DECISION-MAKING OF CRNAS RELATED TO USE OF LARYNGEAL MASK AIRWAY

A Major Paper Presented

by

Salvador Guerrero, RN BSN

Approved:

Committee Chairperson	____________________	________ (Date)
Committee Members	____________________	________ (Date)
	____________________	________ (Date)
Director of Master's Program	____________________	________ (Date)
Dean, School of Nursing	____________________	________ (Date)

DECISION-MAKING OF CRNAS RELATED TO USE OF LARYNGEAL MASK AIRWAYS

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Abstract

Improper airway management is a major concern in anesthesia care. Today the laryngeal mask airway (LMA) has a well-established role in anesthesia practice. It is widely used, but there are certain situations where anesthesia providers are hesitant to use the LMA. The purpose of this study was to evaluate the factors that influence the decision-making process of CRNAs regarding the use of an LMA versus an endotracheal tube. The design of this exploratory study was qualitative and 11 CRNAs participated in semi-structured interviews. Results showed that all participants received formal training with an LMA and were most likely to be using it when the case did not require the use of neuromuscular blocking agents (63%) and during short procedures of less than an hour (18%). The major concern associated with use of the LMA was aspiration. Sixty three percent (n=7) identified no barriers to the use of the LMA, two CRNAs (18%) identified the types of LMAs available, and one CRNA (9%) identified surgeon/anesthesiologist preference as barriers. As an APRN, the CRNA incorporates research and evidence-based practice to achieve optimal outcomes. To date, there is no specific practice guideline that solely pertains to the placement of an LMA versus an ETT. The CRNA must make clinical decisions utilizing the algorithms that do exist such as the ASA's Difficult Airway Algorithm. Choosing an LMA or ETT requires a thorough evaluation of several factors and the decision to use an LMA is often based on personal experience and judgment of the CRNA. Further research is needed.

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Decision-Making of CRNAs related to Use of Laryngeal Mask Airways

Background/Statement of the Problem

Improper airway management is one of the major concerns with anesthesia care. An algorithm has been developed by the American Society of Anesthesiologist (ASA) to assist practitioners with airway management, but despite the guidelines, malpractice claims related to failure to secure the airway persist (Lucisano & Talbot, 2012). The ASA guidelines are not intended as standards or absolute requirements, but they are systematically developed recommendations intended to assist practitioners in making healthcare decisions (ASA, 2013).

According to the ASA guidelines, providers should begin with an evaluation of the airway including history of airway complication and physical assessment of the airway. The second recommendation provides basic preparation guidelines for difficult airway management including having specialized equipment for difficult airway available such as the laryngeal mask airway. The third recommendation is to pre-formulate a strategy for intubation of the difficult airway, which includes the identification of alternative approaches that can be used if the primary approach fails. The 'gold standard' for securing an airway is the use of an endotracheal tube (ETT), but a laryngeal mask airway (LMA) provides a safe adjunct (Martin, 2013).

Invented in 1981 by Dr. Archie Brain, the LMA was created to obviate the need for ETT placement and reduce the airway morbidity related to tracheal intubation (Ramachandran & Kumar, 2014). Today the LMA has a well-established role in anesthesia practice. It is widely used in the surgical patient, but there are certain situations where anesthesia providers are hesitant to use the LMA and as a result establish an airway with the more invasive ETT. Some of the most common controversies surrounding the clinical application of the LMA include its use in obese patients, laparoscopic procedures, positions other than supine and the need for positive pressure ventilation (PPV). Despite the abundance of evidence supporting the use of the LMA in a variety of age groups and surgical procedures using PPV, many providers are reluctant to use the LMA (Chmielewski & Snyder-Clickett, 2004). Elective use of the LMA in subjects positioned prone is feasible, but the reluctance of providers to use the LMA in this position is due to the view that the LMA is best used in patients receiving general anesthesia who can be managed with a face mask (Whitacre, Dieckmann, & Austin, 2014). Many providers reserve the use of the LMA for short outpatient procedures where the patient is able to maintain spontaneous ventilation (Chmmielewski & Snyder-Clickett, 2004).

The purpose of this study was to evaluate the factors that CRNAs consider when choosing the use of ETT versus an LMA to secure the airway of surgical patients. Next, the review of the literature will be presented.

