the effectiveness of the educational intervention. The co-investigator will store the collected data in a password-protected laptop computer.

RESULTS OF QUALITY IMPROVEMENT

Pre-test and Post-test Sample

The pre and posttest demographics are shown in Table 1 below.

Table 1

Demographic	n (%)
Total Participants	6
Gender	
Female	2
Male	4
Ethnicity	
Hispanic	3
African America	2
Other	1
Age	
25-30	1
31-35	3
35 & above	2
Years of Anesthesia Practice	
0-2	2
2-5	1
5-10	2
10 & above	1

There were 15 participants in the pre-test demographics, but only 6 completed the study. Most of the participants were male (n=4, 66.7%), as opposed to female (n=2, 33.3%). There were also a range of ethnicities represented: African American (n=2, 33.3%), Hispanic (n=3, 50%), and other (n=1, 16.7%). The participants were questioned about the years of anesthesia practice experience and the results showed that the practice experience ranged as follows: zero to two

years (n=2, 33.3%), two to five years (n=1, 16.7%), five to ten years (n=2, 33.3%), and ten years and up (n=1, 16.7%).

Difference in pre and post-test (General knowledge of fast-track extubation procedure)

Table 2

Correct Responses	Pretest	Posttest	Difference
Fast-track cardiac anesthesia is a multimodal approach to anesthetic management that includes	50%	100%	50%
With fast-track extubation, the patient must be extubated within	33.3%	66.7%	33.4%
Fast-track anesthesia protocols have been proven effective in	50%	83.3%	33.3%
The CRNA plays a vital role in fast-track surgery and anesthesia based on their choice of	100%	100%	none
Fast-track extubation first appeared in literature	0%	33.3%	33.3%
An essential component of the entire fast-track extubation process would be	33.3%	66.7%	33.4%

Difference in pre and post-test (Knowledge of outcomes of fast track extubation)

Table 3

Correct Responses	Pretest	Posttest	Difference
Fast-track extubation can improve patient outcomes such as	66.7%	100%	33.3%
Prolonged postoperative mechanical ventilation can lead to	100%	100%	none
Arguments in favor of early extubation include	66.7%	100%	33.3%
Generally, re-intubation rates after fast track extubation tend to be	83.3%	100%	16.7%

Difference in pre and post-test (Willingness to use and/or recommend fast track extubation practices)

Table 4

Responses	Pretest	Posttest	Difference
Likely to use fast-track extubation	33.3%	33.3%	none
Ambiguous	33.3%	none	-33.3%
Not likely to use fast-track extubation	33.3%	66.7%	33.3%
Likely to recommend fast-track extubation	33.3%	33.3%	none
Ambiguous	33.3%	none	-33.3%
Not likely to recommend fast-track extubation	33.3%	66.7%	33.3%

Pre-test Knowledge

Pre-Test (General knowledge of fast-track extubation procedure)

Half of the study population (50%) were able to identify all the correct components included in the fast-track anesthesia approach and the populations in which this approach has been effective. 33.3% of the participants were able to correctly identify the time frame for fast track extubation and identify patient and family consent as an essential component of the fast-track extradition process. All the participants (100%) correctly stated that the CRNA plays a vital role in fast-track surgery and anesthesia. While no participants were able to correctly identify when fast-track anesthesia first appeared in the literature.

Pre-test (Knowledge of outcomes of fast track extubation)

Most of the study participants (66.7%) were able to correctly identify the outcomes that were improved in fast track extubation as well as identify the arguments in favor of early extubation in congenital pediatric cardiac surgery. Similarly, the majority of study participants

(83.3%) were able to correctly identify that reintubation rates after fast track extubation tend to be comparable to non-fast track extubation techniques. All the study participants (100%) were able to correctly identify the deleterious effects of prolonged postoperative mechanical ventilation.

Post-test Knowledge

Post-Test (General knowledge of fast-track extubation procedure)

All the study population (100%) were able to identify all of the correct components included in the fast-track anesthesia approach and correctly stated that the CRNA plays a vital role in fast-track surgery and anesthesia. 83.3% participants were able to correctly identify which population this approach has been effective in. 66.7% of the participants were able to correctly identify the time frame for fast track extubation and identify patient and family consent as an essential component of the fast-track extubation process. Finally, 33.3% of participants were able to correctly identify when fast-track anesthesia first appeared in the literature.

