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Implementing the Use of Intracuff Alkalinized Lidocaine among Certified Registered Nurse Anesthetists: A Practice Change Proposal

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IMPLEMENTING THE USE OF INTRACUFF ALKALINIZED LIDOCAINE AMONG CERTIFIED REGISTERED NURSE ANESTHETISTS: A PRACTICE CHANGE PROPOSAL

by

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ABSTRACT

IMPLEMENTING THE USE OF INTRACUFF ALKALINIZED LIDOCAINE AMONG CERTIFIED REGISTERED NURSE ANESTHETISTS: A PRACTICE CHANGE PROPOSAL

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Patients today are experiencing comorbidities predisposing them to increased risk under general anesthesia. Emergence cough reflex is a response that can lead to hemodynamic alterations occurring during emergence and the postoperative period for many patients requiring general endotracheal tube anesthesia (GETA). It is proposed that 38% to 96% of patients receiving GETA will experience coughing during emergence (As, Iqbal, & Ali, 2009; Watkins, Lee, White Jr, & Mundy, 2012).

The use of intracuff alkalinized lidocaine is an intervention shown to be effective in previous studies at blunting this response during anesthesia emergence. Through verbal communication with CRNAs, it was discovered that the use of intracuff alkalinized lidocaine was not currently being used at a facility in Southeastern Mississippi. An evidence-based poster presentation and brochure was prepared using the most recent studies utilizing intracuff alkalinized lidocaine and was presented to the CRNAs at this facility. 18 CRNAs participated in the baseline survey, evidence-based poster presentation, and received a brochure which illustrated the recent research findings on the use of intracuff alkalinized lidocaine. Two weeks after the presentation, 12 CRNAs participated in the follow-up survey. The follow-up surveys demonstrated the percentage use of intracuff alkalinized lidocaine was increased from 0% to 33% among

CRNAs participating in this project. A total of four CRNAs implemented the intervention, reported 11 total cuff inflations in which 82% effectively inhibited the emergence cough reflex. The CRNAs reported that the main barrier to use intracuff alkalinized lidocaine was no recent patient interaction where it would be beneficial to the patients. Through individually presenting CRNAs with the evidence of intracuff alkalinized lidocaine's effectiveness, the goal of this project was to increase the utilization of intracuff alkalinized lidocaine by CRNAs to prevent emergence cough reflex.

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DEDICATION

I would like to dedicate this doctoral project to my family. To my loving girlfriend, Sarah Herrera, I would have been unable to make this journey through school without all the love and support you have given me. To my parents, Teresa and Jackie Taylor, thank you for always being there for me giving your love, support, and encouragement to get me through my goals in life.

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LIST OF ABBREVIATIONS

AANA	American Association of Nurse Anesthetists
APN	Advanced Practice Nurse
ASA	American Society of Anesthesiologist
CRNA	Certified Registered Nurse Anesthetist
CVA	Cerebrovascular Accident
DM	Diabetes Mellitus
DNP	Doctorate of Nursing Practice
ETT	Endotracheal Tube
GETA	General Endotracheal Tube Anesthesia
H20	Water
HTN	Hypertension
HVLP	High Volume, Low Pressure
ICP	Intracranial Pressure
IOP	Intraocular Pressure
IRB	Institutional Review Board
IV	Intravenous
L-B	(Lidocaine + Bicarbonate)
L-Gr	Lidocaine Group
L-Group	Lidocaine Group
LDP-Gr	Lidocaine Dipotassium Phosphate Group
LSB-Gr	Lidocaine Sodium Bicarbonate Group
LTA	Laryngotracheal Administration

LVHP	Low Volume, High Pressure
MANA	Mississippi Association of Nurse Anesthetists
ML	Milliliters
PACU	Post Anesthesia Care Unit
POST	Postoperative Sore Throat
PS	Physical Status
PVC	Polyvinyl Chloride
S-Group	Saline Group
SBP	Systolic Blood Pressure
USM	University of Southern Mississippi

CHAPTER I - INTRODUCTION

Every year, millions of patients undergo general anesthesia for surgical intervention without complications though risks are still involved (National Institute of General Medical Sciences, 2016). General anesthesia is a procedure to prevent pain and allow for unconsciousness during a surgical procedure (National Institute of General Medical Sciences, 2016). For the patient population undergoing surgical intervention, coughing generally occurs while emerging from general endotracheal tube anesthesia (GETA) (Wetzel, Ancona, Cooper, Kortman, Loniewski, & Lebeck, 2008). An estimated 38% to 96% of patients receiving GETA will experience coughing during emergence (As, Iqbal, & Ali, 2009; Watkins, Lee, White Jr, & Mundy, 2012). This cough response occurs due to the presence of an endotracheal tube (ETT) irritating stretch receptors located throughout the inner mucosa of the trachea (Wetzel, et. al., 2008). This cough response in a normal healthy patient may pose minimal problems. The cough response in patients with systemic disease or acute episodes of illness may cause serious hemodynamic alterations rendering them susceptible to an increased mortality rate in the postoperative period. A combination of smooth emergence along with awake extubation is generally needed in many of the cases where hemodynamic alterations may need to be avoided.

Background

Anesthesia providers are responsible for the patient's hemodynamic state by intervening to assure a safe, smooth awakening from general anesthesia to avoid postoperative complications. Currently, there is no guideline endorsed by the American Association of Nurse Anesthetists (AANA) or American Society of Anesthesiologists

(ASA) for preventing the emergence cough reflex. D'Aragon, Beaudet, Gagnon, Martin, & Sansoucy (2013) suggested that many methods have been considered to decrease the adverse effects of mucosal irritation such as opioid administration, extubating while under deep anesthesia, and the use of intravenous (IV) lidocaine prior to emergence. Anesthetics have demonstrated effectiveness in reducing emergence cough but may also pose a delayed time to recovery for patients to respond to simple commands (D'Aragon, et. al., 2013). This delayed time to recovery promotes the use of local anesthetics as a great alternative for rapid awakening from anesthesia while maintaining cough suppression (D'Aragon, et. al., 2013). Estebe, Treggiari, Richebe, Joffe, Chevanne, and Le Corre (2014) suggested many nonpharmacological methods to reduce mucosal irritation such as smaller diameter ETT, water soluble lubricant applied to cuff, tracheal intubation after full muscle relaxation, and maintaining normal cuff pressure. Navarro, Lima, Aguiar, Braz, Carness, & Modolo (2012) reported the delivery of alkalinized lidocaine through the ETT cuff is a method used to decrease tracheal mucosa irritation by inducing an anesthetic action on tracheal receptors in contact with ETT cuff. This effect increases tolerance to ETT cuff inflation, minimizes hemodynamic alterations, and reduces the incidence of emergence cough during tracheal extubation.

Significance

This Doctor of Nursing Practice (DNP) project was aimed at implementing a practice change for certified registered nurse anesthetists (CRNA) to promote smooth emergence upon awakening anesthetized patients. This DNP project was started to evaluate whether a practice change would be implemented by CRNAs suggesting ETT cuff inflation with alkalinized lidocaine. This practice change proposal was

recommended to improve patient outcomes by decreasing the occurrence of coughing while emerging from general anesthesia. The primary goal of this DNP project was to determine whether CRNAs were willing to change practice to decrease emergence cough by using intracuff alkalinized lidocaine. During emergence from GETA, coughing commonly occurs that can delay readiness for extubation, which can affect the patient and anesthesia team in many ways. Coughing can cause long turnover times between cases possibly leading to a reduced surgical workload by surgeons (Watkins, Lee, White Jr, & Mundy, 2012). Long turnover times can give rise to increased organizational costs due to administrative meetings to assess workflow of cases. Prolonged extubation time can lead to increases in anesthesia billing units and lengthen the time needed in the operating room (Watkins, Lee, White Jr, & Mundy, 2012). This delay in recovery time due to emergence cough could increase the cost to both the hospital and patients. Coughing can also continue into the post-anesthesia care unit (PACU) leading to a delay in discharge, overall patient dissatisfaction, and may cause the surgical facility increased labor costs (Watkins, Lee, White Jr, & Mundy, 2012). This practice change was intended to avoid these complications by suggesting that for surgical procedures exceeding two hours, the use of intracuff alkalinized lidocaine, as opposed to air, was effective at preventing emergence cough (D'Aragon, et. al., 2013). The aim of this DNP project was to suggest a practice change to CRNAs to use intracuff alkalinized 2% lidocaine to decrease or prevent possible complications at emergence.

Needs Assessment

A strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted to identify the need for implementation of intracuff alkalinized lidocaine as depicted in Table 1.

Table 1

SWOT Analysis

	Strengths	Weaknesses
Internal	• Shown effective at decreasing emergence cough reflex. • Shown effective at decreasing post-operative sore throat. • Easy to use. • Cost of medications inexpensive. • Does not inhibit the swallowing reflex.	• Only effective in case durations lasting greater than two hours. • After six hours, it can change integrity of ETT cuff. • Extra step to mix lidocaine and bicarbonate solution. • Not endorsed by AANA or ASA.
	Opportunities	**Threats**
External	• CRNAs willing to implement intervention may decrease emergence cough reflex. • Can maintain hemodynamic stability during emergence. • CRNAs can improve readiness for extubation time. • Could improve patient satisfaction by decreasing cough.	• Not used widespread among CRNAs to decrease emergence cough. • CRNAs not willing to implement the intervention. • Additional step of mixing medications for use. • May not have patient interactions where intervention would be beneficial. • CRNAs may not support the evidence shown in current studies.

