Marian University

Leighton School of Nursing

Doctor of Nursing Practice

Final Project Report for Students Graduating in May 2024

Implementation of Standardized Post-anesthesia Care Handoff and Airway Management in Recovery

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Date of Submission: April 29, 2024

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Abstract

When a patient arrives at the postoperative anesthesia care unit (PACU), a transfer of care report from the anesthesia provider to the PACU nurse occurs at the bedside. Historically, there has been a lack of completeness in handoff reporting that has led to numerous avoidable medical errors. The goal of this quality improvement project at a 25-bed critical access hospital in rural Indiana was to implement a standardized handoff tool in the PACU. Secondly, an in-service was provided on airway management amongst special populations across the lifespan to improve the quality and safety of patient care in rural communities. A pre-test survey was used to evaluate the anesthesia department and perioperative nurse's opinions of the current handoff process. A standardized handoff tool was then implemented along with an in-service on airway management of special populations. A post-intervention survey was used to determine if the post-anesthesia tool made handoff a more streamlined process. Unfortunately, due to the lack of participation from participants, results were inconclusive to determine if the standardized handoff tool improved the transition of care process in the recovery room.

Keywords: *perioperative, handoff, post-anesthesia care unit, communication, standardized tool, checklist, reporting tool*.

Implementation of Standardized Post anesthesia Care Handoff & Airway Management in Recovery

This project is submitted to the faculty of Marian University Leighton School of Nursing as partial fulfillment of degree requirements for the Doctor of Nursing Practice, Nurse Anesthesia track. The absence of proper communication during the transfer of care of patients from the surgical suite to the post-anesthesia care unit (PACU) has resulted in numerous medical errors resulting in morbidity and mortality. Despite this phenomenon, there is still an absence of formal handoff in many healthcare facilities when transferring care of patients. The purpose of this evidenced-based quality improvement project is to establish a standardized PACU handoff at a 25-bed critical access facility to ensure patient safety and continuity of care. A thorough handoff and educational in-service provided to recovery room Registered Nurses (RNs) on airway management for specialty populations including pediatrics and bariatrics will improve patient safety, and quality of care in the community in rural Indiana where access to care is limited.

Background

When a patient arrives at the postoperative anesthesia care unit (PACU), a transfer of care report from the anesthesia provider to the PACU nurse occurs at the bedside. This includes the patient's medical history, procedure, intraoperative events, and postoperative plan. After the report is given, the PACU RN assumes care of the patient. Neglecting to give a thorough report is a violation of the American Association of Nurse Anesthetists (AANA) Standards of Practice Standard VII. Under this act, the anesthetist is required to "accurately report the patient's condition including all essential information and transfer the responsibility of care to another qualified health provider in a manner that assumes continuity of care and patient safety" (AANA, 2016).

Historically, hand-off reports on patients have been minimal and inconclusive leading to critical patient safety events leading to The Joint Commission's involvement. Under The Joint Commission's National Patient Safety Goals are the listed expectations for effective handoff reporting with a standardized tool (TJC, 2008). Without utilizing a checklist or tool to reference, providers are forced to recall pertinent details from memory that could be incorrect or missing information (Shah et al., 2019).

Time restraints, interruptions, and multiple tasks taking place simultaneously are contributing factors to handover incompleteness. When there are too many distractions and a comprehensive report is excluded, serious patient safety events can occur such as airway emergencies, re-intubations, delayed discharges, and even death (Lambert, 2018). Different communication styles among providers are also a culprit in improper handoff. A standardized handoff fosters a systematic reporting style in which no intraoperative events must be recalled from memory. Disorganized inconclusive handoff is the cause of 80% of serious medical errors that occur perioperatively (Halladay et al., 2018). To avoid another statistic, standardizing the handoff process is best practice.

In a critical access hospital in rural Indiana where access to care is limited, a provider needs to be well-versed in caring for patients across the lifespan. Safely recovering patients from anesthesia specifically, requires high vigilance and critical thinking skills. This critical access facility in rural Indiana has a high volume of bariatric and pediatric patients daily. There are many key airway differences between pediatric patients versus adults that anesthesia providers and recovery room nurses must be aware of.

Transferring a pediatric patient from the operating room to the recovery room can be a very daunting time due to the fragility and reactivity of their airway. A Laryngospasm is a life-

threatening airway emergency that involves the blockage of the airway that can quickly escalate to hypoxemia if not treated immediately (Furstein & Morey, 2023). To be able to recognize and immediately take action is a skill set required for a PACU nurse to have when recovering pediatric patients. It is also of the utmost importance to have the necessary emergency airway equipment readily available in the PACU bay. This includes a suction setup, a properly fitting Ambu bag, and quick access to an emergency airway cart or crash cart. The safety and efficacy of caring for patients in the special populations mentioned above start with proper handoff in the transition of care to PACU. A conclusive formalized process for handoff utilizing a checklist decreases perioperative miscommunication by increasing data transfer, and efficiency, and improves patient safety.

Problem Statement

Patients in the transition period between being anesthetized in the operating room suite, or procedure room to the PACU remain vulnerable. Inadequate or inconsistent handoff between the anesthesia providers and PACU RNs is a major patient safety risk when patients' lives depend on their competency. The goal of this quality improvement project is to implement a standardized handoff tool to improve patient safety, closing the gap between current practice and best practice in a 25-bed critical access hospital in rural Indiana. The second portion of the project is to provide airway management education to the recovery room RNs who see a high volume of pediatric and bariatric patients to improve the quality and safety of patient care.

Needs Assessment and Gap Analysis

The project site is a 25-bed critical access hospital in rural Indiana. Critical access facilities improve access to care by providing essential healthcare services in rural communities. Currently, there is no formal handoff process in the transition of care between the anesthesia

providers and the PACU nurses. The goal of this DNP project focuses on developing a standardized and evidenced-based practice handoff tool to meet the requirements of the 2007 Joint Commission's National Patient Safety Goals (TJC, 2008). By utilizing the toolkit, Team Strategies to Enhance Performance and Patient Safety (TeamSTEPPS), education will be provided to PACU RNs on proper airway management while implementing a handoff tool into everyday practice. the study hoped to prove that the implementation of a standardized handoff process and specialty patient population education would enhance the satisfaction and confidence of those involved in patient transfer of care.

Review of the Literature

A review of literature was conducted in October 2022 to answer the following question: Does a standardized handoff tool used in the transfer of care to the PACU improve the quality, safety, and continuity of care for the patient as well as improve healthcare worker satisfaction in the process? Professional practice guidelines were obtained from the AANA, The Joint Commission, and the US Department of Defense Patient Safety Program (Dod PSP). The databases utilized for this review were PubMed, and Cumulative Index to Nursing & Allied Health Literature (CINAHL) with the following search terms: anesthesia handoff, anesthesia transfer, standardized handoff, checklist, perioperative handoff, and PACU perceptions. 34 articles were identified and 10 were carefully selected after review, as shown in Appendix A. Inclusion criteria included transfer of care by anesthesia and articles that best answered the clinical questions. Exclusion criteria included articles published beyond the past 5 years and articles that did not contain evidence-based practice findings under the selected topic. A full literary matrix of all articles included in this literary review is included in Appendix B.