Post-test (Knowledge of outcomes of fast track extubation)

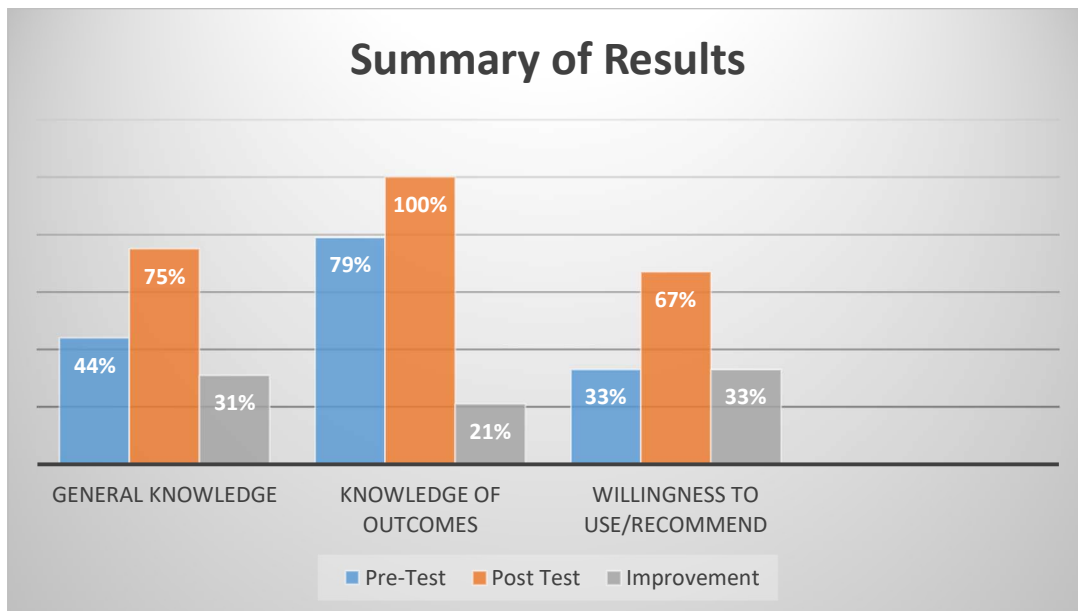
All the study participants (100%) were able to provide the correct answers to all of the questions related to this post-test section.

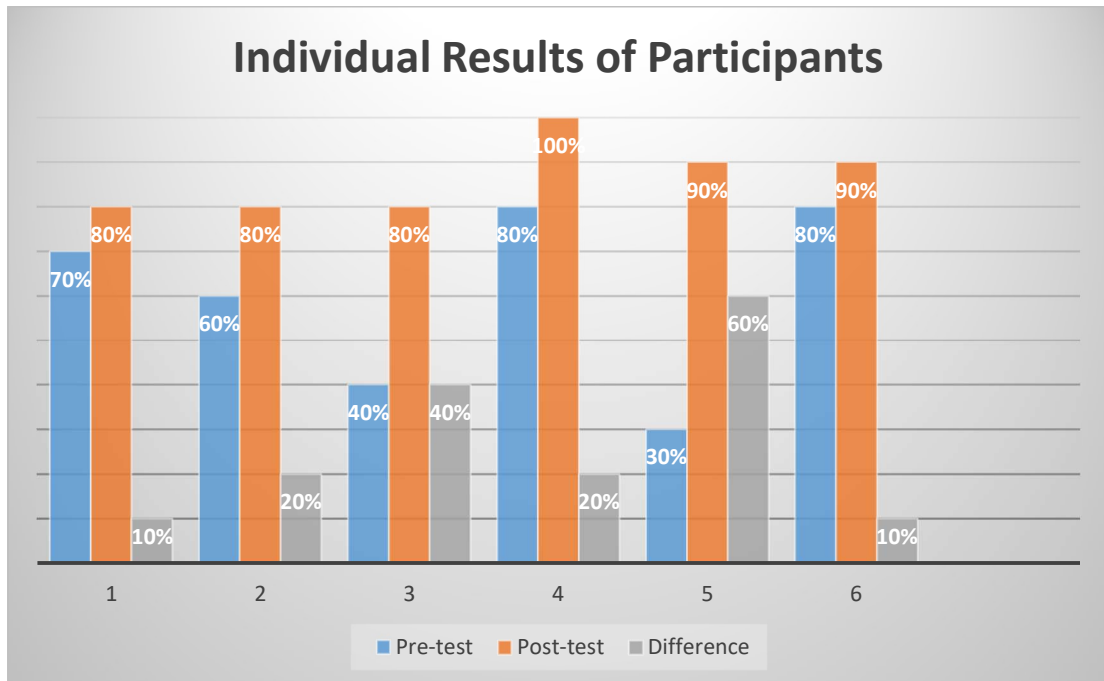
Prior to the educational module, study participants were equally divided (33.3%) in their likelihood to use and/or recommend fast track extubation. Following the educational module, the majority of participants were extremely likely to use and/or recommend fast track extubation, while 33.3% of study participants were somewhat likely to use and or recommend fast track extubation.