Note. SWOT= strengths, weaknesses, opportunities, and threats.

This DNP project was conducted in a 512-bed level II trauma center where multiple general endotracheal tube anesthesia (GETA) cases are conducted daily. This

site was chosen due to the large number of surgical cases consisting of trauma surgery, neurosurgery, and cardiovascular surgery. Currently, the CRNAs are using IV lidocaine, laryngotracheal administration (LTA) of lidocaine, and use of IV opiates to prevent coughing during emergence. Intracuff alkalinized lidocaine was not being used at this facility to decrease emergence cough. Many patients at this facility have comorbidities such as heart disease, hypertension (HTN), obesity, diabetes mellitus (DM), and cerebrovascular accidents (CVA) that place them at greater risk for hemodynamic alterations from emergence cough. Hemodynamic alterations can pose many challenges to the anesthesia provider while performing induction, maintenance, and emergence from GETA. Using alkalinized lidocaine in the ETT cuff may allow for smooth emergence in these patient populations to maintain hemodynamic stability in the postoperative period.

Clinical Question and Purpose

The purpose of this project was to propose a practice change to CRNAs through an evidence-based poster presentation and brochure on the use of intracuff alkalinized lidocaine to decrease emergence cough. The clinical question focused on whether CRNAs were willing to change their current practice to use intracuff alkalinized lidocaine to prevent emergence cough. This DNP project evaluated whether CRNAs implemented the practice change to decrease emergence cough.

Overview of Synthesis of Evidence

A synthesis of evidence, focused on the use of intracuff alkalinized lidocaine at preventing the cough response in patients requiring GETA, was conducted. The synthesis of evidence focused on the administration of intracuff alkalinized lidocaine compared to ETT cuff inflation with air at preventing emergence cough. This synthesis

of evidence sought to find the best evidence-based results to suggest a practice change to CRNAs. Evidence demonstrated intracuff alkalinized lidocaine to be effective at inhibiting or decreasing the emergence cough reflex in surgical case durations lasting longer than 120 minutes.

Synthesis of Evidence

A literature search was performed to establish evidence-based information regarding the use of ETT intracuff alkalinized lidocaine to reduce or prevent cough response in patients upon emergence. The search was performed through The University of Southern Mississippi's (USM) online library accessing multiple databases. The databases searched were PubMed, Google Scholar, and the Cochrane Library. The search terms utilized were *lidocaine, alkalinized lidocaine, intracuff, ETT, cough, and emergence*. The search terms were used in different combinations to construct advance searches that would result in evidence-based articles. All searches were modified to full text articles within the last eight years. Inclusion criteria consisted of articles being written in English language and which demonstrated effectiveness of using intracuff alkalinized lidocaine in reducing cough emergence. Exclusion criteria consisted of any articles that were not published in the English language, which were not published within past eight years, or irrelevant to the proposed project topic. A combined total of 144 articles resulted from advanced searches; from this, 14 articles were accepted. Of the 144 articles resulted, most articles were excluded due to intracuff alkalinized lidocaine being used in prevention of other complications rather than inhibiting emergence cough reflex or showed irrelevant data to the topic.

Endotracheal tubes

Endotracheal tubes are used during surgery to provide a definitive airway to allow for gas exchange and administration of volatile anesthetics while preventing aspiration of secretions, blood, or gastric contents into the lungs. ETTs are flexible catheters inserted through the nose or mouth into the trachea to secure airway. ETTs have a cuff that can be inflated with air or liquid to seal the trachea from gas leaks or aspiration (Mali, Solanki, & Deshpande, 2017). Excessive cuff inflation can cause decreased tracheal capillary perfusion, while minimal cuff inflation can possibly allow for aspiration of secretions, blood, or gastric content (Mali, Solanki, & Deshpande, 2017).

Emergence

Emergence is defined as the return to baseline physiologic function of all organ systems as a patient transitions from the general anesthetic sleep state to full consciousness (Burns, 2003). Emergence consists of returning through four stages of anesthesia as described in Table 2. As patients progress to an awakened state from GETA, they may experience temporary neurologic dysfunction, such as mental confusion, impaired speech, or impairments in sensory or motor function. Delayed emergence is another phenomenon that can occur in any patient. Delayed emergence is defined as slow awakening by patient after receiving general anesthesia usually caused by drug effects, metabolic disorders, or neurologic disorders (Tzabazis, Miller, Dobrow, Zheng, & Brock, 2015). This phenomenon can occur with overdosing of opioid medications in any population, but most commonly occurs in elderly populations (Tzabazis, Miller, Dobrow, Zheng, & Brock, 2015).

Table 2

Four Stages of Anesthesia

Four Stages of Anesthesia	
Stage I.	Induction of anesthesia to loss of consciousness. (amnestic state)
Stage II.	Excitation, delirium, tachycardia, involuntary movement, elevated blood pressure, potential for laryngospasm, pupillary dilation (fight or flight response)
Stage III.	Adequate anesthesia depth, regular respiration, pupillary constriction, absence of movement (surgical anesthesia)
Stage IV.	Minimal or no respiratory effort, non-reactive pupils, cardiovascular effects, hypotension (overdose)

Emergence Cough Reflex

Emergence cough reflex commonly occurs during awakening from general anesthesia. The proposed method of action by which this cough response is initiated is usually related to presence of an ETT cuff applying pressure to tracheal wall (Wetzel, et. al., 2008). Stretch receptors located throughout the inner tracheal mucosa can become stimulated by irritants such as an ETT (Wetzel, et. al., 2008). These superficial tracheal receptors are found just below the epithelium of the tracheal mucosa allowing for easy stimulus by irritants. Crerar, Weldon, Salazar, Gann, Kelly, & Pellegrini (2008) reported inherent causes of the cough reflex can be from ETT insertion, ETT cuff inflation pressure, positive-pressure ventilation, or by volatile agents used to maintain the anesthetic state. These possible irritating causes activate minimally myelinated nociceptive fibers in the tracheal mucosa causing ETT induced cough reflex (Crerar, et. al., 2008). According to Abbasi, et. al. (2013), the tracheal mucosa is an extremely

fragile tissue as evidenced by recent studies showing the use of a simple cotton swab pulled across the mucosa caused loss of epithelium. Furthermore, patients with hyperactive airways such as seen in smokers may have hypersensitive receptors located in the trachea that predispose these patients to more frequent and forceful coughing during extubation (Jaichandran, Bhanulakshi, Jagadeesh, & Thennarasu, 2009).

Detriments of Emergence Cough

Emergence cough can predispose patients to hemodynamic alterations such as increased intracranial pressure (ICP), increased intraocular pressure (IOP), elevated systolic blood pressure (SBP), tachycardia, increased abdominal pressure, and possible disruption of sutured surgical wound closure (D'Aragon, et. al., 2013). D'Aragon, et. al. (2013) reported bronchospasm, laryngospasm, and aspiration are also complications that may occur. Laryngospasm can be a significant event occurring during intubation and extubation in patients who require GETA. Laryngospasm can be caused by coughing that can lead to considerable airway constriction after extubation which can be life threatening (Watkins, et. al., 2012). Patients undergoing ophthalmic surgery involving open globe repair can experience increased IOP, disruption of sutures, and suprachoroidal hemorrhage from coughing if smooth emergence from GETA is not performed (Jaichandran, et. al., 2009). Patients undergoing thyroidectomy can develop hemorrhage resulting in a dangerous cervical hematoma that could possibly occlude the airway if coughing is not controlled (Lee, Koo, Jeong, Kim, & Lee, 2011). Rao, Snigdha, Alai, & Vijay (2013) reported the increased risk of myocardial ischemia, tachycardia, and increased risk of bleeding during the postoperative period can be related to cough phenomenon during emergence. During extubation and the postoperative

period, changes in cardiac ejection fraction and cardiac workload can predispose susceptible patients to myocardial ischemia if tachycardia occurs (Nho, Lee, Kang, Kim, Choi, Shin, Kim, & Kwon, 2009). Coughing during this period of recovery can cause increases in arterial pressure, heart rate, and decrease coronary blood flow leading to ischemia (Nho, et. al., 2009).

Lidocaine

Lidocaine, an amide local anesthetic, is a medication that can be used to inhibit neuronal pathways. Lidocaine works by altering signal conduction in neurons responsible for signal transduction. Lidocaine inhibits fast voltage-gated sodium channels in the neuronal cell membrane. This action inhibits the ability of the postsynaptic neuron to depolarize and transmit an action potential (Nagelhout & Plaus, 2014). This action causes an anesthetic effect by inhibiting pain signals before propagation to the brain is permitted. Topical intratracheal lidocaine is currently being used as a treatment option to prevent laryngospasm during emergence and tracheal extubation (Watkins, et. al., 2008). Topical lidocaine s useful since tracheal receptors lie superficially within the tracheal mucosa, allowing lidocaine to inhibit the receptor response (Wetzel, et. al., 2008). Basuni (2014) reported intracuff alkalinized lidocaine was suggested to continuously diffuse across the cuff membrane causing local anesthesia to underlying trachea mucosal tissue. The semi-permeable membrane properties of the ETT cuff and the alkalinized lidocaine solution allow for gradual diffusion of lidocaine through the cuff membrane to reach tracheal receptors (D'Aragon, et. al., 2013). This gradual diffusion of lidocaine slowly decreases the sensitivity of tracheal receptors through all the critical periods of emergence. Various factors have to be considered for

the diffusion of intracuff alkalinized lidocaine such as alkalization, temperature, local anesthetic concentration, and duration of the surgical procedure (Rao, et. al., 2013). Adequate time must be allowed for alkalinized lidocaine to diffuse from the cuff membrane to reach tracheal receptors responsible for eliciting emergence cough (Rao, et. al., 2013).