Literature Review

The primary database used was CINAHL Plus with full text. The key words used in the search were laryngeal mask airway, anesthesia, knowledge, training, and airway which were used separately and combined. Initially the time period was limited to those published within the past five years, but it was expanded due to the risk of omitting valuable studies.

Airway Management

Airway evaluation in the pre operative area is essential because airway problems are best managed when they are anticipated (Martin, 2013). Airway management is the ability to ventilate the patient, as the skill of intubation alone will not save lives. Maintaining a clear airway and adequate ventilation in the unconscious patient is paramount because they are at risk of obstruction due to the relaxation effects of anesthetic drugs. The 'gold standard' for securing a patient's airway is the use of endotracheal tubes, which are provided in a variety of sizes, oral or nasal, for the adult and pediatric population. Providers must evaluate the situation and be prepared by having the necessary equipment readily available (Martin,).

The author of a similar article suggested that anesthetists should approach airway management with strategies rather than just a plan. Airway plans suggest a single approach to airway management, but a strategy suggests a coordinated, logical sequence of plans (ASA, 2013). A good starting point would be for every department to have an explicit policy for management of a difficult airway and have algorithms attached to the difficult airway cart. Anesthesia providers should be competent in several airway skills and have access to a range of airway devices (ASA).

Management of Difficult Airways

Hannah Greener was the first recorded death victim of anesthesia complications after receiving chloroform for the removal of a toenail in 1848, but today anesthesia is considered to be generally safe (Mellanby, Podmore, & McNarry, 2014). In the 1950s the reported anesthetic mortality rate was 1 in 2,000 hospital administered anesthetics. Even though anesthetic mortality decreased fivefold to 1-2 per 10,000 between the 1950s and the 1970s, the authors raise the question of the true safety of anesthesia. Any system that relies on perfect human performance will fail; therefore the anesthetist should have a well prepared, equipped, trained, and highly competent team available to help prevent errors (Mellanby et al.). When making a decision on the best way to secure an airway, the anesthesia provider must anticipate difficulties. Some risk factors to consider are obesity, neck circumference, pregnancy, malignancy, swelling, deformity and facial hair. When significant complications with ventilation and intubation are predicted, an awake fiberoptic intubation should be performed (Mellanby et al.).

According to the ASA (2013), a difficult airway is defined as a clinical situation where a trained anesthesia provider experiences difficulty ventilating a patient with a facemask, difficulty with tracheal intubation, or both. A literature review evaluated the anatomy and physiology along with common conditions that can predispose pediatric patients to a difficult airway such as macroglossia, mandibular hypoplasia, micrognathia, cervical instability, limited cervical movement, maxillary and midfacial hypoplasia, and cleft palate (Belanger & Kossick, 2015). The anatomical and physiological differences of the pediatric airway are most important under two years of age and most differences disappear around age six to eight (Belanger & Kossick). Those under the age of one year have the greatest risk of presenting with a difficult airway. The nose of the infant is softer with more mucous and lymphoid tissue with a smaller diameter of the nasal passages which puts them at greater risk for obstruction (Belanger & Kossick).

One of the major concerns during anesthesia is aspiration. Aspiration accounts for 17% of primary anesthetic airway problems and 50% of anesthesia deaths (Woodall, Frerk, & Cook, 2011). A systematic review also found obesity as a risk factor when receiving anesthesia. Obesity increases the risk of difficult airway, reduces the functional residual capacity and increases metabolism which all lead to a reduction in the time a person can tolerate hypoxia (Lucisano & Talbot, 2012). The lungs of obese patients are known to be difficult to ventilate by facemask and their tracheas may be more difficult to intubate (Woodall et al., 2011). With such a high prevalence of obesity in the United States, anesthesia providers must be competent in the knowledge and technical skills of airway management (Lucisano & Talbot, 2012). The NAP4 found that even when faced with predictable problems, anesthesia providers failed to alter behavior and used LMAs instead of the recommended ETT in morbidly obese patients who had a high risk of aspiration (Woodall et al., 2011). In order to improve the safety of airway care delivered to patients, there must be ongoing education, learning and performance assessment at local and national levels (Woodall et al.).