Improved teamwork and employee satisfaction: When patient acuity increases, copious tasks with multiple distractions commence. Routinely utilizing the same checklist in handoff seamlessly guides the transition of care process allowing time to cross-check information amongst the healthcare team. A checklist also provides less room for error from missing information in turn less frustration from having to track people down for follow-up questions (Reine et al., 2020). However, for changes to be implemented, providers must be open and willing to accept change. Results of a study conducted by Lambert (2018), found that providers who are accustomed to taking written notes in reports are more inclined to implement a handoff tool into everyday practice and were observed to be the best change champions (Lambert, 2018). Consequently, the positive effects from using the tool provided for a familiar routine each time a handoff is given. A systematic review (n=27) and one quality improvement project (n= 135) reported increased employee satisfaction, after implementation of a handoff tool (Dalal et al., 2020; Lambert, 2018). 77 out of 79 anesthesia providers in a meta-analysis reported that it made the handoff process easier (Shah, 2019).

Improved quality and continuity of care: 3 studies highlighted that there is an ongoing disagreement among providers on the essential components of handoff (Dalal et al., 2020; Gibney, 2017: Randmaa et al., 2017). However, after standardizing the handoff process, an improvement in the efficacy of handoff was seen along with a more comprehensive report (Dalal et al., 2020; Lambert 2018). Shah's study (2019), reiterated systematic handoff tools allow clear communication of concurrent information in which the receiver retains the information being reported.

Patient Safety: Pertinent patient information left out in handoff is a direct link to poor patient outcomes. A checklist serves as a physical reminder to prevent information omission

(Park et al., 2016). Each time the transition of care occurs from one provider to another there is the risk of human error from neglecting to inform the oncoming provider of pertinent patient data. A multicenter population-based study (n=102,156) found a significant increase in the number of post-operative 1-year mortality and well longer hospital lengths of stay when intraoperative anesthesia handoff was given (Sun et al., 2022). The strength of this study is that it reviewed patients over a decade with a large sample size. Secondly, one of the first randomized control trials on anesthesia handoffs compared patient outcomes of participants who received intraoperative handoff versus patients without with a sample size of 1,817 participants. The results of this study concluded that 52% of patients required ICU admissions postoperatively when intraoperative handoff of care was given (Meersch et al., 2022). Despite the limitations of this study having multiple variables that could have contributed to ICU admissions, it recapitulates the importance of proper handoff to prevent further complications.

Communication failures associated with handoff may be one of the most important contributors to preventable adverse events in healthcare (Lowe & Geroge-Gay, 2017). After the implementation of a handoff in a pediatric hospital (n= 135) there was a significant decrease in the number of missing items that needed to be reported such as airway techniques, ventilation status, venous access, medications given, and pertinent intraoperative events compared to pre-handoff tool results ($P<0.001$) (Dalal et al., 2020). Providing handoff in a systematic approach utilizing a checklist such as the SBAR, (Situation, Background, Assessment, Recommendation) information omissions are minimized in the handoff process (Reine et al., 2020).

Several methods for standardized handoff from anesthesia to the PACU exist in the literature. Different tools and mnemonics were utilized in the handoff process reaching the same consensus that a standardized handoff tool is essential for patient safety and continuity of care.

Theoretical Framework

The John Hopkins Evidence-Based Practice (JHNEBP) model will be utilized to serve as a blueprint for the decision-making process of this quality improvement project. Inquiry is the starting point for this model. An individual or team seeks to identify if the current practice reflects the best evidence available (Dang et al., 2022). The JHNEBP includes a 19-step process that can be simplified into 3 phases. Practice questions, evidence, and transition or PET (Dang et al., 2022). The PET model provides a systematic approach to solving practice questions, finding the best evidence, and translating that information into practice. A visual representation of this process can be seen in Appendix C. This process is centered on the fact that healthcare is becoming increasingly complex and ongoing learning is necessary to remain current in best practice. The model encourages a spirit of inquiry and a culture of learning.

Project Aims and Objectives

The goal of this DNP project is to improve the handoff process between anesthesia and PACU RNs by implementing a standardized handoff tool. The primary purpose was to identify the barriers and reasons for incompleteness in the current handoff process. Secondly, we wish to improve the confidence level of PACU RNs when recovering bariatric and pediatric patients. We aim to implement a standardized handoff tool that complies with the Joint Commission's National Patient Safety Goal (TJC, 2008) while improving the staff's perception and satisfaction utilizing the tool in handoff.

SWOT Analysis

A thorough assessment was completed to identify the strengths and weaknesses of this project. The strengths of this study include using evidence-based practices to improve patient outcomes. Utilizing an evidenced-based practice handoff tool is accessible and easy to adopt into

practice. The aim of this study target areas needed for improvement and gear the continuing education to improve patient care. The project encouraged staff to become more involved by recruiting a project champion. The project champion encouraged participation from co-workers. Utilizing a project champion has the potential to motivate future quality improvement projects at this clinical site.

Examining and recognizing potential barriers involved in this project is as important as assessing the strengths. The key weaknesses of this study include a small sample size, the unwillingness of participants to adopt new changes, and data collection being dependent on participant engagement. A small sample size can skew results and lead to less reliable data. There is the potential for unwillingness of participants to adopt changes due to comfortability in the current process. The collection of data depends on voluntary participation, which can lead to a decreased number of completed surveys. A full SWOT analysis describing the strengths and weaknesses of this study is located in Appendix D.

Designs and Methods

This DNP project utilized a quality improvement design following John Hopkins's evidence-based practice (EBP) model. The TeamSTEPPS framework was used as a tool to successfully integrate efficient communication. The standardized handoff tool was created by Monroe Children's Hospital at Vanderbilt University Medical Center. Permission for use was obtained from Laura Payne DNAP, CRNA, the Pediatric Anesthesia Service Specialist at Vanderbilt. This tool is compliant with the required data to be reported set forth by the Joint Commission (TJC, 2008). A digital presentation was created and sent to participants on airway management skills for bariatric and pediatric patients via PowerPoint. Permission to proceed

with the project was obtained by the clinical lead at the facility and sent to the Institutional Review Board (IRB) at Marian University. All participation in this project was voluntary.

Project Site and Population

This project took place at a 25-bed critical access facility in the west-central region of rural Indiana. Currently, this facility offers a 24-hour emergency department, medical/surgical care, and three surgical suites. They specialize in orthopedic procedures, bariatric surgeries, pediatric ENT (ear, nose, and throat) surgeries, and pediatric dental services. The participants in this project include two Certified Registered Nurse Anesthetists (CRNA), one anesthesiologist, and ten registered nurses recruited voluntarily to be a part of this DNP project.

Potential barriers include the reluctance to accept change from staff. Several staff members have worked there for many years together and may see that their current practice techniques work best. One champion nurse was recruited voluntarily to encourage staff participation and pilot implementation of the handoff tool.

Measurement Instruments

To evaluate the outcomes of this DNP project a pre-test/post-test design via Qualtrics (qualtrics.com) was conducted. The pre-test/post-test design examined the current opinions of the handoff process, knowledge base, and confidence levels of nurses recovering from bariatric and pediatric patients. A post-test was utilized after the implementation process to determine if the standardized handoff tool was effective in the participant's daily practice.