The following sections compared the diffusion rates of intracuff alkalinized lidocaine through polyvinyl chloride (PVC) ETTs cuffs versus polyurethane ETT cuffs. The 50 µm thick PVC ETT cuff showed a diffusion rate different than the thinner 7 µm polyurethane cuff. The following sections also demonstrated how intracuff alkalinized lidocaine would diffuse the membranous cuff to elicit its localized tracheal effect. Other uses of intracuff alkalinized lidocaine were also detailed to show the multiple benefits of implementing the intervention.

Polyvinyl Chloride Endotracheal Tube Cuff

A controlled trial by Momota, Kakudo, Miyatani, Miyake, Tamura, Oshital, and Kishimoto (2016) was conducted to determine diffusion rate of lidocaine solutions across the polyvinyl chloride (PVC) membranous cuff of an oral ETT. The trial was performed using three different lidocaine mixtures, solutions of 2 mL 4% lidocaine hydrochloride and 4 mL distilled water (L-Gr), 2 mL 4% lidocaine hydrochloride and 4 mL 8.4% sodium bicarbonate (LSB-Gr), or 2 mL 4% lidocaine hydrochloride and 4 mL dipotassium phosphate (LDP-Gr). Endotracheal tube PVC cuffs were then instilled with 6 mL of each solution separately and submerged in beakers of distilled water. Samples of 0.1 mL of distilled water were removed and examined from each beaker at 30 minute intervals for duration of six hours. Fluorescence polarization immunoassay was utilized

to determine the amount of lidocaine diffused through the cuff at each time interval. Momota, et. al. 2016 reported findings of lidocaine diffusion through the cuffs at 30 minutes of exposure in LSB-Gr and LDP-Gr. Results of L-Gr demonstrated lidocaine concentrations ranging between 0.06 ± 0.04 µg/mL and 1.05 ± 0.34 µg/mL with an increased concentration noted at 270 minutes. Results of lidocaine concentrations at 120 minutes were 12.0 ± 3.74 µg/mL and 133.8 ± 23.2 µg/mL for LSB-Gr, and 11.4 ± 2.41 µg/mL and 119 ± 14.8 µg/mL for LDP-Gr respectively.

The authors conducted a separate trial to examine the integrity of the PVC membranous cuff against inadvertent rupture from diffusion of tested solutions. Intervals of 60, 180, and 360 minutes using stereomicroscopic observation were used. The cuffs were filled with the three solutions separately and submerged in distilled water for the 360-minute duration. The trial demonstrated no change in appearance or integrity of the cuff at 360 minutes when L-Gr was used. The LSB-Gr and LDP-Gr filled ETT cuffs revealed changes in appearance at sixty minutes with no cuff rupture during submersion for 360 minutes (Momota, et. al., 2016). Furthermore, upon completion of a 360-minute immersion, three of six cuffs instilled with LSB-Gr and two of six cuffs instilled with LDP-Gr ruptured when manual pressure was applied. Momota, et. al. (2016) reported at 360 minutes LSB-Gr and LDP-Gr instilled cuffs became rough on surfaces exposed to solution as compared to the control cuff of L-Gr.

The significance of this study was to show the diffusion rates of lidocaine through a PVC ETT cuff and afterwards the integrity of the membranous cuff. It revealed the diffusion of lidocaine to be greater after 120 minutes duration. The integrity of the cuffs became rough on surfaces after six hours of exposure to alkalinized lidocaine but

remained intact, though some ETT cuffs were ruptured after six hours when direct manual pressure was applied.

Polyurethane Endotracheal Tube Cuff.

In a different study by Estebe, et. al. (2014), the diffusion rate of alkalinized lidocaine through the membranous ETT polyurethane cuff was measured, as well as the safety of this procedure. In a previous study, Estebe, et. al. (2014) reported the lack of diffusion of lidocaine when used alone was due to a low diffusion rate through the hydrophobic membrane. They also found by adding bicarbonate to the lidocaine solution, a relatively smaller amount of lidocaine might be used with an increased rate of diffusion through the ETT cuff. This study evaluated the use of polyurethane high volume, low pressure (HVLP) cuffs with a thickness of 7 µm as compared to PVC low volume, high pressure (LVHP) cuffs with a thickness > 50 µm. Each polyurethane ETT cuff was filled with 8 mL of varying L-B (lidocaine + bicarbonate) concentration, then measured every 15 minutes for a 24-hour duration to evaluate amount of lidocaine diffused through the polyurethane cuff. The release profile validated diffusion rates for lidocaine less than 8% over 24-hour duration, while L-B showed diffusion rates greater than 90% over a 24-hour duration. The study evaluated 24-hour durations of removing and reinstilling the exact solution showing a similar lidocaine release profile for all eight days of study. This study also validated another key factor in the safe use of this method of lidocaine administration. After eight days of repeatedly instilling the L-B solution into the same ETT cuffs there was lack of rupture of the thin polyurethane cuff in all experiments. Furthermore, the use of lidocaine 1% in low doses and bicarbonate in low doses decreased the risk of injury or toxicity if inadvertent cuff rupture were to

occur. The significance of this study was lidocaine can be used in smaller dosages when mixed with sodium bicarbonate to diffuse through the ETT cuff. It also showed polyurethane ETT cuffs maintained their integrity when being filled with L-B solution and not rupturing after repeated use for eight days.

Intracuff Alkalinized Lidocaine.

A double-blind, randomized controlled trial by D'Aragon, et. al. (2013) evaluated the use of lidocaine sprayed topically to subglottic trachea versus instilling 2% alkalinized lidocaine into the ETT cuff. A total of 120 adult women with ASA physical status I or II were enrolled in the study over a four-year period. These participants were undergoing elective gynecological procedures with durations between 30 to 120 minutes. The participants were divided into 4 groups of 30 participants, in which 4% lidocaine or 0.9% saline was sprayed topically to subglottic tracheal areas. Following successful intubation, the ETT cuff was filled with alkalinized 2% lidocaine or 0.9% saline. The resulting four groups: lidocaine spray - lidocaine cuff, lidocaine spray - saline cuff, saline spray - lidocaine cuff, and saline spray - saline cuff were analyzed using logistic regression. This study by D'Aragon, et. al. (2013) revealed that cough occurred in 42% lidocaine spray - lidocaine cuff group, 24% lidocaine spray - saline cuff group, 63% saline spray – lidocaine cuff, and 69% saline spray – saline cuff groups. The study detailed topical lidocaine to be more effective in preventing emergence cough in surgeries less than 120 minutes duration (D'Aragon, et. al., 2013). The study showed 2% alkalinized lidocaine to be ineffective in surgeries lasting less than 120 minutes duration due to slow diffusion through the membranous ETT cuff (D'Aragon, et. al. 2013). The significance of this study showed that the lidocaine bicarbonate solution when placed in

an ETT cuff must be allotted a longer duration of time to diffuse through the ETT cuff membrane to inhibit pharyngeal mucosa receptors.

A randomized, double blind clinical trial performed by Navarro, et. al. (2012) was conducted using intracuff alkalinized 2% lidocaine as an intervention to blunt emergence cough response in current everyday smokers. The patients were placed into two groups, L group to receive intracuff alkalinized 2% lidocaine and S group to receive intracuff 0.9% saline. Key factors evaluated in this study include intracuff pressure, anesthesia duration, extubation timing, and cuff solution volumes. Patients were instructed to continue smoking prior to elective surgical date. Coughing was assessed as whether it was present or absent in each patient during emergence. The absence of cough was defined as no cough or coughing only during the removal of ETT, while the presence of coughing was considered coughing during regular or irregular breathing with intact ETT. Twenty patients experienced cough during emergence in the saline group compared to seven patients in alkalinized 2% lidocaine group. These results were significant as it showed intracuff alkalinized lidocaine to be nearly three times more effective at preventing cough in smokers ($p < 0.001$). An additional finding showed that emergence required less time to awakening in the lidocaine group as compared to saline group.

Use of Intracuff Lidocaine in Other Populations

Basuni (2014) evaluated the use of intracuff alkalinized lidocaine to decrease the use of sedative infusions which predispose patients to weak inspiratory muscles or ventilator asynchrony. A trial was conducted to evaluate the efficacy of intracuff alkalinized lidocaine on decreasing sedative requirements and improving patient-ventilator synchrony in intensive care patients requiring mechanical ventilation. High

dose sedative/analgesics are currently being used to keep patients comfortable and in synchrony with the ventilator. High dose sedatives/analgesics can have a cumulative effect on patients requiring more days of mechanical ventilation. Patients requiring ventilatory support for duration of longer than 48 hours were included in the study. A total of 64 patients were randomly assigned to intracuff saline or intracuff lidocaine groups. The saline group had ETT cuffs instilled with 0.9% saline, while lidocaine group had ETT cuffs instilled with alkalinized 2% lidocaine. Both groups received propofol and fentanyl infusions for sedation during the trial. The trial recorded frequency, severity of cough, and number of ineffective ventilator triggers during the initial 24 hours of mechanical ventilation. Basuni (2014) reported a 30% reduction in requirements for sedative infusions when intracuff alkalinized lidocaine was instilled in the ETT cuff ($p < 0.001$). He also found patients who received intracuff alkalinized lidocaine experienced lower frequency and severity of cough ($p < 0.001$). Fewer episodes of elevated blood pressure and heart rate increase were noted with use of intracuff alkalinized lidocaine (Basuni, 2014). The study revealed that sedative/analgesic requirements were decreased when intracuff alkalinized lidocaine was instilled. This allowed mechanical ventilation to be more tolerable for patients in intensive care units during ventilator weaning.