Perspective of Use in Practice

Overall, the results show that there is a significant improvement for both categories of knowledge. After completing the educational module, general knowledge of fast track extubation demonstrated a 31% increase and knowledge regarding outcomes of fast track extubation demonstrated a 21% increase. Similarly, study participants were more likely to use and or recommend fast track extubation after completing the educational module. The degree of difference is demonstrated in the figure below.

Graph 1. Individual Results of Participants



Graph 2. Individual Results of Participants

DISCUSSION OF QUALITY IMPROVEMENT

Limitations

Limitations of the study include the small sample size. The study was distributed to a large number of FIU alumni however, response rates were low. A larger sample size would have been preferable in order to increase the strength of the study. Furthermore, the delivery method was limited since the educational module was done entirely online, which does not consider the diversity of learning styles of participants.

Future Implications for Advanced Nursing Practice

The impact of the intervention is significant as it may affect the anesthesia providers perception on alternative extubation techniques. Educational interventions are likely to broaden the providers knowledge base and assist in developing strategies to enhance patient outcomes and satisfaction.⁵ The data showed that the educational module was effective in increasing the

anesthesia provider's knowledge and willingness to use and or recommend fast track extubation. The findings can be presented in other clinical settings where the use of fast track extubation may be feasible.

CONCLUSION

Fast track extubation is practiced in pediatric cardiac surgery all over the world. When fast-track extubation is used appropriately and with the correct support mechanisms, resources, and training, it can greatly impact the patient's post-operative outcome. Fast track extubation encourages a decrease in ICU and hospital length of stay ^{10,11,12,13,14,15}. Additionally, patients undergoing fast track extubation are not subjected to higher rates of reintubation or mortality. ^{10,12,13,15}. With careful forethought and planning in choosing the appropriate cases, fast-track extubation can be a powerful technique utilized by the anesthesia provider when considering airway management and early emergence after pediatric cardiac surgery.

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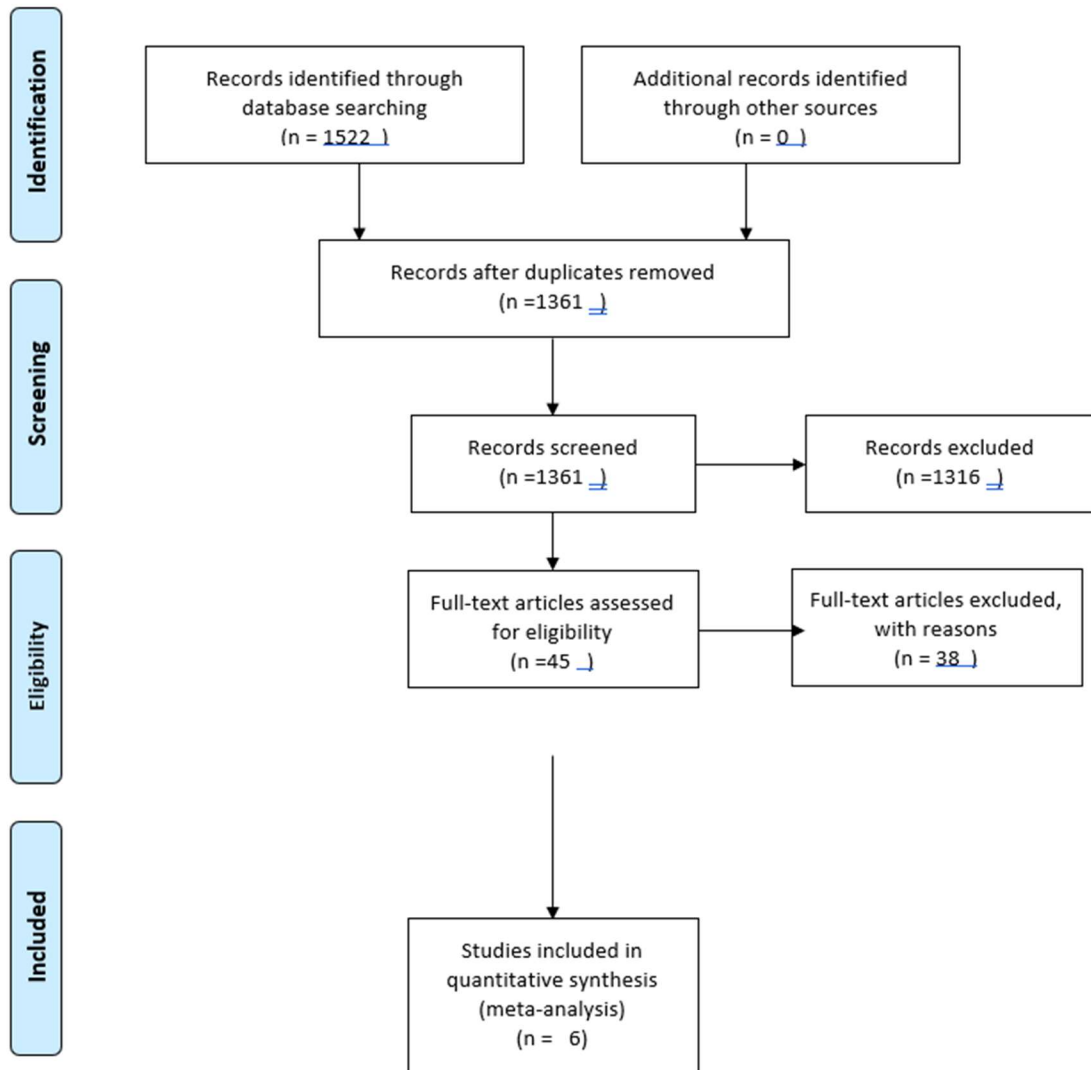
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APPENDIX A