Data Collection Procedures

Pre-Intervention: The pre-test survey was sent to staff via email by investigators encouraging their participation. The pre-test survey contained 8 multiple-choice questions and 1 fill in the blank question. Our goal was to identify the perioperative staff’s satisfaction with the

current handoff process, the quality of information transfer, and what areas need improvement. This survey also identified gaps in management skills for pediatric and bariatric patients.

Intervention strategies: After reviewing pre-test results, a PowerPoint presentation (Appendix E) was sent to participants followed by a live 1-hour voluntary in-service on how to utilize the handoff tool. The in-service provided education on how to incorporate the handoff tool, the benefits of using the tool, and outcomes based on personal experience with utilizing the tool in practice. A laminated copy of the handoff tool was then placed on the monitors of each PACU bay. This was first approved by the project site clinical coordinator and project committee member.

Post Intervention: A post-test survey was utilized to examine if the education component has helped with the confidence in recovering pediatric and bariatric patients. Secondly, the survey questions asked if the handoff tool was easily adopted into practice and has helped the workflow. This survey consisted of 8 multiple-choice questions focused on satisfaction of current process, and knowledge assessment related to specialty populations.

Ethical Considerations

The Marian Internal Review Board (IRB) approval was obtained prior to initiating this project (Appendix F). No patients were involved in this study; thus no patient health information was included. Participants in this study were involved on a voluntary basis. It was disclosed to all participants that all responses in the pre/post-test surveys were anonymous. Due to the very small sample size, no demographic data was collected to protect the privacy of the participants. Participant confidentiality was protected by coding the participants using individual identification numbers. The aggregated data was kept in a locked secure location, only accessible by project team members. All electronic files containing identifiable information were kept

password-protected to prevent access by unauthorized users. Only the project coordinators had access to these passwords.

Data Analysis and Results

Data from the pre-test and post-test surveys were analyzed with descriptive and inferential statistics to determine the effectiveness of the intervention. The data was analyzed using measures of frequency, central tendency, and variability. A total of nine registered nurses were eligible and participated in this project. Eligibility criteria included providers involved in the transfer of PACU patients at our project site. To determine satisfaction with the current transfer of care process and confidence with specialty patient populations the participants reported their satisfaction and confidence based on a 3-point Likert-like scale. Data from the pre-test and post-test surveys were analyzed using paired t-tests to compare preintervention survey results versus postintervention survey results. Five questions related to satisfaction with the current handoff process and two questions focused on knowledge assessment. The results were analyzed in relation to their categories and as a whole.

Satisfaction with the Current Process

The first five survey questions assessed satisfaction with the current handoff process. These were based on a 3-point Likert-like scale. The results were analyzed with descriptive statistics to compare means pre-intervention versus post-intervention. Table 1 shows the mean results for satisfaction-based questions. A t-test with equal variance was then completed to determine the significance of the results. Table 2. Shows no statistical significance in satisfaction improvement ($p=0.15$) between pre-tests and post-tests.

Table 1.

	Pre-Test	Post- Test	Mean Difference
Satisfaction 1	2.22	2.55	0.33
Satisfaction 2	2.44	2.22	-0.22
Satisfaction 3	2.88	2.66	-0.22
Satisfaction 4	2	1.66	-0.34
Satisfaction 5	1.77	1.88	0.11

Table 2.	*Pre-Test Satisfaction*	*Post-Test Satisfaction*
Mean	2.266666667	2.066666667
Variance	0.182716049	0.105555556
P(T<=t) one-tail	0.154501294	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.309002587	
t Critical two-tail	2.776445105	

Knowledge Assessment

The last two questions of the survey focused on knowledge assessment of airway management across the lifespan. The participants were asked to answer knowledge-focused questions based on a 4-point Likert scale. The results were analyzed with descriptive statistics to discover mean differences between pre-test and post-test scores. Table 3. Displays these findings.

Table 3.	Pre-Test mean	Post-Test mean	Mean Difference
Knowledge 1	3.11	3.16	0.05
Knowledge 2	1.66	2	0.34

A t-test was then conducted to determine the significance of these results. These results showed no statistical significance in knowledge improvement pre-intervention versus post-intervention. This can be seen in Table 4. Although post-test scores slightly increased in knowledge-focused questions, the results were not significant (p=0.2).

Table 4.	*Pre-Test*	*Post-Test*
Mean	2.352941176	2.545454545
Variance	0.992647059	0.672727273
Observations	17	11
Pooled Variance		0.869600987
Hypothesized Mean Difference		0
df		26
t Stat		0.53351013
P(T<=t) one-tail		0.29910614
t Critical one-tail		

Overall Results

The overall results of the pre and post-tests were analyzed with descriptive and inferential statistics. Means were calculated for both pre and post-intervention surveys shown below. While overall scores increased slightly in the post-test, the results showed no statistical significance (p=0.4). In this case, there is little to no evidence to reject the null hypothesis at a standard significance level. This indicates that the observed results are likely due to random variability rather than a significant effect.

Pre-Test	
Mean	2.28125
Standard Error	0.112398
Median	2
Mode	3
Standard Deviation	0.8991839
Sample Variance	0.8085317
Skewness	-0.1893662
Range	3
Minimum	1
Maximum	4
Confidence Interval Upper	2.5058595
Confidence interval Lower	2.0566405
Confidence Level(95.0%)	0.2246095

Post-Test	
Mean	2.3333333
Standard Error	0.116405
Median	2
Mode	2
Standard Deviation	0.7543909
Sample Variance	0.5691057
Skewness	0.0662786
Range	3
Minimum	1
Maximum	4
Confidence Interval Upper	2.5684181
Confidence Interval Lower	2.0982486
Confidence Level(95.0%)	0.2350848

Discussion

Overall, the participant's score for knowledge-focused questions slightly increased (77%-79%) after providing an educational in-service on airway management across the lifespan. When the questions are analyzed individually, they show no significant difference. When the surveys are analyzed as a whole the mean post-test score (77%) increased slightly from the pre-test score (76%), but again showed no statistical significance. When satisfaction-based questions were analyzed, they showed a decrease in mean post-test scores (69%) versus pre-test scores (75%). This could be due to a lack of participation in the post-test survey. The outcomes of these results could have been represented more accurately with a higher participation percentage. Due to the limited participation from subjects in the post-survey, results are inconclusive to say that the handoff tool is being utilized after implementation at this facility.

The limitations of this study included a very small sample size. Due to the small sample size, no demographic data could be obtained to determine if anesthesia providers benefit from the handoff tool versus perioperative room nurses. This was to protect the confidentiality of the participants. Additionally, the handoff process depends on the individual's compliance. Since this is an exceedingly small facility in which providers have worked together for many years a reluctance to change factor is probable.

The project's strengths were that it provided airway education to staff and a reference tool to teach new oncoming staff how to properly care for patient populations across the lifespan. Another strength of this study is that for oncoming SRNAs (student registered nurse anesthetists) the handoff tool is now visible to them to improve the flow and adequacy of their handoff report and continue to be used throughout the program.

Our aim of implementing a standardized process for safe PACU handoff was completed, further research needs to be conducted to determine effectiveness and whether the process continues to be utilized in practice. Additionally, our goal of improving confidence levels through airway education in PACU staff was met but needs further investigation and participation to determine the significance of improvement.