A double-blind, randomized controlled trial by Abbasi et. al. (2013) was conducted to evaluate the effectiveness of instilling 2% lidocaine into ETT cuffs in patients requiring long-term mechanical ventilation. Damage to the tracheal mucosa causing possible ischemia and necrosis is commonly seen in hyperinflated ETT cuffs with pressures above 25 cm H2O (Abbasi, et. al., 2013). The trial was seeking evidence on whether the use of intracuff 2% lidocaine was effective at decreasing tracheal mucosa

damage from ETT cuff pressure. A total of 51 long term mechanically ventilated patients were evaluated during this investigation. Inclusion criteria consisted of ages between 18 to 70 years, hemodynamically stable, or no recent episodes of mechanical ventilation. Patients excluded from study had less than 48 hours of mechanical ventilation, an ETT cuff pressure greater than 25 cm H2O, or were hemodynamically unstable. Patients evaluated during this study were divided into intracuff lidocaine or intracuff air groups respectively. Bronchoscopy examination of tracheal mucosa occurred after 24 hours revealing no statistical difference between the two groups ($p=0.109$). Reexamination after 48 hours of intubation revealed erythema and edema of tracheal mucosa in 2 patients (7.7%) belonging to intracuff lidocaine group and total of 6 patients (24%) of intracuff air group experienced edema and erythema. The significance of this study showed 2% lidocaine to be effective at reducing mucosal damage caused by the inflated ETT cuff remaining in contact with tracheal mucosa.

Synthesis of Evidence Conclusion

The synthesis of evidence provided substantial evidence that intracuff alkalinized lidocaine is an effective intervention in decreasing the cough response during emergence in cases lasting a duration of greater than 120 minutes. Though intracuff alkalinized lidocaine has been shown to be less effective as compared to topical laryngotracheal lidocaine administration in cases less than 120 minutes duration. PVC and polyurethane ETT cuffs were both independently evaluated to determine lidocaine bicarbonate solution diffusion rates through the different membranous ETT cuffs. Estebe, et. al. (2014) and Momato, et. al. (2015) both evaluated the integrity of the outer surface of each type of ETT cuff showing no rupture while using polyurethane ETT cuff. Cuff rupture was

noted, however, in the PVC ETT cuffs after six hours of intracuff lidocaine bicarbonate solution. The outer membranous cuff surface became rough and was ruptured by manual pressure applied by the fingers which occurred only in a few of the examined ETTs. Research revealed that intracuff lidocaine was effective at decreasing the sedative requirements for long-term mechanically ventilated patients and effective at decreasing mucosal damage from ETT cuff inflation. The synthesis of evidence reveals that the use of intracuff alkalinized lidocaine is a safe, effective route of administration to decrease emergence cough to prevent hemodynamic alterations.

Theoretical Framework

The theoretical framework used with this DNP project is the Model for Change to Evidence Based Practice. The model was developed by Rosswurm and Larrabee (1999) as a model to guide healthcare professionals through a systematic approach for the need to change to evidence-based practice. The increase in healthcare advances in clinical research has led to shifts from traditional practice to evidence-based practice, allowing advanced practice nurses to utilize the best research evidence in their patient care treatment plan. The basis of this model from a theoretical approach is related to evidence-based practice, research utilization, and the change theory as described in Table 3. (Rosswurm & Larrabee, 1999).

Table 3

A Model for Change to Evidence Based Practice

A Model for Change to Evidence Based Practice	
Step 1	Assess need for change by collecting and comparing data, identifying practice problems.
Step 2	Link problems to interventions and outcomes using standardized classification system and languages.
Step 3	Synthesize best evidence by searching research literature, critiquing, rating and synthesizing best evidence, assessing feasibility.
Step 4	Design practice changes by defining protocol change, planning a pilot/demonstration including implementation, education, resources needed.
Step 5	Implement and evaluate the practice change including evaluation of pilot and decision to adapt/adopt/reject change
Step 6	Integrate and maintain change by communicating to stakeholders, in-service education, approving practice standards and monitoring outcomes.

Rosswurm and Larrabee (1999) proposed six unique steps involved in the model framework which are: "1) Assess need for change in practice; 2) Link problem with interventions and outcomes; 3) Synthesize best evidence; 4) Design a change in practice; 5) Implement and evaluate the change in practice; and 6) Integrate and maintain the change in practice" (p. 319). The first step, assessing need for change in practice relates to this DNP project through evaluating the need to keep patients hemodynamically stable through all periods of anesthesia. Emerging patients from GETA can elicit a cough

response that can cause brief hemodynamic alterations such as increased ICP, elevated blood pressure, or tachycardia. Step two, linking problem with interventions and outcomes could be considered through the use intracuff alkalinized lidocaine as an intervention to decrease the problem of coughing during emergence. Intracuff alkalinized lidocaine could lead to an overall outcome of no hemodynamic alterations experienced by the patient. Step three, synthesizing the best evidence can be applied to this project through the amount of evidence-based literature published over recent years concluding intracuff alkalinized lidocaine to be an effective intervention at decreasing the cough response. Step four implied a design to change practice done through this DNP project by gathering evidence-based data and designing an evidence-based presentation to discuss a practice change for CRNAs. Step five was achieved by proposing a practice change to CRNAs suggesting the current evidence-based practice findings on the use of intracuff alkalinized lidocaine. A practice change was determined by whether CRNAs changed their practice or not. After the practice change proposal, a follow-up survey was administered two weeks later to evaluate whether a practice change occurred by CRNAs. Step six refers to integrating and maintaining the intervention for an improved practice change. Integrating and maintaining the practice change can only occur if CRNAs were willing to change practice based on evidence-based studies showing positive outcomes with the use of intracuff alkalinized lidocaine. Each CRNA involved in this practice change proposal could potentially play a large role in implementing this intervention into long-term use. Based on outcomes and first-hand experiences by CRNAs this intervention may become a sustainable treatment for decreasing emergence cough.

The aim of this DNP project was to evaluate whether CRNAs were willing to implement a practice change to decrease emergence cough and maintain hemodynamic stability. The goal of implementing this evidence-based practice change proposal was to determine if CRNAs were willing to change their current practice after being presented with current evidence-based results on intracuff alkalinized lidocaine. By using the framework established by Rosswurm and Larrabee (1999), a structured model to provide a needed change in practice was implemented to reduce the cough response in patients during emergence from general anesthesia.

Doctoral of Nursing Practice Essentials

This doctoral project met all eight DNP essentials as described in Appendix A. Zaccagnini and White (2017) reported the use of these essentials in current practice allowing advanced practice nurses (APNs) the skill set to enhance education. Essentials III, VI, VIII were mostly reflected in this DNP project. Essential III, Clinical Scholarship and Analytical Methods for Evidence-Based Practice, was reflected by using analytical methods to appraise existing research on the effects of using intracuff alkalinized lidocaine to reduce coughing during emergence. Essential III was also met by evaluating quality improvement methods to collect, inform, and analyze current practice methods through an evidence-based presentation on current research suggesting the use of intracuff alkalinized lidocaine to practicing CRNAs. Essential VI, Interprofessional Collaboration for Improving Patient and Population Health Outcomes, was reflected by utilizing therapeutic communication and collaborative skills among anesthesia providers to develop and implement a practice change in the health care system. Essential VIII, Advanced Nursing Practice, was reflected by designing a practice change to improve

patient safety and satisfaction. This project evaluated whether CRNAs were willing to change practice based on reported evidence-based results of using intracuff alkalinized 2% lidocaine.

Summary

This project evaluated whether CRNAs were willing to change their practice through utilizing intracuff alkalinized lidocaine to decrease emergence cough. This project was presented through an evidence-based poster presentation and brochure to CRNAs at a regional hospital in Southeastern Mississippi. All results were gathered via paper survey administered prior to presentation and 2 weeks post-presentation. All results will be evaluated by descriptive statistics to determine if CRNAs changed their practice to utilize intracuff alkalinized lidocaine to decrease emergence cough.

CHAPTER II - METHODOLOGY

The purpose of this DNP project was to evaluate the willingness of CRNAs to change practice after presented evidence-based results from current research on benefits of intracuff alkalinized lidocaine. It was estimated that 38% to 96% of patients receiving GETA experienced coughing during emergence (As, Iqbal, & Ali, 2009). Synthesized evidence revealed a correlation between using intracuff alkalinized lidocaine and decreasing cough severity. Based on current research findings, an evidence-based presentation was developed. For the GETA patient population, use of intracuff alkalinized lidocaine is a proposed intervention that could be beneficial in decreasing incidence or severity of coughing during emergence from anesthesia. The following sections reveal the proposed method design, data collection, and data analysis that was used to determine whether the practice change proposal was implemented by CRNAs.

Population

Inclusion criteria included all CRNAs employed at a level II trauma center in southeast Mississippi. CRNAs at this facility administer anesthesia to patients of all American Society of Anesthesiologists (ASA) physical status (PS) I - VI classifications as described in Table 4. A total of 11,833 surgical cases were performed at this center in 2016 (U.S. News & World Report, 2017). This facility offers multiple surgical services such as: Neurosurgery, cardiothoracic surgery, vascular surgery, orthopedic surgery, and many other general surgery services. Exclusion criteria included any CRNA not willing to participate in this DNP project or unable to attend the evidence-based presentation. There was no random selection among the participating CRNAs.