PRISMA Flow Diagram



APPENDIX B**Matrix Table**

Citation	Preisman et al., 2009 A Randomized Trial of Outcomes of Anesthetic Management Directed to Very Early Extubation After Cardiac Surgery in Children. ¹⁰
Design/Method	Prospective randomized observational study. An evaluation of Safety and efficacy of the early extubation approach
Sample/Setting	Setting: A single university-affiliated hospital Participants: 100 consecutive pediatric patients age one month to 15 years requiring cardiac surgery
Major Variables Studied and Their Definitions	IV1: Extubation in the operating room (EG) IV2: Elective prolonged mechanical ventilation (CG) DV1: Pediatric intensive care unit PICU length of stay DV2: Hospital length of stay DV3: Post-operative mortality
Measurement and Data Analysis	The Fisher exact test was used for dichotomous variables. The Kolmogorov-Smirnov test was used to test the normality of the distribution of continuous variables. The student T test for continuous variables was used in case of normal distribution of the variable. The Mann Whitney U test was used if the distribution was not normal. The Holm-Bonferroni stepwise procedure was used as well.
Findings	PICU LOS (range, median in days): EG= 0.2-8.9, 2.9

	<p>CG= 1.6-20.9, 4.7 Total= 0.2-20.9, 3.4</p> <p>p Value= <0.001</p> <p>Hospital LOS (range, median in days):</p> <p>EG= 3.0-15.0, 7.0 CG= 4.0-40.0, 8.0 Total= 3.0-40.0, 7.5</p> <p>p Value= 0.009</p> <p>Mortality:</p> <p>EG= 2, 4.0%</p> <p>CG= 2 (4.1%)</p> <p>Total= 4 (4.0%)</p> <p>p Value= 1.0</p>
Conclusions	Early extubation after cardiac surgery in children appears to be safe and decreases hospital and PICU length of stay.
Appraisal: Worth to Practice/Level	<p>Strength: Randomization of participants and use of control group.</p> <p>Broad age range of participants. Limitations: Lack of blinding of assessors. No use of protocol for extubation criteria. Risk of harm: Respiratory acidosis in early extubation group. Prolonged ventilation in control group. Feasibility of use: Adequate however would require PACU equipped with post-operative ventilation potential if patient not returning to PICU.</p>

Matrix table 2

Citation	Yu et al., 2019. Comparison of Fast-Track and Conventional Anesthesia for Transthoracic Closure of Ventricular Septal Defects in Pediatric Patients. ¹¹
Design/Method	A retrospective non-randomized study. A comparison and analysis of the safety and efficacy of fast track and conventional anesthesia for transthoracic closure of ventricular septal defects (VSD) in pediatric patients.
Sample/Setting	Setting: University affiliated hospital Participants: 82 pediatric patients Age 1.4- 4.8 years old undergoing transthoracic closure of VSD
Major Variables Studied and Their Definitions	IV1: Fast track anesthesia (Group F) IV2: Conventional anesthesia (Group C) DV1: ICU LOS DV2: Hospital LOS DV3: mechanical ventilation time DV4: hospitalization expenses
Measurement and Data Analysis	Continuous data were found to be in accordance with normal distribution. Independent Sample T test was used for statistical analysis. Chi-square test was used to compare the number of post-operative complications between the two groups.
Findings	DV1:

	<p>Group F: 4.67 ± 1.42</p> <p>Group C: 11.18 ± 5.98</p> <p>P value: 0.034</p> <p>DV2:</p> <p>Group F: 2.04 ± 0.75</p> <p>Group C: 4.68 ± 1.46</p> <p>P value: 0.047</p> <p>DV3:</p> <p>Group F: 1.26 ± 0.39</p> <p>Group C: 4.55 ± 2.74</p> <p>P value: 0.045</p> <p>DV4 (China currency renminbi):</p> <p>Group F: 2.59 ± 0.47</p> <p>Group C: 3.84 ± 1.63</p> <p>P value: 0.049</p>
Conclusions	Fast track anesthesia for transthoracic closure of VSD in pediatric patients is safe and effective for use.
Appraisal: Worth to Practice/Level	Strength: Detailed anesthesia protocol for both fast track and conventional anesthesia. Limitations: No randomization. Retrospective rather than prospective study. Narrow spectrum for patient age group and cardiac surgical procedure. Risk of harm: potential for pulmonary

	and post-operative complications. Feasibility of use: Good value for clinical applicability
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Matrix table 3

Citation	Xu et al., 2019 Benefits of ultra-fast-track anesthesia for children with congenital heart disease undergoing cardiac surgery. ¹²
Design/Method	A prospective randomized controlled trial. Comparison of the outcomes of ultra-fast track anesthesia (UFTA) and conventional anesthesia in cardiac surgery for children with congenital heart disease
Sample/Setting	Setting: China emergency General Hospital Participants: 194 children with congenital heart disease aged six months to two years with a weight between 5 to 10 kilograms and the American Society of anesthesiologists ASA physical status III and IV
Major Variables Studied and Their Definitions	IV1: Ultra-Fast track anesthesia (UFTA) IV2: Conventional anesthesia (CG) DV1: ICU LOS DV2: Hospital LOS DV3: Extubation time Secondary outcomes: Sedation Agitation Scores (SAS) and Adverse reactions

Measurement and Data Analysis	<p>The data were analyzed by SPSS version 20.0 Kolmogorov-Smirnov test. Distributed variables were compared by independent samples Student's t-test. The frequencies of categorical variables were compared using Pearson 2 or Fisher's exact test, when appropriate. A value of $P < 0.05$ was considered significant.</p>
Findings	<p>DV1 (hours): UFTA: 20.7 ± 6.5 CG: 28.5 ± 4.2</p> <p>DV2 (days): UFTA: 11.5 ± 3.0 CG: 16.1 ± 2.5</p> <p>DV3 (min): UFTA: 22.9 ± 3.5 CG: 189.1 ± 31.2</p> <p>P value: 0.05</p>
Conclusions	<p>Ultra-fast track anesthesia shortens extubation time, ICU stay in hospital stay for children with congenital heart disease.</p>
Appraisal: Worth to Practice/Level	<p>Strength: Randomized trial. Limitations: Small sample size. Patients with mild illness only. Risk of harm: Hematological parameters related to ventilator-associated pneumonia not measured Feasibility of use: Is feasible to be recommended in clinical practice</p>

Matrix table 4

Citation	Ono et al., 2019 Early extubation improves outcome following extracardiac total cavopulmonary connection. ¹³
Design/Method	A retrospective cohort study. Investigating the impact of early extubation on outcomes following extracardiac total cavopulmonary connection surgery when compared to conventional extubation strategies.
Sample/Setting	Setting: German Heart Center. Participants: 458 patients aged 1.7-5.3 years undergoing extracardiac total cavo pulmonary connection surgery.
Major Variables Studied and Their Definitions	IV1: Early extubation (Group A) IV2: Conventional anesthesia (Group B) DV1: ICU LOS DV2: Ventilation time DV3: Chest tube duration DV4: Reintubation rate DV5: Early mortality DV6: Fluid volume administered in first 24 hours
Measurement and Data Analysis	Categorical data was analyzed using the χ^2 test and t-test was use. The Mann–Whitney U-test and the Kaplan–Meier method was used. A Cox regression model was used. All the statistical tests were 2-sided, and P-values of 0.05 or less were considered statistically significant. Data analysis