Conclusion

Utilizing a standardized handoff checklist has helped healthcare providers stay organized and improve efficiency in the transition of care for patients. The checklist is simply an aid that ensures no pertinent information is lost. However, with the diverse nature of different healthcare facilities, each with individual ways of operation, reluctance to change will always be a contributing factor to why a checklist is not used consistently. In the future, further studies at larger healthcare institutions are needed to assess the effectiveness of utilizing a standardized checklist in the handoff process. Standardizing the handoff process has been shown to improve the organization and adequacy of handoff reporting. Utilizing a standardized handoff tool can decrease errors related to miscommunication.

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Appendix A: Review of Literature

Citation	Design & Level of Evidence	Population / Sample size n=x	Major Variables	Instruments/Data Collection	Results
Dalal, P. G., Cios, T. J., DeMartini, T. K. M., Prasad, A. A., Whitley, M. C., Clark, J. B., Lin, L., Mujsce, D. J., & Cilley, R. E. (2020). A Model for a Standardized and Sustainable Pediatric Anesthesia-Intensive Care Unit Hand-Off Process. *Children (Basel, Switzerland)*, *7*(9), 123. https://doi.org/10.3390/children7090123	Quality Improvement Project Level: 1	n=135	Intensive Care Unit nurses and Intensivists Anesthesia providers	Joint Commissions "time out model" as universal protocol for start of handoff to ensure a standardized sequence of handoff. Staff satisfaction surveys of handoff process and performance audits made to identify if any critical parts of handoff were missed.	Standardized handoff improves efficacy and staff satisfaction with decreased missed information without increasing healthcare costs.
Gibney, C. (2017). A Needs Assessment for Development of the TIME Anesthesia Handoff Tool. *AANA Journal*, *85*(6), 431–437.	Meta Analysis Level:4	n=82	Anesthesia providers, work experience, hours worked per week.	Descriptive survey design to assess need for handoff tool. opinions on most essential components of handoff at 2 large teaching hospitals in Chicago.	Peer handoff lacks consistency without at tool, 64% do not use systematic process. Standardized handoff tool improves communication

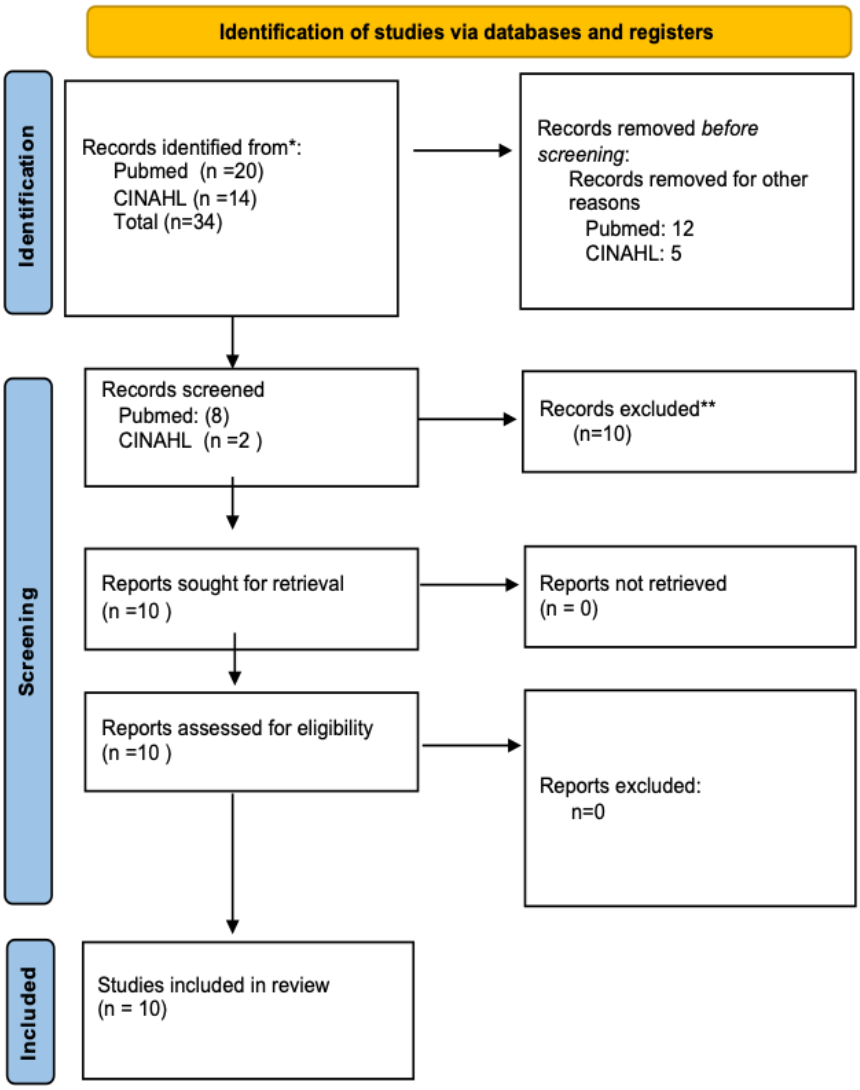
Lambert, L. H. (2018). Improved Anesthesia Handoff After Implementation of the Written Handoff Anesthesia Tool (WHAT). *AANA Journal*, *86*(5), 361–370.	Quality Improvement Level: 1	n = 26	CRNAs, Anesthesiologists, PACU Rns	Priori Power analysis to determine adequacy of sample size TST power analysis for assessment of current handoff process, causes of insufficient handoffs, and to review handoff process after implementation of written handoff tool was created.	WHAT handoff tool improved problem with insufficient handoff and improved patient satisfaction amongst anesthesia providers and PACU RNs.
Lowe, J. S. (2017). A high-fidelity simulation study of intraoperative latent hazards and their impact on anesthesia care-related handoff outcomes. *AANA Journal*, *85*(4), 250–255.	Observational study Level: 4	n =58	Distraction, production pressure, noninteractive communication, inappropriately timed handoff.	The human error theory was utilized to review archived video recordings of simulations.	81% of the handoff reports possessed distractions contributing to poor quality handoff. (47/58). 24% of handoffs reviewed that report was given at inappropriate times when focus should have been on other events.
Meersch, M., Weiss, R., Küllmar, M., Bergmann, L., Thompson, A., Griep, L., Kusmierz, D., Buchholz, A., Wolf, A., Nowak, H., Rahmel, T., Adamzik, M., Haaker, J. G., Goettker, C., Gruendel, M., Hemping-Bovenkerk, A., Goebel, U., Braumann, J., Wisudanto, I., Wenk, M., …	Randomized Clinical Control Trial Level: 5	n=1817	Intraoperative handovers from anesthesia and no Intraoperative handovers given.	Participants recruited if ASA 3 or 4 status undergoing elective surgery.	52% of patients who had intraoperative handoff given required ICU admission (P=.10). There were no statistically