Table 4

American Society of Anesthesiologists Classification System

Physical Status	Class Definition
ASA PS 1	A normal healthy patient.
ASA PS 2	A patient with mild systemic disease.
ASA PS 3	A patient with severe systemic disease, not incapacitating.
ASA PS 4	A patient with severe systemic disease that is a constant threat to life.
ASA PS 5	A moribound patient who is not expected to survive without the operation.
ASA PS 6	A patient who has already been declared brain-dead and whose organs are being removed for transplant.
E	Emergent surgery.

Note. ASA= American Society of Anesthesiologist. PS= Physical status.

Setting

A 512-bed level II trauma center in southeast Mississippi was the facility in which this DNP project was presented to CRNAs. An evidence-based poster presentation and brochure was presented in the anesthesia personnel lounge within the surgical department at this facility. The anesthesia personnel lounge was a secure area, only accessible through door code entry by authorized anesthesia personnel.

Design

The design was a practice change proposal offered to CRNAs through an evidence-based poster presentation and brochure suggesting use of intracuff alkalinized lidocaine to decrease emergence cough. CRNAs were presented with current research on advantages of instilling alkalinized lidocaine into ETT cuffs to prevent emergence cough.

Prior to the presentation, each CRNA was asked to fill out a baseline paper survey assessing their current knowledge on the use of intracuff alkalinized lidocaine. During the evidence-based poster presentation and student nurse anesthetist (SRNA) developed brochure was presented to each CRNA suggesting current dosages, onset, and peak effect times of alkalinized lidocaine based on the synthesis of evidence current research findings. Two weeks after presentation a secondary follow-up paper survey was conducted to evaluate whether each CRNA implemented the practice change proposal or to determine barriers which may have prevented them from implementing this intervention. The feedback received from the follow-up survey allowed a determination on whether CRNAs changed their current practice. There was no coding on the baseline survey or follow-up survey. All results obtained from CRNAs on baseline survey or follow-up survey remained anonymous.

No patient interaction occurred during implementation of this DNP project. Risk of harm to any patient was avoided as this DNP project was solely a presentation of evidence-based results on current research findings demonstrating the benefits of using intracuff alkalinized lidocaine. No personal or confidential information was received on any patient or participant during the project.

After successful Institutional Review Board (IRB) approval from The University of Southern Mississippi (Protocol number: 17071703) and a letter of support from the chief anesthesiologist at this facility, implementation of this DNP project was started. All data received during this project implementation remained anonymous to ensure participant confidentiality.

No identifiable personal information was collected from CRNAs on either survey. All surveys were collected as aggregate data and not individualized to each CRNA. Paper surveys were protected and maintained in a locked file cabinet for which the author has the sole key. Six months after graduation requirements all computer data files will be deleted and paper surveys shredded to ensure confidentiality of all participants involved in this study.

Statistical Analysis

Statistical analysis was illustrated through descriptive statistics to describe the population and whether a practice change was implemented by CRNAs. Descriptive statistics are a form of statistical analysis used to quantitatively describe or summarize a collection of information, usually a sample of data (Daniel, 2009). Descriptive statistics were utilized for this DNP project to quantify the data from each survey completed. After two weeks, an additional follow-up survey was handed out to CRNAs to gather data on whether intracuff alkalinized lidocaine was implemented since the evidence-based presentation was presented. After gathering the follow-up survey results, descriptive statistics were utilized and compared to original results to determine whether implementation of this intervention had been effective. Measures of central tendency such as the mean was calculated to determine average years of experience in which CRNAs were willing to implement a practice change.

Summary

The population for this project included CRNAs at a 512-bed regional hospital in Southeastern Mississippi. These CRNAs were currently not using intracuff alkalinized lidocaine to prevent emergence cough. The CRNAs were presented with an evidence-

based poster presentation and brochure, which occurred in the anesthesia lounge. The CRNAs completed baseline surveys prior to presentation and then completed follow-up surveys two weeks after the presentation. Results were gathered on paper surveys and maintained in a locked cabinet until data analysis. No personal or identifiable information was gathered on CRNAs or patients. Descriptive statistics was utilized to evaluate the survey results to determine if a practice change occurred among CRNAs.

CHAPTER III - RESULTS

Statistical Analysis

A baseline survey was administered to 18 CRNAs of potentially 48 CRNAs at a 512-bed regional hospital in Southeastern Mississippi. The baseline survey was administered prior to the delivery of each individual ten minute, evidence-based poster presentation and brochure, which occurred in the anesthesia department lounge. After completion of each individual presentation, the anesthesia provider was notified of a follow-up survey to be completed after a two-week period elapsed. The paper follow-up survey was hand-delivered to 12 CRNAs who participated in this DNP project. There was no coding on follow-up surveys, CRNAs remained anonymous as aggregate data was collected. The evidence-based presentation was presented during each CRNA's normally scheduled workday. Upon completion of the two-week period post-presentation, 12 follow-up surveys from the potential 18 CRNAs who participated in the baseline survey were gathered and maintained in a locked file cabinet for which the author has the only key.

Baseline Survey Results

Demographic data was initially gathered on all CRNAs participating in this project to include years of experience, age, and gender. A total of 18 CRNAs received the evidence-based presentation and participated in completing baseline surveys. Figure 1 illustrated years of experience among CRNAs showing 39% (n=7) had 1 to 5 years of experience, 16% (n=3) had 6 to 10 years of experience, 39% (n=7) had 11 to 15 years of experience, and 6% (n=1) had 21+ years of experience. The 18 CRNAs amassed 168

years of anesthesia experience between them, ranging from 1 year to 35 years of anesthesia experience, with mean of 9.3 years of experience (see Figure 1).

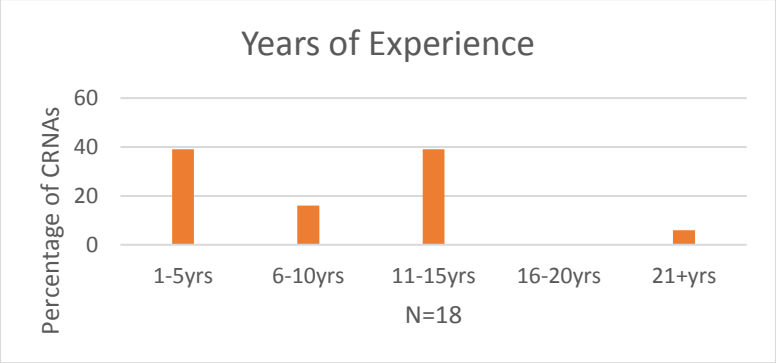


Figure 1. Demographic Data: Years of Experience

Figure 2 depicts the age of the sample population of 18 CRNAs showing 11% (n=2) between the ages of 21-30 years, 50% (n=9) between the ages of 31-40 years, 28% (n=5) between the ages of 41-50 years, and 11% (n=2) who were 51+ years participated in the baseline survey. The mean age of participants was 37 years old (see Figure 2). Question 3 acquired the gender of the sample of 18 CRNAs, revealing 89% (n=16) males and 11% (n=2) females. Of the potential 48 member CRNA population, males accounted for 77% (n=37) compared to 23% (n=11) females (see Figure 3).

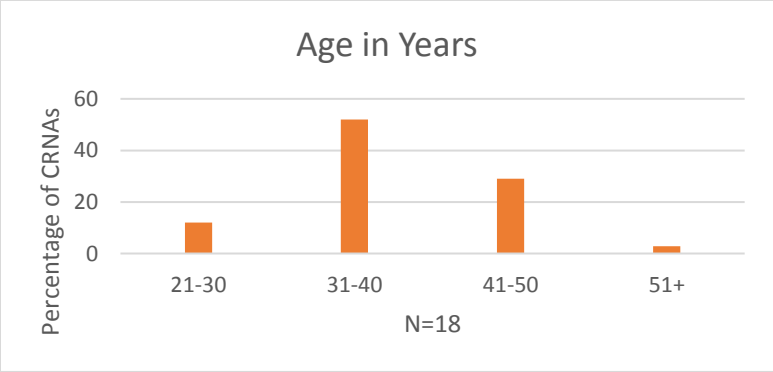


Figure 2. Demographic Data: Age

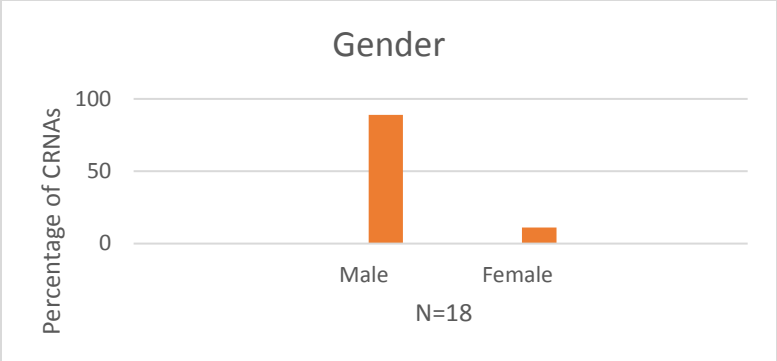


Figure 3. Demographic Data: Gender.

Questions 4-6 of the baseline survey inquired about the baseline usage, knowledge of, and consideration for implementing the use of intracuff alkalinized lidocaine among CRNAs in this project. Figure 4 illustrated current knowledge of using intracuff alkalinized lidocaine to decrease emergence cough. The baseline survey revealed 67% (n=12) of CRNAs were not familiar with the usage of intracuff alkalinized lidocaine, while 33% (n=6) had previous knowledge of the intervention (see Figure 4).