O'Sullivan, Laffey and Pandit (2011) also evaluated the NAP4 report and found similar results. Aspects of airway management were suboptimal in 75% of anesthesia events and in 80% of deaths (O'Sullivan et al.). The NAP4 report consists of findings from across all 309 hospitals in the UK. Local reporters at each hospital recorded relevant data of the incidence and impact of airway-related mortality and morbidity. A census of all clinical activity over one ‘snapshot’ month was carried out to estimate the number of patients who underwent anesthesia during the audit period to yield the ‘denominator’ and permit calculation of incidence figures. They found that the most common human factors in these situations were poor communication, poor leadership and task fixation. Error of judgment by the anesthesia providers was a major concern. In the majority of cases airway difficulty was not anticipated. Problems were not anticipated because a formal airway assessment was only recorded in 26% of patients. The authors also stated that subgroups including pregnant women and children had better outcomes (O’Sullivan et al.).

ASA Guidelines for Difficult Airway Management

The practice guidelines for management of difficult airway were adopted by the ASA in 2002 and published in 2003 with the purpose of facilitating airway management and reduce the likelihood of adverse outcomes. The LMA was incorporated into the practice guidelines in 2003 (Artime & Hagberg, 2015). According to the ASA (2013), in 2011 the ASA Committee on Standards and Practice Parameters requested that the guidelines be reevaluated. At that time, the guidelines were modified and the LMA was replaced with supraglottic airway (SGA) to reflect the growing number of SGAs available (Artime & Hagberg, 2015). An update evaluation consists of an evaluation of the literature and evaluation of survey findings of expert consultants and ASA members. The survey return rate for the consultants was 63%. Eighty-eight percent of the respondents indicated that the guidelines had no effect on the amount of time they spend in a typical case, but 12% indicated that the guidelines would require more time to perform a particular case (ASA, 2013). One hundred percent indicated that the guidelines do not require new equipment, supplies, or training nor would it require changes that would affect cost (ASA).

The guidelines are intended for every type of setting and patient population who are under anesthesia care. Successful LMA placement in patients with difficult airway occurs at a rate of 71.4-100 % (ASA, 2013). When facemask ventilation is not adequate, the algorithm suggests using a supraglottic airway such as an LMA (ASA).

The first step of the difficult airway algorithm is to assess the likelihood and impact of six problems that the anesthesia provider might encounter including: (1) difficulty with patient cooperation or consent; (2) difficult mask ventilation; (3) difficult SGA placement; (4) difficult laryngoscopy; (5) difficult intubation; and (6) difficult surgical airway access. The provider must consider the relative clinical merits and feasibility of the basic management choices and identify an alternative approach if the primary or preferred approach fails. The algorithm suggests that the LMA could be used both in the nonemergency pathway when face mask ventilation is adequate and when face mask ventilation is not adequate. The algorithm encourages the use of a SGA (e.g. LMA or ILAM) as an intubation conduit when ventilation with a facemask is not adequate.

Laryngeal Mask Airway (LMA)

Invented in 1981 by Dr. Archie Brain, the LMA was created to obviate the need for ETT placement and reduce the airway morbidity related to tracheal intubation (Ramachandran & Kumar, 2014). In the first three years of its clinical availability, the LMA received wide recognition and replaced the ETT as the airway management in over 40% of routine general anesthetics (Ramachndran & Kumar). In comparison to tracheal intubation, the LMA is associated with more stability in hemodynamics, intracranial pressure and intraocular pressure. The authors suggested that due to some concerns about the LMA's ability to adequately ventilate and increased risk of pulmonary aspiration of gastric content, the healthcare provider must have excellent technical skills and patients' whose airway is secured with a LMA should be carefully selected (Ramachndran & Kumar).

A meta-analysis (Brimacombe, 1995) was performed on randomized prospective trials comparing the LMA with other forms of airway management to determine if the LMA offered any advantages over the ETT or facemask (FM). Out of 858 LMA publications identified, 52 met the criteria for the analysis. Thirty-two different issues were tested using the Fisher's method for combining the P values. Data were obtained from prospective randomized studies that compared the LMA with the tracheal tube or facemask. Only peer reviewed journals were included. The data collected from the selected papers included the type of comparative study (LMA vs. TT' LMA vs. FM; LMA vs. FM vs. TT). Other data collected included the type of surgery, the phase of anesthesia studied, ventilation mode, the population size and type (adult, pediatric or mixed), LMA user, insertion technique, and success with the device (considered successful if LMA technique was abandoned in less than 5% cases). The issues were catalogued and P values were documented. A null hypothesis was formed that the LMA offered no advantage over the TT or FM for a particular issue. The hypothesis was tested for each issue using the Fisher's method for combining the P values, and significance was set at $P < 0.05$. The LMA was identified as having 13 advantages over the ETT including: increased speed and ease by experienced personnel including anesthesia providers