Zarbock, A. (2022). Effect of intraoperative handovers of anesthesia care on mortality, readmission, or postoperative complications among adults: The handicap randomized clinical trial. *JAMA*, *327*(24), 2403–2412. https://doi.org/10.1001/jama.2022.9451			Mortality, hospital readmissions, post-operative complications, anesthesia provider training.	Retrospective analysis of multicenter with randomized testing utilizing HandiCAP trial.	significant differences in hospital length of stay between non-handover group and handover group.
Park, L. S., Yang, G., Tan, K. S., Wong, C. H., Oskar, S., Borchardt, R. A., & Tollinche, L. E. (2017). Does checklist implementation Improve Quantity of Data Transfer: An observation in postanesthesia care unit (PACU). *Open Journal of Anesthesiology*, *7*(4), 69–82. https://doi.org/10.4236/ojanes.2017.74007	Cross-Sectional observational study Level of evidence: 4	N=60	Anesthesia providers, surgical staff	A checklist was created and placed at every recovery suite bedside and required to be adhered to. Quantity of reporting handoff items were measured 60 pre checklist and 60 post checklist items.	Anesthesia staff consistently omitted reporting off surgical information, plans. Implementation of a physical checklist increased overall data transfer.
Randmaa, M., Engström, M., Swenne, C. L., & Mårtensson, G. (2017). The postoperative handover: a focus group interview study with nurse anaesthetists, anaesthesiologists and PACU nurses. *BMJ open*, *7*(8), e015038. https://doi.org/10.1136/bmjopen-2016-015038	Qualitative analysis Level of evidence: 5	n= 23	Different Perceptions and priorities amongst focus groups: focus areas include RN perspectives of handoff vs anesthesia providers perspective. Handover quality	SBAR vs WHO SURGICAL CHECKLIST: Focus group interviews Analysis completed by moderator and sub moderator 5 categories emerged from interviews conducted: labeled with code	Insecurity when information is transferred can impair quality of handoff. Need for a shared understanding amongst anesthesia and recovery RNs on priority of interventions.

				placed into subcategories	
Reine, E., Aase, K., Raeder, J., Thorud, A., Aarsnes, R. M., & Rustøen, T. (2021). Exploring postoperative handover quality in relation to patient condition: A mixed methods study. Journal of clinical nursing, 30(7-8), 1046–1059. https://doi.org/10.1111/jocn.15 650	Observational mixed methods Level of Evidence: 5	Quantitative data N=109 Qualitative n=48	Anesthesia providers and pacu nurses	Two different PACU's observed in. the handoff process utilizing the SBAR handoff checklist by two observers with the post-op handoff tool over a 1 year period	46% of handovers had interruptions
Shah, A. C., Oh, D. C., Xue, A. H., Lang, J. D., & Nair, B. G. (2019). An electronic handoff tool to facilitate transfer of care from anesthesia to nursing in intensive care units. *Health informatics journal*, *25*(1), 3–16. https://doi.org/10.1177/1460458216681180	Meta analysis Level 4	n=79	Qualitative data: Type of Surgery, ASA status, type of anesthetic, Anesthesia providers, attending physicians, ICU personnel engaging in ICU handoff after patients underwent surgery. Quantitative: content of verbal reporting and handover tasks	Data collected from Anesthesia Information Management Systems (AIMS) and Smart Anesthesia Manager system to acquire real time data adding an informatics tool to facilitate handoff. A pilot observational study by medical students used to evaluate provider use of checklist. A pre-and post-survey sent to handoff participants.	Electronic handoff resulted in more present and engaging handoff with less focus on numbers when utilizing an electronic handoff tool.

Sun, L. Y., Jones, P. M., Wijeysundera, D. N., Mamas, M. A., Bader Eddeen, A., & O'Connor, J. (2022). Association between handover of anesthesiology care and 1-year mortality among adults undergoing cardiac surgery. *JAMA Network Open*, *5*(2), e2148161. https://doi.org/10.1001/jamanetworkopen.2021.48161	Retrospective cohort Level 4	N=102,156	Adult patients undergoing cardiac or thoracic surgery between 2008-2019 Length of surgery, presence of cardiogenic shock Heart failure symptoms, who had full transition of care by providers intraoperatively.	CorHealth Ontario medical records obtained and reviewed with ICES administrative health databases. @ sample t-tests and Wilcoxon rank sum test to compare data.	Handover during intraoperative cardiac surgery is associated with increased risk of 30-day mortality and 1-year mortality.