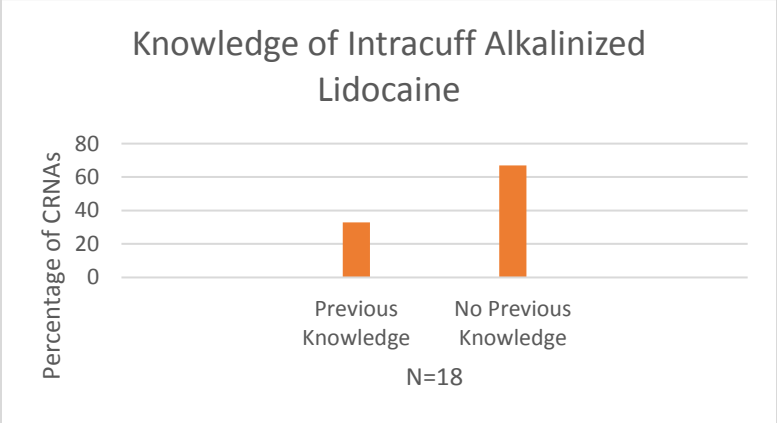


Figure 4. Knowledge of Intracuff Alkalinized Lidocaine

Figure 5 depicts previous intracuff alkalinized lidocaine knowledge among the 18 CRNAs. Of the 33% (n=6) of CRNAs familiar with the usage of intracuff alkalinized lidocaine, only 11% CRNAs (n=2) had utilized the intervention in previous practice. The

2 CRNAs reported utilizing 2% intracuff alkalinized lidocaine during their SRNA training, administered during carotid endarterectomy surgery at another medical facility. Most CRNAs, 67% (n=12) had no previous knowledge regarding using intracuff alkalinized lidocaine to decrease emergence cough. CRNAs accounting for 22% (n=4) of the sample reported knowledge of the intervention, but reported no use of intervention because they were not required to implement the intervention (see Figure 5).

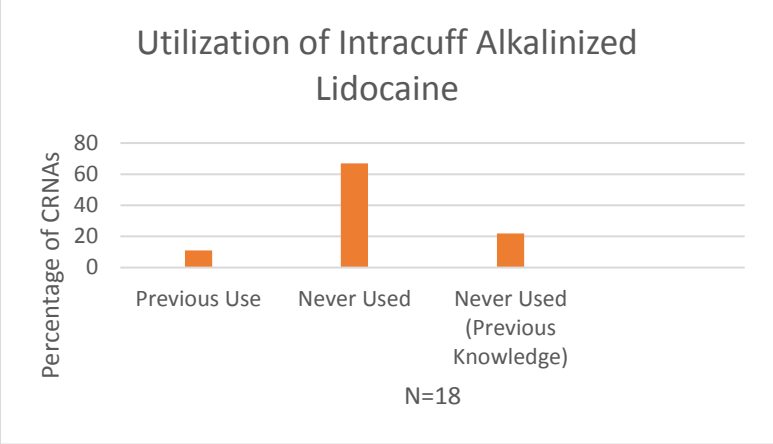


Figure 5. Utilization of Intracuff Alkalinized Lidocaine

Figure 6 correlates with Question 6 of the baseline survey on whether the proposed intervention would be considered in the CRNAs current practice, 78% (n=15) reported they would consider the use of intracuff alkalinized lidocaine, while 22% (n=3) answered maybe. No CRNA initially declined the consideration of using intracuff alkalinized lidocaine. All 18 CRNAs asked to participate in the project voluntarily agreed to participate in this project (see Figure 6).

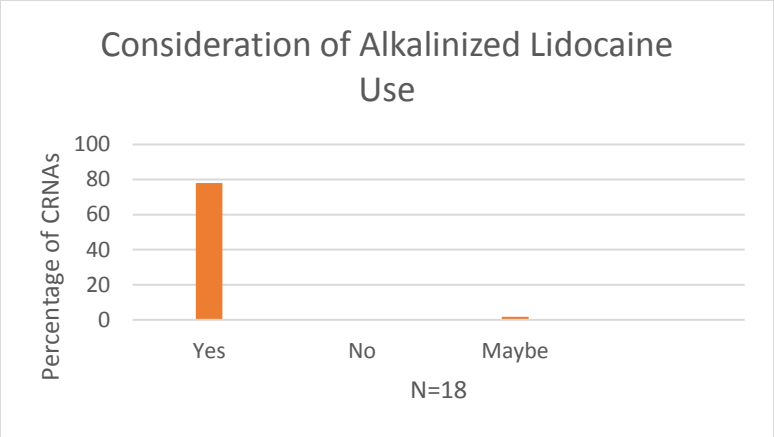


Figure 6. Consideration of Alkalinized Lidocaine Use

Two-week Data Collection, Follow-up Survey Results

Questions 1-3 of the follow-up survey acquired the demographics of the 12 CRNAs who participated in the project and who completed the follow-up survey and are depicted in Figures 7-9. Figure 7 depicts years of anesthesia experience among CRNAs showing 50% (n=6) had 1 to 5 years experience, 25% (n=3) had 6 to 10 years experience, and 25% (n=3) had 11 to 15 years experience. The 12 CRNAs amassed 74 years of experience between them, ranging from 1year to 15 years of experience, with mean of 6 years of experience (see Figure 7).

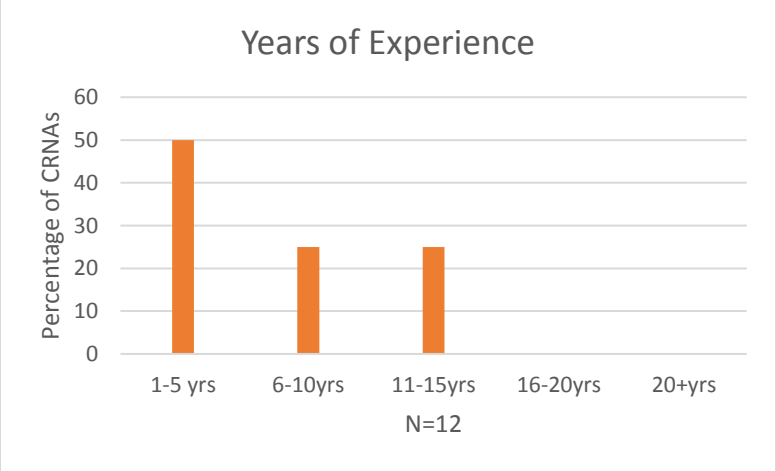


Figure 7. Demographic Data: Years of Experience

Figure 8 depicts the age of the sample population of 12 CRNAs, showing 25% (n=3) CRNAs between the ages of 21-30 years, 50% (n=6) between the ages of 31-40 years, and 25% (n=3) between the ages of 41-50 years participated in the follow-up survey. The median age was 36 years old (see Figure 8). Figure 9 depicts the gender of the 12 CRNAs participating in the follow-up survey revealing 100% (n=12) of the participants were male (see Figure 9).

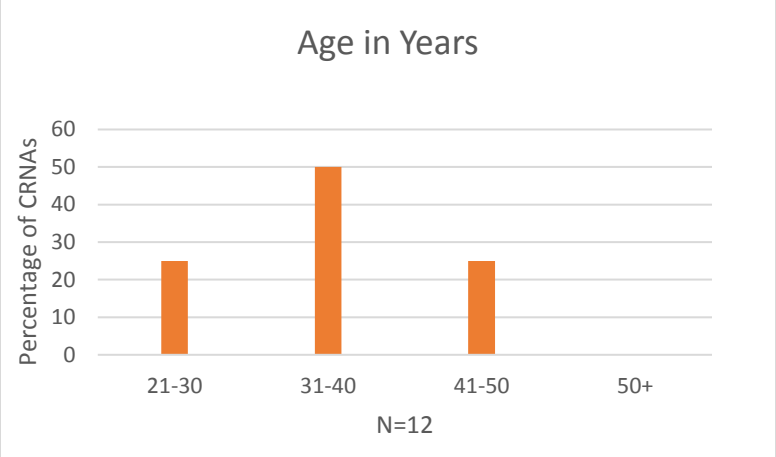


Figure 8. Demographic Data: Age

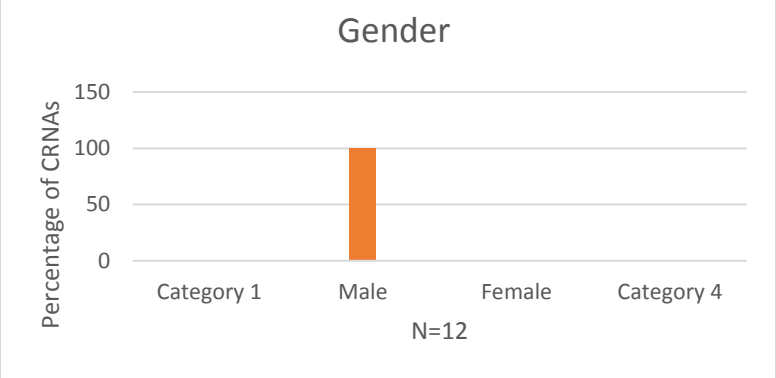


Figure 9. Demographic Data: Gender.

Question 4 asked CRNAs if they implemented intracuff alkalinized lidocaine since the evidence-based poster presentation and brochure were implemented. Of the 12 CRNAs, 33% (n=4) implemented intracuff alkalinized lidocaine, while 67% (n=8) of

CRNAs did not implement the proposed intervention. Of the 4 CRNAs implementing the intervention, 3 CRNAs had between 11-15 years of experience in anesthesia practice and a mean age of 41 years old. The increased usage of intracuff alkalinized lidocaine from 0% to 33% among CRNAs participating in the project is demonstrated in Figure 10 (see Figure 10).