(P<0.001); improved hemodynamic stability at induction and during emergence (P<0.001); minimal increase in intraocular pressure following induction (P<0.001); reduced anesthetic requirements for airway tolerance; lower frequency of coughing during emergence; and improved oxygen saturation during emergence (Brimacombe, 1995). The data also showed that 39% of patients complained of sore throats after tracheal intubation but only 17% (P<0.05) of patients complained of sore throats with the LMA. The disadvantages of the LMA included lower seal pressures and a higher frequency of gastric insufflation (Brimacombe).

A systematic review (Whitacre, et al., 2014) examined the evidence for using LMAs for airway rescue in subjects in the prone positioned. The PICO question was as follows: In adults with ASA physical status 1 to 3, body mass index less than 35kg/m2, and no history of difficult intubation or ventilation who are having anesthesia for surgical procedures in the prone position, is the use of the various LMAs in the prone position a safe practice? The online sources and search engines used included The Cochrane Database, PubMED, SUMSearch, and Google Scholar. The inclusion criteria included full-text, English-language articles or clinical practice guidelines published in peer-reviewed journals or on the websites of specialty organizations. The search resulted in 51 potential evidence sources, with six sources involving 441 subjects that met the inclusion criteria. The LMA was suggested to be safe and effective during spontaneous and intermittent positive pressure ventilation. Optimal ventilation was attained in 58 of 60 subjects (97%) using the LMA ProSeal and 51 of 60 subjects (85%, P<0.05) using the LMA Supreme. The authors identified that since its introduction, the LMA has rivaled the ETT as a method of securing the airway. Using the LMA for procedures performed in the prone position could help meet the demands of quicker operating room turnover time requirements, staffing reductions and the desire to expedite patient recovery in the postoperative period because one of the major advantages of placing the LMA while the patient is prone is the time saved positioning the patient. The first attempt success rate of placing either the LMA Proseal or LMA Supreme ranged from 98% to 100% in the RTC and 82.5% to 93.2% in the descriptive studies. No patients had to be turned supine to manage the airway. The overall conclusion of this meta-analysis was that the elective use of LMAs in subjects positioned prone is feasible, but evidence was lacking supporting its use for airway rescue in patients in the prone position (Whitacre et al.).

There is an abundance of evidence supporting the use of the LMA in surgical procedures using PPV but anesthesia providers are reluctant to use the LMA when PPV is needed (Chmielewski & Snyder-Clickett, 2004). The reluctance is likely partially due to the misconception that when using an LMA with mechanical ventilation, there is an increased incidence of gastric insufflations, failed ventilation and pulmonary aspiration. Pressure control ventilation (PCV) is discussed as being the method of choice for delivering PPV through an LMA because it helps maintain a constant ventilation pressure with less variability than volume control ventilation (Chmielewski et al.).

Airway management complications is the most important cause of anesthesia related morbidity and mortality. The close claims analysis of the ASA indicates that 6% of all claims concern airway injury, and in 21% of these claims, the standard of care was not performed (Hagberg, 2005). A major disadvantage of the LMA is its inability to protect against pulmonary aspiration and regurgitation of gastric contents. Even though the reported incidence of gastric content regurgitation was as high as 25%, the overall risk of aspiration was similar to an endotracheal tube when the indications and contraindications of the LMA use were respected (Hagberg). The use of a LMA is contraindicated in the morbidly obese patients, non-fasted, hiatal hernia, Zenker's diverticulum, acute abdomen, trauma, or required inspiratory pressures greater than 20-25cmH2O in the presence of low pulmonary compliance (Hagberg).