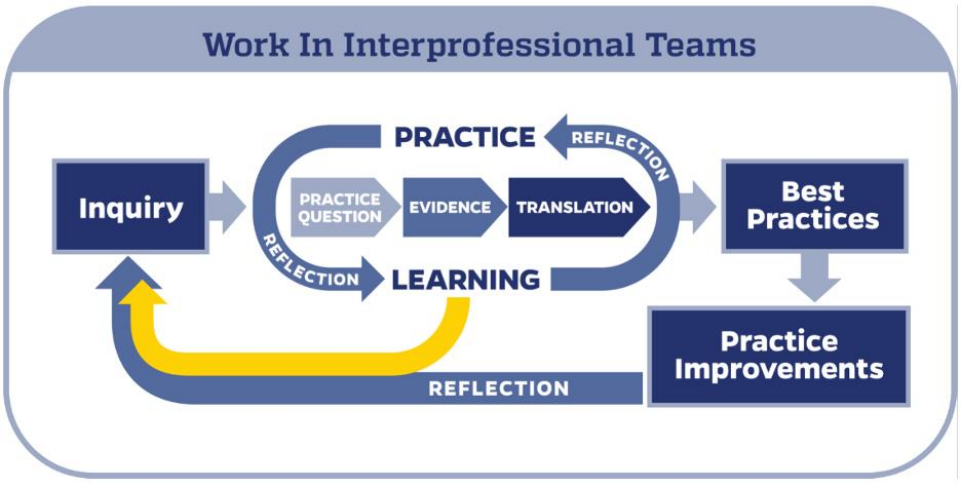
Appendix B: PRISMA diagram



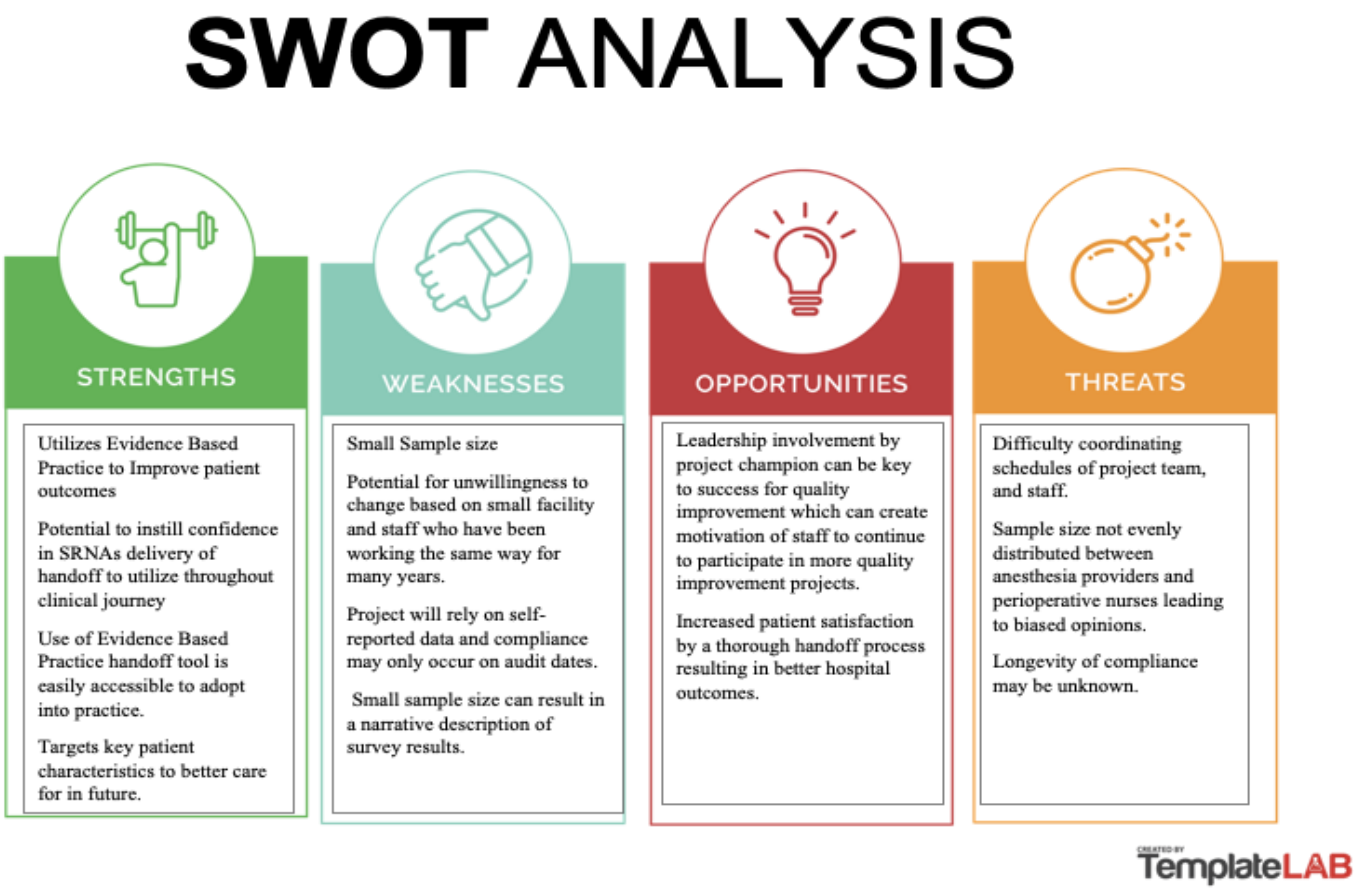
From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

Appendix C: Theoretical Framework



Appendix D: SWOT Analysis



Appendix E: PowerPoint Presentation

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THIS IS WHAT WE'RE MADE OF

ANESTHESIA HANDOFF & AIRWAY MANAGEMENT OF SPECIAL POPULATIONS

BY: HALEY SCROGGHAM & CARRIE FALASCA

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IMPORTANCE OF ANESTHESIA HANDOFF

- MORE THAN 70% OF MEDICAL ERRORS ARE RELATED TO POOR COMMUNICATION.
- THE TRANSFER OF CARE FROM ANESTHESIA TO RECOVERY OFTEN IS:
  - BRIEF
  - DISORGANIZED
  - OMITS PERTINENT DETAILS RELEVANT TO PATIENT/CASE/ECT.
- WITHOUT USING A HANDOFF TOOL, YOU ARE FORCED TO RECALL DETAILS: OFTEN MISSING IMPORTANT THE IMPORTANT STUFF!
- IMPROPER HANDOFF HAS RESULTED IN AIRWAY EMERGENCIES, RE-INTUBATIONS, DELAYED DISCHARGES, AND DEATH!

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The Standardized Handoff Tool

- WHAT'S THE PURPOSE OF ANOTHER CHECKLIST?
- IMPROVED QUALITY OF PATIENT CARE
- INCREASED HEALTHCARE WORKER SATISFACTION
- LESS DISORGANIZED REPORT
- IMPROVES CONFIDENCE IN SRNA HANDOFF DIRECTING ATTENTION TO PERTINENT DETAILS TO IMPROVE FLOW
- AN EXAMPLE OF A HANDOFF TOOL IS ON NEXT PAGE

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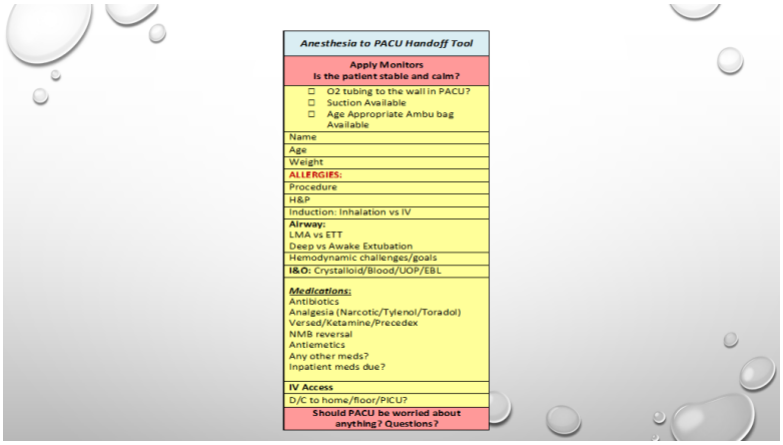
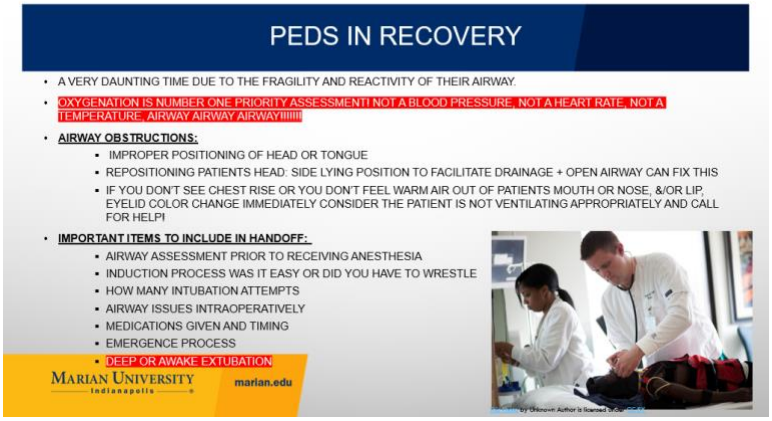


Anesthesia to PACU Handoff Tool

Apply Monitors **Is the patient stable and calm?**
☐ O2 tubing to the wall in PACU? ☐ Suction Available ☐ Age Appropriate Ambu bag Available
Name
Age
Weight
ALLERGIES:
Procedure
H&P
Induction: Inhalation vs IV
Airway: LMA vs ETT Deep vs Awake Extubation
Hemodynamic challenges/goals
I&O: Crystalloid/Blood/UOP/EBL
Medications: Antibiotics Analgesia (Narcotic/Tylenol/Toradol) Versed/Ketamine/Precedex NMB reversal Antiemetics Any other meds? Inpatient meds due?
IV Access
D/C to home/floor/PICU?
Should PACU be worried about anything? Questions?