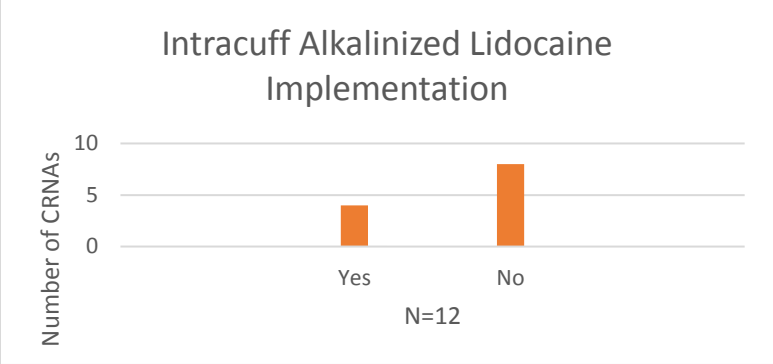


Figure 10. Intracuff Alkalinized Lidocaine Implementation

Figure 11 incorporated Question 5 and Question 6 acquiring how many cuff inflations were implemented and how effective the intervention was at preventing emergence cough. A total of 11 cuff inflations were implemented by 4 CRNAs in the project. Of the 4 CRNAs, 2 CRNAs reported using 6 cuff inflations in total, preventing emergence cough in all 6 patients who received the intervention. Another CRNA utilized 2 cuff inflations, reporting 1 episode of emergence cough due to case duration lasting less than 2 hours. The last CRNA reported 3 cuff inflations in which 1 cuff inflation was reported as not effective at preventing emergence cough. The CRNA reported the patient was a chronic smoker and coughed immediately after extubation. The total of 11 cuff inflations showed 82% (n=9) to be effective at preventing emergence cough, while 18% (n=2) were deemed not effective at preventing emergence cough.

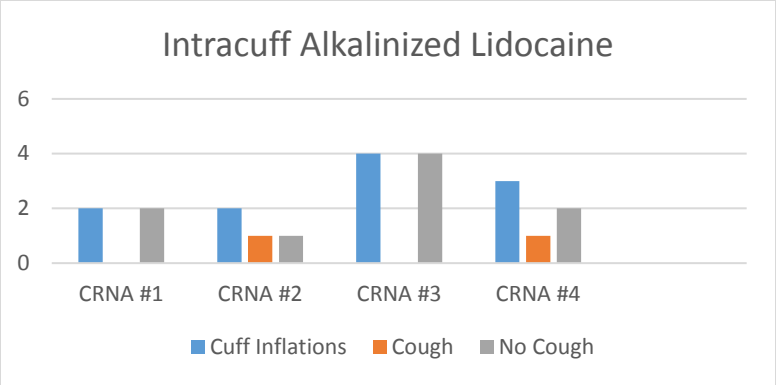


Figure 11. Cuff Inflations Compared to Prevention of Emergence Cough

The final question of the follow-up survey asked CRNAs what barriers may have prevented the use of intracuff alkalinized lidocaine. Figure 12 revealed the most common barriers to using the intervention among CRNAs participating in this project. Of the 8 CRNAs (67%) who did not implement the intervention, 5 CRNAs (62%) reported no recent patient interaction where the intervention would be beneficial. These 5 CRNAs reported they would be willing to administer intracuff alkalinized lidocaine if they believed it would be beneficial to the patient. Of the 3 CRNAs (38%) not willing to implement the intervention, 1 CRNA (13%) reported there was not enough evidence to support the intervention. The other 2 CRNAs (25%) reported not wanting to implement this intervention due to the extra step of having to get sodium bicarbonate from pharmacy and then having to take the time to prepare the medications (see Figure 12).

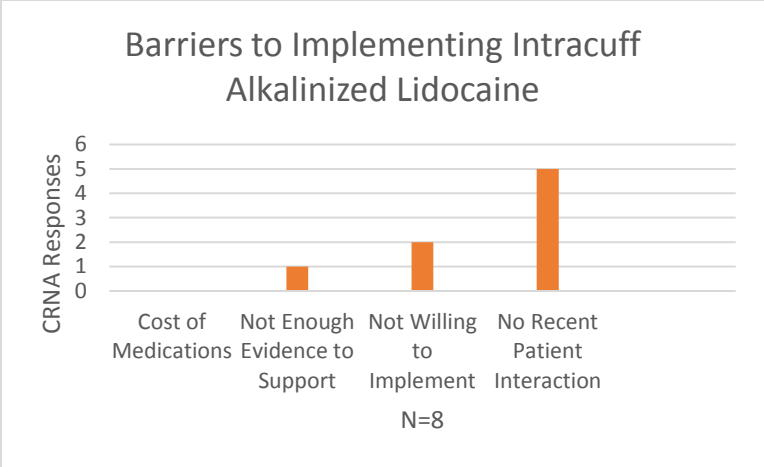


Figure 12. Barriers to Implementing Intracuff Alkalinized Lidocaine

Summary

During the project, CRNAs at this facility increased the implementation of intracuff alkalinized lidocaine from 0% to 33% to decrease or inhibit the emergence cough reflex. Implementation of this intervention by CRNAs accomplished the primary goal intended for this doctoral project. If barriers could be avoided, then CRNAs may potentially further increase their utilization of intracuff alkalinized lidocaine. Further discussion of the results, future implications, limitations, and dissemination of project are provided within the next chapter.

CHAPTER IV – DISCUSSION

Recommendations

The increased implementation of intracuff alkalinized lidocaine after evidence-based poster presentation and brochure demonstrated the project was successful during the time frame of this project. Evaluation of the baseline survey data showed the major barrier to using intracuff alkalinized lidocaine initially was the lack of knowledge about the intervention among CRNAs. Follow-up surveys reflected that most CRNAs would utilize the intervention if patients met the criteria for use. If the pharmacy premixed lidocaine and sodium bicarbonate solution, perhaps there would be an even higher rate of usage. Taking the time to mix these solutions as recommended could cause a short delay in beginning anesthesia induction. This time constraint in the operating room could delay workflow. Premixed solutions would allow the medications to be more readily available and probably utilized more often in everyday anesthetic practice.

Implications for Future Practice

Comparable evidence-based educational presentations involving the results of new studies on intracuff alkalinized lidocaine administration would be beneficial in increasing usage of this intervention. Furthermore, presentations explaining other benefits of intracuff alkalinized lidocaine such as decreasing severity of postoperative sore throat (POST) for the initial 24 hours after extubation were demonstrated in numerous evidence-based studies. This intervention could improve patient satisfaction by decreasing severity of POST and decreasing the length of stay in the post-anesthesia care unit (PACU). A study should also be conducted to evaluate the long-term outcomes of patients who experienced emergence cough compared to patients in which emergence

cough reflex was inhibited from a hemodynamic standpoint. A future study focused on hemodynamic stability during emergence could allow for evaluation of patient safety, patient satisfaction, and quality of care. In my future career as a CRNA, I plan to utilize the intervention of intracuff alkalinized lidocaine in patient s where the intervention would be beneficial.

Limitations

The project was limited to CRNAs available and willing to participate in one anesthesia department at a regional hospital in Southeastern Mississippi. A small sample size of 18 CRNAs was obtained for this project. A larger sample size may have improved the results of project. Implementing the evidence-based poster presentation and brochure at numerous anesthesia departments could yield increased knowledge and usage of suggested intervention among practicing CRNAs. A two-week time limit for implementation of this project affected the results, as a longer duration of time for implementation of this project may increase utilization among CRNAs.

Dissemination

Results of project will be disseminated to nursing research committee and supervising anesthesiologist at hospital in which intervention was conducted. Project dissemination will also be conveyed to Mississippi Association of Nurse Anesthetists (MANA) and hopefully results of evidence-based study can be viewed by practicing CRNAs all over the state of Mississippi. Project results will also be conveyed to junior and freshmen student nurse anesthetists in hopes of one classmate continuing a further in-depth project related to the benefits of intracuff alkalinized lidocaine.

Conclusion

This project showed evidence that CRNAs who utilized this intervention saw evidence of its effectiveness of inhibiting emergence cough reflex, thus avoiding hemodynamic alterations. Though only a small percentage of the sample population actually utilized the intervention, the positive results may allow for increased usage of intracuff alkalinized lidocaine by these CRNAs. After the presentation, utilization of intracuff alkalinized lidocaine among practicing CRNAs increased from 0% to 33%. Future studies could be performed to assess how to avoid barriers that may reduce the usage of intracuff alkalinized lidocaine such as premixing the lidocaine and bicarbonate solution by the pharmacy. With the goal of reducing hemodynamic alterations caused by emergence cough reflex, CRNAs can utilize this intervention to maintain patient hemodynamic stability.