	was performed using the Statistical Package for the Social Sciences (SPSS), version 22.0 for Windows
Findings	<p>Group A vs. Group B</p> <p>DV1: median 6 days vs 7 days</p> <p>P= 0.001</p> <p>DV2: median 4 h vs 16 h, P= 0.001</p> <p>DV3: median 3 days vs 4 days P = 0.028</p> <p>DV4: 7% VS 6 %, P= 0.547</p> <p>DV5: 0.8% VS 1.5%, P= .0465</p> <p>DV5: mean 110ml/kg vs 164ml/kg</p> <p>P= 0.003</p>
Conclusions	<p>Early extubation is feasible in nearly all patients following extracardiac total cavo pulmonary surgery regardless of their hemodynamic status.</p> <p>Early extubation is associated with earlier chest tube removal and shorter ICU stays.</p>
Appraisal: Worth to Practice/Level	<p>Strength: Large sample size and long time frame of study. Limitations: Results specific to surgery for one specific cardiac defect. Retrospective and single-center design. Risk of harm: atrioventricular valve (AVV) regurgitation may be the intrinsic risk factor for an unfavorable outcome. Feasibility of use: Feasible to implement in high acuity centers that manage the most complex cardiac defects.</p>

Matrix table 5

Citation	Garg et al. 2014 Extubation in the Operating Room After Cardiac Surgery in Children: A Prospective Observational Study With Multidisciplinary Coordinated Approach. ¹⁴
Design/Method	A prospective observational study. To evaluate the feasibility and safety of extubation in the operating room after surgery for congenital heart disease in pediatric patients.
Sample/Setting	Setting: A single tertiary care referral hospital. Participants: 1000 consecutive pediatric patients requiring cardiac surgery age one day to 18 years old.
Major Variables Studied and Their Definitions	IV1: Early extubation (Study group SG) IV2: Conventional anesthesia (Before study group BSG) DV1: ICU LOS DV2: Number of patients in the ICU daily DV3: Number of patients on the ventilator daily DV6: Fluid volume administered in first 24 hours
Measurement and Data Analysis	Data analysis completed using computer program epidemiological information package EPI 2010 developed by the Center for Diseases Control, Atlanta GA. Range, frequencies, percentages, means, standard deviations and P values were calculated using this software. Student T test was used to test the significance of difference among quantitative

	variables. AP value less than 0.05 was considered a significant relationship
Findings	<p>SG vs. BSG</p> <p>DV1:</p> <p>BSG: 5.4 ± 2.32</p> <p>SG: 2.56 ± 1.85</p> <p>P value: 0.0001</p> <p>DV2:</p> <p>BSG: 59.98 ± 4.92</p> <p>SG: 34.76 ± 3.19</p> <p>P value: 0.0001</p> <p>DV3:</p> <p>BSG: 24.5 ± 2.88</p> <p>SG: 5.1 ± 1.24</p> <p>P value: 0.0001</p>
Conclusions	<p>Early extubation in the operating room was successful in 87.1 % of patients. No significant increase in morbidity or mortality was found.</p> <p>There was a decrease in ICU LOS and use of hospital resources.</p>
Appraisal: Worth to Practice/Level	<p>Strength: Very large sample size and wide age range. Limitations: Non-blinding, potential for bias. Risk of harm: Varied anesthesia techniques.</p> <p>Feasibility of use: May be inappropriate or unsafe to recreate without a anesthesia protocol in place.</p>

Matrix table 6

Citation	Alam et al. 2018 Predictors and Outcome of Early Extubation in Infants Postcardiac Surgery: A Single-center Observational Study. ¹⁵
Design/Method	A prospective cohort study. To evaluate the timing of first extubation and compare the outcome of patients extubated early with others.
Sample/Setting	Setting: 65 bed pediatric cardiac ICU in India. Participants: children less than one year of age undergoing surgery for congenital heart disease.
Major Variables Studied and Their Definitions	IV1: Early extubation (Group A) IV2: Prolonged ventilation (Group B) DV1: ICU LOS DV2: Sepsis DV3: Mortality DV4: Reintubation
Measurement and Data Analysis	The Mann Whitney U test was used to analyze continuous data. The chi-square test and the Fisher exact test were used to determine categorical data. P less than 0.05 was considered statistically significant. Univariate analysis and multivariate logistic regression analysis were used to identify independent risk factors and odds ratios were calculated