PEDS IN RECOVERY

- A VERY DAUNTING TIME DUE TO THE FRAGILITY AND REACTIVITY OF THEIR AIRWAY.
- OXYGENATION IS NUMBER ONE PRIORITY ASSESSMENT! NOT A BLOOD PRESSURE, NOT A HEART RATE, NOT A TEMPERATURE. AIRWAY AIRWAY AIRWAY!!!!!!!
- **AIRWAY OBSTRUCTIONS:**
  - IMPROPER POSITIONING OF HEAD OR TONGUE
  - REPOSITIONING PATIENTS HEAD: SIDE LYING POSITION TO FACILITATE DRAINAGE + OPEN AIRWAY CAN FIX THIS
  - IF YOU DON'T SEE CHEST RISE OR YOU DON'T FEEL WARM AIR OUT OF PATIENTS MOUTH OR NOSE, &/OR LIP, EYELID COLOR CHANGE IMMEDIATELY CONSIDER THE PATIENT IS NOT VENTILATING APPROPRIATELY AND CALL FOR HELP!
- **IMPORTANT ITEMS TO INCLUDE IN HANDOFF:**
  - AIRWAY ASSESSMENT PRIOR TO RECEIVING ANESTHESIA
  - INDUCTION PROCESS WAS IT EASY OR DID YOU HAVE TO WRESTLE
  - HOW MANY INTUBATION ATTEMPTS
  - AIRWAY ISSUES INTRAOPERATIVELY
  - MEDICATIONS GIVEN AND TIMING
  - EMERGENCE PROCESS
  - DEEP OR AWAKE EXTUBATION

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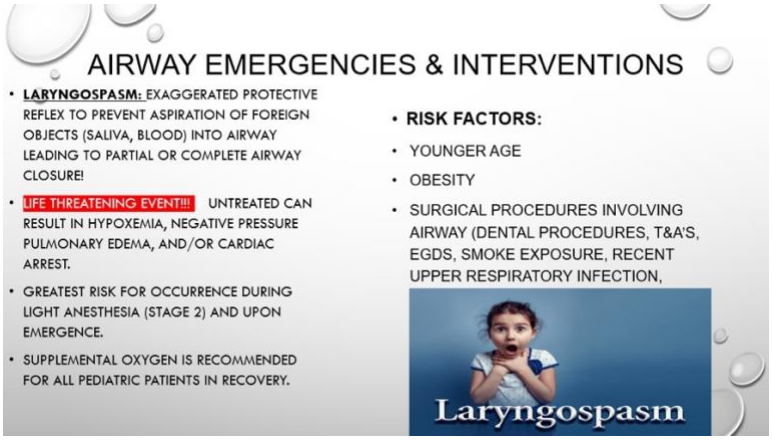

AIRWAY EMERGENCIES & INTERVENTIONS

- **LARYNGOSPASM:** EXAGGERATED PROTECTIVE REFLEX TO PREVENT ASPIRATION OF FOREIGN OBJECTS (SALIVA, BLOOD) INTO AIRWAY LEADING TO PARTIAL OR COMPLETE AIRWAY CLOSURE!
- LIFE THREATENING EVENT!!! UNTREATED CAN RESULT IN HYPOXEMIA, NEGATIVE PRESSURE PULMONARY EDEMA, AND/OR CARDIAC ARREST.
- GREATEST RISK FOR OCCURRENCE DURING LIGHT ANESTHESIA (STAGE 2) AND UPON EMERGENCE.
- SUPPLEMENTAL OXYGEN IS RECOMMENDED FOR ALL PEDIATRIC PATIENTS IN RECOVERY.

- **RISK FACTORS:**
- YOUNGER AGE
- OBESITY
- SURGICAL PROCEDURES INVOLVING AIRWAY (DENTAL PROCEDURES, T&A'S, EGDS, SMOKE EXPOSURE, RECENT UPPER RESPIRATORY INFECTION,

LARYNGOSPASMS & EMERGENCY AIRWAY INTERVENTIONS IN PEDIATRICS

- **PREVENTION:** DO NOT REMOVE TUBE IN STAGE 2 (DISCONJUGATE PUPILS, ABNORMAL BREATHING PATTERN, PT THRASHING BUT NOT CONSOLABLE)
  - SUCTIONING SECRETIONS WHILE DEEP.
  - EXTUBATE TO SIDE LYING POSTION TO FACILITATE DRAINAGE AND OPEN AIRWAY
  - PROPOFOL! 0.5MG/G UPON PRIOR TO EXTUBATING.
- **SIGNS:** EXPIRATORY STRIDOR, ACCESSORY MUSCLE BREATHING (TUGGING OF NECK MUSCLES), BELLY BREATHING, IRREGULAR CHEST RISE, PLACE STETHOSCOPE OVER TRACHEA AND HEAR CROWING OR NO AIR MOVEMENT AT ALL THIS IS BAD!

Treatment:

1.) 100% oxygen via ambu bag-mask ventilation delivering positive pressure breaths. Simultaneously call for help if alone

2.) **Larsons maneuver:** hard pressure applied at laryngospasm notch (below earlobe b/t mastoid process and anterior mandibular condyle) while performing jaw thrust

3.) Deepen plane of sedation: push propofol.

4.) Do not wait to push paralytic until desaturations If above steps are not working administer Succinylcholine (more on next slide)

Uptodate

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RECOGNITION & TREATMENT

- **PREVENTION:** DO NOT REMOVE TUBE IN STAGE 2 (DISCONJUGATE PUPILS, ABNORMAL BREATHING PATTERN, PT THRASHING BUT NOT CONSOLABLE)
  - SUCTIONING SECRETIONS WHILE DEEP.
  - EXTUBATE TO SIDE LYING POSTION TO FACILITATE DRAINAGE AND OPEN AIRWAY
  - PROPOFOL! 0.5MG/G UPON PRIOR TO EXTUBATING.
- **SIGNS:** EXPIRATORY STRIDOR, ACCESSORY MUSCLE BREATHING (TUGGING OF NECK MUSCLES), BELLY BREATHING, IRREGULAR CHEST RISE, PLACE STETHOSCOPE OVER TRACHEA AND HEAR CROWING OR NO AIR MOVEMENT AT ALL THIS IS BAD!

- **TREATMENT:**
- 1.) 100% OXYGEN VIA AMBU BAG-MASK VENTILATION DELIVERING POSITIVE PRESSURE BREATHS. SIMULTANEOUSLY CALL FOR HELP IF ALONE
- 2.) **LARSONS MANEUVER:** HARD PRESSURE APPLIED AT LARYNGOSPASM NOTCH (BELOW EARLOBE B/T MASTOID PROCESS AND ANTERIOR MANDIBULAR CONDYLE) WHILE PERFORMING JAW THRUST
- 3.) DEEPEN PLANE OF SEDATION: PUSH PROPOFOL.
- 4.) DO NOT WAIT TO PUSH PARALYTIC UNTIL DESATURATIONS IF ABOVE STEPS ARE NOT WORKING ADMINISTER SUCCINYLCHOLINE (MORE ON NEXT SLIDE)

SUCCINYLCHOLINE

- SHORT-ACTING DEPOLARIZING MUSCLE RELAXANT USED TO BREAK LARYNGOSPASM.
  - DRUG VIAL: 20MG/1ML
  - DOSE: 1-2MG/KG (SOMETIMES 10MG (1/2 ML) IS ALL THAT IS NEEDED TO PARALYZE VOCAL CORDS TO BREAK SPASM.
- NOT WITHOUT CONCERN: CAN LEAD TO FATAL HYPERKALEMIA CARDIAC ARREST IN PATIENTS WITH UNDIAGNOSED MUSCULAR DYSTROPHY,AND BRADYARRYTHMIAS.
- IF GIVING SUCC HAVE ATROPINE AVAILABLE TO CO-ADMINISTER: 0.01MG/KG (SUCC CAN CAUSE BRADYCARDIA IN PEDIATRIC PATIENTS ESPECIALLY WITH SUBSEQUENT DOSES)
(NAGELHOUT,2018)

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EMERGENCE DELERIUM

- **WHAT IS IT?** IMBALANCE B/T EXCITATORY & INHIBITORY PATHWAYS IN COMBO WITH ANESTHESIA ON CORTICAL AND SUBCORTICAL NETWORKS. WOOFI
- PERIOD OF MENTAL CONFUSION, CRYING, RESTLESSNESS, HYPEREXCITBILITY.