APPENDIX A – DNP ESSENTIALS

Essential I: Scientific Underpinnings for Practice	This doctoral research project described advanced strategies to help decrease emergence coughing that can elicit detrimental complications.
Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking	This doctoral research project evaluated a care delivery system through the use of intra-cuff alkalinized lidocaine to improve future needs and outcomes for patients undergoing general anesthesia.
Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice	This doctoral research project used analytical methods to appraise existing research on the effects of using intra-cuff lidocaine to reduce coughing during emergence, designing and implementing a strategy to evaluate the clinical outcomes of current practice, furthermore evaluating quality improvement methods to collect, inform, and analyze current practice methods.
Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	This doctoral research project demonstrated an effective ability to implement and execute an evaluation plan for the use of intra-cuff lidocaine by anesthesia providers.
Essential V: Health Care Policy for Advocacy in Health Care	This doctoral research project promoted better outcomes for emerging patients from general anesthesia by developing, evaluating, and providing leadership to help change health care policy for safer anesthesia practice.
Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes	This doctoral research project utilized therapeutic communication and collaborative skills among anesthesia providers to develop and implement a change in the health care system.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health	This doctoral research project will disseminate clinical findings to Mississippi Association Nurse Anesthetist or American Association Nurse Anesthetist upon completion.
Essential VIII: Advanced Nursing Practice	This doctoral research project designed, implemented, and evaluated an intervention to improve emergence outcomes based on nursing science and improving patient care.

APPENDIX B – Hospital Research Request Approval Letter

[redacted]

Patient Care Services—Research Committee

RESEARCH PROPOSAL LETTER OF AGREEMENT

TO: **Shawn Taylor**

FROM: Research Committee

RE: Proposed project/study entitled: IMPLEMENTING THE USE OF INTRACUFF ALKALINZED LIDOCAINE AMONG CERTIFIED REGISTERED NURSE ANESTHETISTS: A PRACTICE CHANGE PROPOSAL

On August 8, 2017 your research project/study proposal was approved by the Nurse Practice Council to be conducted within Patient Care Services at [redacted]. You are free to proceed with your project/study within the following guidelines:

1. You are required to complete an online non-employee orientation that is administered though our Education Department (601-288-2677).
2. A *Non-Employee Confidentiality and Nondisclosure Agreement* must be signed during the online orientation process.
3. Any modifications to this approved study must be re-routed to the Research Committee. All activity on this project must stop until you are notified by the Research Committee Chair of Committee's decision regarding proposed changes
4. Data Collection Period:
5. Inform Research Chair when data collection is initiated and when completed (via e-mail)
6. Provide results of study to committee (may provide presentation or written documentation of findings)

Sincerely,

Linda Holmes, MSN, RN-BC

[redacted]

I,_____, have reviewed the above guidelines and agree to comply with the terms of this *Research Proposal Letter of Agreement.*

Signature:_____Date:_____

Facility/School/Other Association: _____

APPENDIX C – Letter of Support

[redacted]

[redacted]

RE: [redacted]

[redacted]m offering this letter of support of the SRNA doctoral student, Shawn Taylor, in her capstone project titled IMPLEMENTING THE USE OF INTRACUFF ALKALNIZED LIDOCAINE AMONG CERTIFIED REGISTERED NURSE ANESTHETISTS: A PRACTICE CHANGE PROPOSAL.

I understand that Shawn Taylor is a doctoral student in the nurse anesthesia program at The University of Southern Mississippi who is planning to graduate in December of 2017. This letter of support will be included in the The University of Southern Mississippi IRB application. I understand that open participation will be presented to anesthesia providers practicing at this facility. There is no compensation for their participation.

I understand the planned dates for his research are from June, 2017 to August, 2017 after USM IRB approval is received. His committee chair contact information is Dr. Marjorie Geisz-Everson at Marjorie.geiszeverson@usm.edu and at (601) 266-5462.

I understand that participation is completely anonymous and voluntary. If anesthesia providers at this facility choose to not participate or withdraw from the study at any time, there will be no penalty.

[redacted]esearch and impact on clinical practice. Sincerely,

[redacted]

APPENDIX D – USM IRB Approval Letter

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 17071703

PROJECT TITLE: Implementing the Use of Intracuff Alkalinzed Lidocaine among Certified Registered Nurse Anesthetists: A Practice Change Proposal

PROJECT TYPE: New Project

RESEARCHER(S): Shawn Austin Taylor

COLLEGE/DIVISION: College of Nursing

DEPARTMENT: Advanced Practice

FUNDING AGENCY/SPONSOR: N/A

IRB COMMITTEE ACTION: Expedited Review Approval PERIOD OF APPROVAL: 08/30/2017 to 08/29/2018

Lawrence A. Hosman, Ph.D.
Institutional Review Board

APPENDIX E – Baseline Survey

Pre-Survey

Intracuff Alkalinized Lidocaine

1) Current years of anesthesia practice?

_____ years

2) Current Age?

_____ years

3) Gender?

- Male
- Female

4) Current knowledge on the use of intracuff alkalinized lidocaine to decrease emergence cough?

- Familiar with the usage of intracuff alkalinized lidocaine.
- Not familiar with the usage of intracuff alkalinized lidocaine.

5) Have you ever utilized endotracheal tube cuff inflation with alkalinized lidocaine to decrease emergence cough?

- Have used previously in anesthesia care.
- Have never used previously in anesthesia care.

6) Would you consider this proposed intervention in your current anesthesia practice?

- Yes
- No
- Maybe

APPENDIX F – Follow-Up Survey

Post- Survey

Intracuff Alkalinized Lidocaine

1) Current years of anesthesia practice?

_____ years

2) Current Age?

_____ years

3) Gender?

- Male
- Female

4) Was intracuff alkalinized lidocaine implemented in your anesthesia practice since presentation?

- Yes
- If No, please skip to question #7

5) If intracuff alkalinized lidocaine was implemented in your anesthesia practice, how many times was it implemented?

_____ cuff inflations

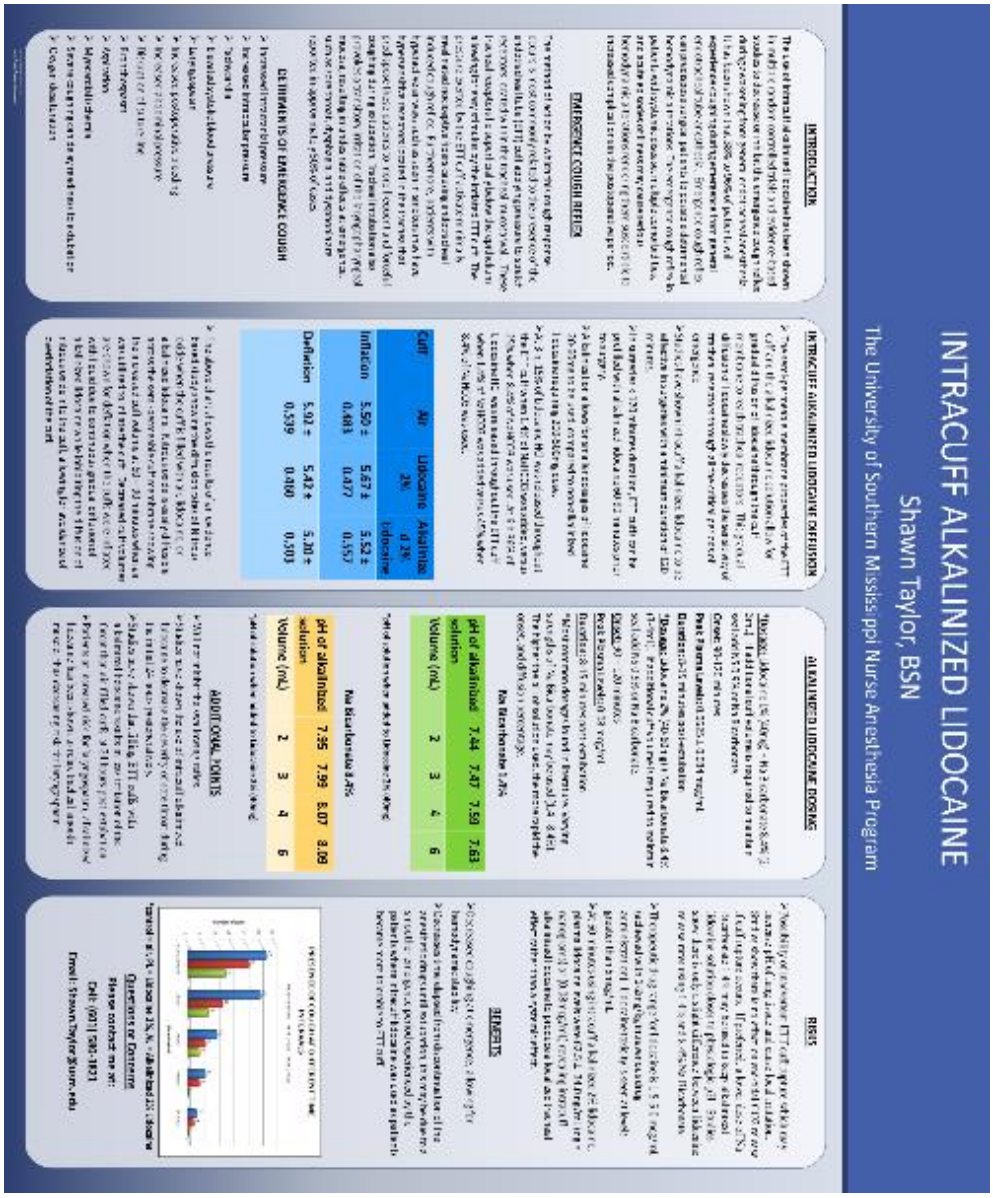
6) If implemented, was intracuff alkalinized lidocaine effective at preventing emergence cough?

- Yes
- No

7) If intracuff alkalinized lidocaine was not implemented, what barriers may have prevented you from implementing this intervention?

- Cost of medications.
- Not enough evidence to consider implementation.
- Not willing to implement intervention.
- No recent patient interaction where you would find this intervention to be beneficial.
- Other (comment optional)

APPENDIX G – Evidence-Based Poster



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