Education and Training

Despite the ASA guidelines for difficult airways, malpractice claims related to failure to secure the airway persist (Lucisano & Talbot, 2012). A systematic review was conducted to evaluate the current literature on human patient simulation for preparing anesthesia and other health care providers for advanced airway management. The review was conducted on 34 articles published between 1990 and 2009 on airway management for patients undergoing anesthesia. The review included 15 experimental or quasi-experimental design, eight descriptive studies and 11 analyses of equipment or technique evaluation using simulation. The keywords used in the search included difficult airway management, general anesthesia, patient safety, and simulation training. The authors independently applied the eligibility criteria for the review to the methods section or each article from the selected databases. The eligibility criteria included: (1) experimental or quasi-experimental design; (2) inclusion of a simulated advanced airway management training process for anesthesia; and (3) clearly stated study objectives with measured outcomes. The review evaluated the decay of the effects of training over time and found that training effects were sustained at six to eight week retest but not at six to eight month retest. Training should therefore be repeated at six month intervals or less (Lucisano & Talbot).

The findings of the systematic review confirmed that simulation can be an effective tool when teaching airway management skills, but few studies have established a valid method of evaluating the actual effects of simulation training and the transition of skills from the laboratory to the clinical setting. The authors stated that limitations to their review included the chance that relevant studies were missed and recommended that additional research was needed to further evaluate the use of simulation as a tool to teach advanced airway management to anesthesia students and practitioners (Lucisano & Talbot).

A key advantage of using a LMA in the adult population is that skill development occurs much more quickly than it does for tracheal intubation, but this is not the case in the pediatric population (Patel & Bingham, 2009). The authors described the current uses and limitations of LMAs in the pediatric population. The LMA has the ability to bypass obstructions at the supraglottic level and allows for rescue oxygenation and ventilation. Even though the anatomy of a child differs from that of an adult, pediatric size LMAs perform remarkably well, but LMA placement is more difficult to perform in pediatric patients. When trainees are using LMAs in the pediatric population, they require a greater degree of supervision. According to the authors, a learning curve exists for the use of LMAs in pediatric practice and complications are more frequent than in adult practice. However, the authors do not describe the study or give information on how the data was measured, collected or analyzed. The manufacturer's guidelines also suggest that LMAs in pediatric patients should not be used for prolonged periods of time due to a high risk of gastric insufflations and regurgitation, which increases if the LMA is malpositioned (Patel & Bingham).

Clinical Decision-making

Anesthesia care is susceptible to decision errors because it frequently requires rapid, complex decision (Stiegler & Tung, 2014). Practice variability, noncompliance with evidence-based guidelines and medical errors are common. Medical decisions are influenced by cognitive factors. Heuristics, preferences for certainty, overconfidence, affective (emotional) influences, memory distortions, bias, and social forces such as fairness and blame are some of the most well studied cognitive factors. Specialties that are characterized by a high degree of time pressure, stress, distractions and data uncertainty have a great incidence of diagnostic errors (Stiegler & Tung).

Many adverse anesthetic outcomes are due to clinical misjudgments and flawed decision-making (Kremer, Collahan & Hicks, 2002). A study (Kremer et al.) used the cognitive psychology framework of information-processing theory and literature pertaining to the use of heuristics, or rules of thumb, and clinical biases to analyze cases from the AANA Foundation closed malpractice claims database. Ten CRNA investigators on the AANA Closed Claims research team analyzed the files. The purpose of the study was to describe the types of cognitive errors made by CRNAs that contributed to adverse anesthetic outcomes.

Common heuristic and biases included: anchoring, which is the tendency not to deviate from an early diagnosis and to ignore contradictory evidence; ego bias, or warping probability estimates in a self-serving way; hindsight bias, defined as reacting to new information with the feeling that it was known all along; framing, where decisions are influenced by the presentation or framing of actions and outcomes; and availability heuristic, the ease of remembering specific instances with the probability that such instances will occur. Anchoring was seen in nine of 13 cases studied, making it the most frequently observed bias. Despite evident clinical deterioration the anesthetist were reluctant to deviate from their initial impression. Hindsight bias was seen in two of 13 cases and availability heuristic was present in five of 13 cases (Kremer et al.).

Clinical practice guidelines are often used to implement evidence into practice, but adherence is often poor (Putnam, et al. 2015). A multiphase, multifaceted quality improvement initiative was conducted from 2011 to 2014 in the OR of a 278-bed children's' hospital in order to improve overall adherence to prophylactic antibiotics guidelines and address known barriers. A total of 1,052 operations were observed, and 629 required prophylactic antibiotics. Adherence to guidelines remained unchanged in 54-55% of cases. Redosing adherence improved, but the correct type of antibiotic decreased 98-70%. The percentage of cases in which only one guideline was missed remained unchanged was 35%. Overall adherence to antibiotic prophylaxis guidelines during the three year program did not improve despite the multiple cycles of targeted interventions. Adherence to the guidelines was poor due to barriers including poor awareness and knowledge of the guidelines, unclear roles, and lack of standardized processes to ensure proper administration (Putnam et al.).