RISK FACTORS:

- CHILDREN 2-5
- PREOP ANXIETY
- EAR, NOSE, THROAT SURGERIES
- INHALATIONAL AGENTS
- RAPID EMERGENCE

PREVENTION METHODS:

- PREOP MEDICATION FOR SEVERELY ANXIOUS CHILD: MIDAZOLAM ORAL (0.5MG/KG) NEEDS 30 MIN TO WORK PROPERLY.
- DEXMETATOMIDINE (PRECEDEX) 0.5MCGS/KG AFTER INDUCTION:
  - ALLOWS VOLATILE SPARING + ANALGESIC EFFECTS
  - LESS THAN 0.5MCGS/KG DOES NOT CONSISTENTLY PREVENT ED
  - VANDERBILT CHILDREN'S COMMONLY GIVES 0.5MCGS/KG UPON EMERGENCE FOR ALL EYE, ENT PROCEDURES, THE PACU IS ALWAYS THANKFUL!
- SMOOTH EMERGENCE: PROPOFOLI 1.5-2.5MG/KG

1. The child makes eye contact with the caregiver.
2. The child's actions are purposeful.
3. The child is aware of his/her surroundings.
4. The child is restless.
5. The child is inconsolable.

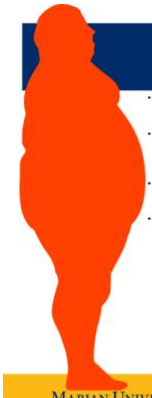
Items 1, 2, and 3 are reversed scored as follows: 4 = not at all, 3 = just a little, 2 = quite a bit, 1 = very much, 0 = extremely. Items 4 and 5 are scored as follows: 0 = not at all, 1 = just a little, 2 = quite a bit, 3 = very much, 4 = extremely. The scores of each item were summed to obtain a total Pediatric Anesthesia Emergence Delirium (PAED) scale score. The degree of emergence delirium increased directly with the total score.

AmericanSocietyof Anesthesiologists

RECOVERY ROOM ITEMS NEEDED ALWAYS FOR PEDIATRIC PATIENTS

- APPROPRIATE SIZED AMBU BAG
- SUCTION SET UP AND FUNCTIONING
- MONITOR: EKG LEADS, SPO2, BP, ETCO2 MONITORING
- 02 SET UP FOR NASAL CANNULA & AMBU BAG MASK
- IS THE CHILD'S IV FUNCTIONAL?
- KNOW WHERE THE PEDS AIRWAY CART IS
- KNOW WHERE PEDS CRASH CART IS
- WHO TO CALL FOR HELP IN EMERGENCY
- IF ASKED TO GIVE SUCCINYLCHOLINE: KNOW THE CONCENTRATION: 20MG/ML CAN BE GIVEN IV OR IM

BARIATRIC PATIENTS



- 2X THE RISK FOR DEVELOPMENT OF SEVERE AIRWAY COMPLICATIONS
- DM, GERD, OSA, + OBESITY LEADS TO INCREASED RISK OF HYPOXIA, ASPIRATION, HYPOVENTILATION, UPPER AIRWAY OBSTRUCTION.
- PRONE TO POST-EXTUBATION AIRWAY OBSTRUCTIONS AND DESATURATIONS
- RECOVERY:
  - USE CPAP & SUPPLEMENTAL OXYGEN
  - SIT PATIENT UPRIGHT: BELLY OFF DIAPHRAGM POSITION. REVERSE TRENDELENBURG IS GREAT!
  - USE OF ORAL/NASAL AIRWAY ADJUNCTS TO RELIEVE AIRWAY OBSTRUCTIONS.
  - AVOIDANCE OF LONG ACTING OPIOIDS
  - LONGER MONITORING OF RESPIRATORY STATUS: CAPNOGRAPHY, SPO2, IF RECURRENT PACU RESPIRATORY EVENTS OCCUR.

Signs and Symptoms of Anastomotic Leak

- Unexplained tachycardia (sustained heart rate greater than 120 bpm)
- Shoulder pain (usually left)
- Abdominal pain
- Pelvic pain
- Substernal pressure
- Shortness of breath
- Fever
- Increased thirst
- Hypotension
- Unexplained oliguria
- Hiccups
- Restlessness

Nagelhout, J. J., & Elisha, S. (2018). Nurse anesthesia (6th ed.). Elsevier.

Bariatric Surgeries 2% incidence of Anastomotic leak: Unexplained Tachycardia most sensitive indicator.

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RESIDUAL NEUROMUSCULAR BLOCKADE

- Potential for residual airway muscle weakness/inadequate ventilation when neuromuscular blocking agents (Paralytics) are used intraoperatively.
- Signs can be indistinguishable from delirium/delayed awakening: agitation, restlessness, accessory muscle use, twitchy movements.
- If unrecognized can lead to complete airway obstruction, hypoxemia, & respiratory failure requiring re-intubation:
- **Recognition and Prevention:**
  - Include in handoff if Suggamadex or Neostigmine was utilized for reversal
  - Know that Residual blockade is more common when Neostigmine is utilized.
  - Key is early recognition and call for help!

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Nagelhout, J. J., & Elisha, S. (2018). *Nurse anesthesia* (6th ed.). Elsevier.

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Appendix F: IRB Approval Letter

MARIAN UNIVERSITY
Indianapolis ®

Institutional Review Board

DATE:	11-28-2023
TO:	Carrie Falasca, Haley Scroggham, & Dr. Lee Ranalli
FROM:	Institutional Review Board
RE:	S23.144
TITLE:	Implementation of Standardized Post-anesthesia Care handoff and Airway Management in Recovery
SUBMISSION TYPE:	Project Amendment
ACTION:	Determination of EXEMPT Status
DECISION DATE:	11-21-2023

The Institutional Review Board at Marian University has reviewed your protocol amendment and has determined the procedures proposed are still appropriate for exemption under the federal regulation. As such, there will be no further review of your protocol and you are cleared to proceed with your project. The protocol will remain on file with the Marian University IRB as a matter of record.

Although researchers for exempt studies are not required to complete online CITI training for research involving human subjects, the IRB **recommends** that they do so, particularly as a learning exercise in the case of student researchers. Information on CITI training can be found on the IRB's website: http://www.marian.edu/academics/institutional-review-board.

It is the responsibility of the PI (and, if applicable, the faculty supervisor) to inform the IRB if the procedures presented in this protocol are to be modified of if problems related to human research participants arise in connection with this project. Any procedural modifications must be evaluated by the IRB before being implemented, as some modifications may change the review status of this project. Please contact me if you are unsure whether your proposed modification requires review. Proposed modifications should be addressed in writing to the IRB. **Please reference the above IRB protocol number in any communication to the IRB regarding this project.**

Christina Pepin, Ph.D., RN, CNE
Chair, Marian University Institutional Review Board