Findings	<p>DV1 (hours) =</p> <p>Group A: 60.2±28.1</p> <p>Group B: 111.6±70.8</p> <p>P value: 0.000</p> <p>DV2 (%) =</p> <p>Group A: 3 (1.8)</p> <p>Group B: 21 (5.5)</p> <p>P value: 0.024</p> <p>DV3 (%) =</p> <p>Group A: 3 (1.5)</p> <p>Group B: 17 (4.5)</p> <p>P value: 0.091</p> <p>DV4 (%)=</p> <p>Group A: 12 (6.2)</p> <p>Group B: 27 (7.2)</p> <p>P value: 0.656</p>
Conclusions	<p>Early extubation in infants post cardiac surgery lowers the pediatric ICU stay and sepsis without increasing the risk of mortality or reintubation</p>
Appraisal: Worth to Practice/Level	<p>Strength: Large sample size. Limitations: Dichotomized sample. The absence of fixed anesthesia protocol. Risk of harm: Potential pulmonary and post-operative complications. Feasibility of use: applicable to clinical practice</p>

APPENDIX C



Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To: Dr. Vicente Gonzalez
CC: Aisha Williams-Hunte
From: Elizabeth Juhasz, Ph.D., IRB Coordinator *EJ*
Date: June 22, 2021
Protocol Title: "An Educational Intervention on the use of fast-track extubation in congenital pediatric cardiac surgery: A quality improvement project."

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #: IRB-21-0258 **IRB Exemption Date:** 06/22/21
TOPAZ Reference #: 110331

As a requirement of IRB Exemption you are required to:

- 1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
- 2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
- 3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at <http://research.fiu.edu/irb>.

EJ

APPENDIX D

CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT
“An Educational Intervention on the use of fast-track extubation in congenital
pediatric cardiac surgery: A quality improvement project.”

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** Educational module concerning the use of fast-track extubation in congenital pediatric cardiac surgery.
- **Procedures:** If you choose to participate, you will be asked to complete a pretest watch a voice PowerPoint and then a post test
- **Duration:** This will take about a total of 20-minutes total.
- **Risks:** The main risk or discomfort from this research is minimal
- **Benefits:** The main benefit to you from this research is to increase the participant’s knowledge on the role fast-track extubation in congenital pediatric cardiac surgery.
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

PURPOSE OF THE PROJECT

You are being asked to participate in a quality improvement project. The goal of this project is to increase the knowledge of health care providers in using fast-track extubation in congenital pediatric cardiac surgery.

DURATION OF THE PROJECT

Your participation will require about 20 minutes of your time.

PROCEDURES

If you agree to be in the project, we will ask you to do the following things:

RISKS AND/OR DISCOMFORTS

There are no foreseeable risks with you for participating in this project.

BENEFITS

The following benefits may be associated with your participation in this project:

An increased understanding of the use of fast-track extubation in congenital pediatric cardiac surgery. The overall objective of the program is to increase the quality of healthcare delivery and improve healthcare outcomes for our patients.

ALTERNATIVES

There are no known alternatives available to you other than not taking part in this project. However, if you would like to receive the educational material given to the participants in this project, it will be provided to you at no cost.

CONFIDENTIALITY

The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, we might publish, we will not include any information that will make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

PARTICIPATION: Taking part in this research project is voluntary.

COMPENSATION & COSTS

There is no cost or payment to you for receiving the health education and/or for participating in this project.

RIGHT TO DECLINE OR WITHDRAW

Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the best interest.

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Aisha Williams Hunte. at 305-879-9209, awill395@fiu.edu or Dr. Jorge Valdes at 305-348-7729/jvalde@fiu.edu.

IRB CONTACT INFORMATION

If you would like to talk with someone about your rights pertaining to being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

PARTICIPANT AGREEMENT

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. By clicking on the “consent to participate” button below I am providing my informed consent.

APPENDIX E**Pretest and Posttest Questionnaire:**

Fast-Track Extubation in Congenital Pediatric Cardiac Surgery

INTRODUCTION

The primary aim of this QI project is to improve the knowledge of CRNAs pertaining to fast-track extubation in congenital pediatric cardiac surgery in order to improve patient outcomes in this population. Please answer the question below to the best of your ability. The questions are either in multiple choice or true/false format and are meant to measure knowledge and perceptions on fast-track extubation in congenital pediatric cardiac surgery

PERSONAL INFORMATION

1. **Gender:** Male Female Other _____
2. **Age:** _____
3. **Ethnicity:**
 Hispanic Caucasian African American Asian Other _____
4. **Position/Title:** _____
5. **Level of Education:** Associates Bachelors Masters Other

6. How many years have you been an anesthesia provider?
 Over 10 5-10 years 2-5 years 0-2 years

QUESTIONNAIRE

1. Fast track cardiac anesthesia is a multimodal approach to anesthetic management that includes:
 - a. Early extubation
 - b. Analgesia
 - c. Sedation
 - d. All of the above
2. With fast track extubation, the patient must be extubated
 - a. In the OR suite
 - b. In the ICU in less than 6 hours
 - c. Within 7-10 hours
 - d. A and B
3. Fast track anesthesia protocols have been proven effective in
 - a. Adult cardiac surgery
 - b. Neonatal patients with pulmonary hypertension
 - c. Developing countries with economic constraints
 - d. A and C
4. The CRNA plays a vital role in fast track surgery and anesthesia based on their choice of
 - a. Perioperative medications, anesthetics, and techniques
 - b. Patient positioning
 - c. Endotracheal tube size
 - d. None of the above, the surgeon is responsible
5. Fast track extubation can improve patient outcomes such as
 - a. Morbidity and mortality
 - b. Length of stay in the ICU
 - c. Length of stay in the hospital
 - d. All of the above

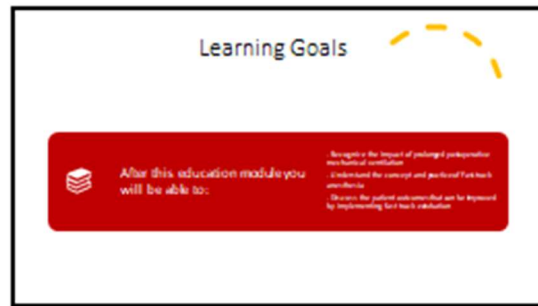
6. Prolonged postoperative mechanical ventilation can lead to
 - a. Pneumonia
 - b. Ventilator associated lung injury
 - c. Prolonged hospital length of stay
 - d. Increased postoperative mortality
 - e. Overall increased costs of surgical care
 - f. All of the above
7. Very early extubation was suggested as a viable option
 - a. Within the last five years
 - b. Within the last 10 years
 - c. Less than one year ago
 - d. More than 25 years ago
8. Arguments in favor of early extubation in congenital pediatric cardiac surgery include
 - a. Rapid reestablishment of normal physiologic conditions
 - b. early start of feeding
 - c. Early interaction with parents
 - d. Decreased incidence of ventilator associated complications
 - e. All of the above
9. An essential component of the entire fast track process would be
 - a. Patient/family consent
 - b. Adequate analgesic regimen
 - c. Low risk surgeries
 - d. High dose opioid technique
10. Generally, re-intubation rates after fast track extubation tend to be
 - a. Higher
 - b. Lower

- c. Comparable
11. How likely are you to use fast track extubation in congenital pediatric cardiac surgery
- a. Most likely
 - b. Somewhat likely
 - c. Somewhat unlikely
 - d. Most unlikely
12. How likely are you to recommend fast track extubation in congenital pediatric cardiac surgery
- a. Most likely
 - b. Somewhat likely
 - c. Somewhat unlikely
 - d. Most unlikely

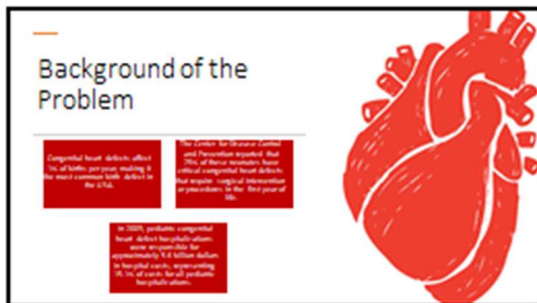
APPENDIX F



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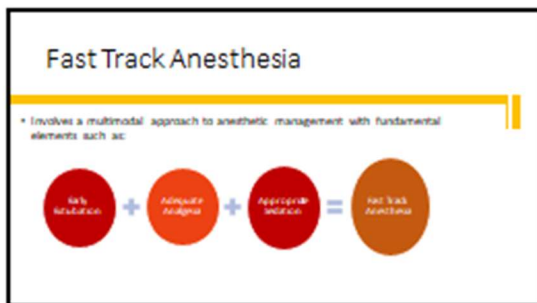
2



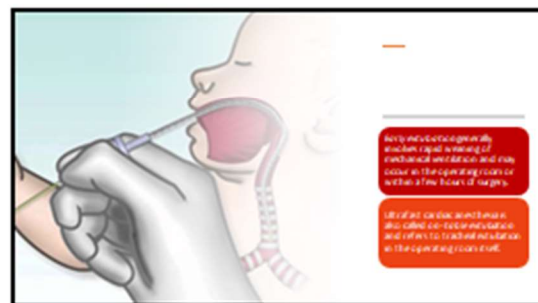
3



4



5



6