Next, the theoretical framework used to guide this study design will be presented.

Theoretical Framework: The AACN Synergy Model

The anesthesia provider must consider all of the patients' needs and use them as a guide for the care he or she provides. The American Association of Critical-Care Nurses (AACN) Synergy Model was developed to link clinical practice with patient outcomes. The three components to the model include patient characteristics, nurse competencies and system (Freyling, Kesten, & Heath, 2008) In 1998, the AACN Synergy Model was first described to link certified practice to patient outcomes (Kohr, Hickey, & Curley, 2012). The Synergy Model serves as a foundation for the certification of critical care and acute care nurses, but it can be appropriately used throughout nursing practice including the operating room (Pope, 2002). "The underlying tenet of the Synergy Model is that each patient and family brings to a health care situation characteristics that will affect the nursing care required to best meet their needs" (Kohr et al., 2012, p. 421).

Stability, complexity, predictability, resiliency, vulnerability, participation in decision-making, participation in care, and resources availability are the eight patient and family dimensions described in the Synergy Model (Kohr et al., 2012). Optimal outcomes can be expected when such dimensions are matched with the healthcare provider's competence. The eight nursing competencies that must be identified include clinical judgment, advocacy/moral agency, caring practices, collaboration, systems thinking, response to diversity, clinical inquiry, and facilitation of learning (Pope, 2002). The patients' and healthcare providers' characteristics must be ranked in order for a match to be made. The Synergy Model has five levels of care required to meet the patients' needs ranging from high (level 1) to minimal (level 5) and five levels of competency ranging from competent (level 1) to expert (level 5) (Freyling et al., 2008). "In addition, the model includes three spheres of influence: those derived through the nurse's influence with patients and families, nurses, and health care systems" (p. 23).

Nursing practice is illuminated by the Synergy Model. It describes both patient characteristics and nurse competencies and notes that when the two are linked, optimal patient outcomes result (Edwards, 1999). The driving force of nurse competencies is the patient's characteristics. If the patient's needs cannot be met with the current competence level then adjustments must be made to provide the best care possible. In whatever setting it is being used, the Synergy Model provides a great framework that ensures the patient's needs are being met and high quality care is being provided.

Next, the study methods will be presented.

Method

Purpose

The purpose of this study was to evaluate the factors that CRNAs consider when choosing the use of an ETT versus an LMA.

Design

The design was a qualitative "exploratory" study. Words were collected as data.

Sample and Site

The potential subjects were practicing CRNAs employed at Our Lady of Fatima Hospital in North Providence RI.

Inclusion criteria: At least six months of experience practicing as a CRNA.

Exclusion criteria: Anesthesiologists were excluded from this study.

Nonprobability sampling was utilized and subjects were interviewed in their work setting. Snowball sampling was also used: participants were asked to discuss the study with further participants to solicit their potential interest. Recruitment continued until saturation was achieved.

Procedure

Approval to conduct the study was obtained from the Director of Anesthesia at Fatima Hospital. IRB approval was obtained from Charter Care followed by the RIC IRB. Flyers approved by the IRB were posted in the anesthesia office. The flyers contained contact information, email and a phone number so that interested CRNAs could contact the student researcher, who addressed questions or concerns at that time and set up an appointment time.

On the day of the interview, the researcher first obtained consent using the IRB approved consent document. Participants were reminded that their participation was voluntary and they could withdraw at any time and choose not to answer any questions. The student research then proceeded to ask the identified questions and took notes to record responses. The interviews occurred in the anesthesia office at Fatima Hospital.

Measurement

The interviews were conducted as a person-to-person interview with open-ended semi-structured questions. The goal was to assess the decision-making process of CRNAs in relation to use of the LMA when making the decision of how to secure patients airway. No instrument that reflected this specific research problem was found in the literature, so questions were constructed based on themes identified in the literature. The focus of the questions was to identify the factors that CRNAs consider when securing a patients airway including experience, airway management protocols in the facility, and available equipment. Table 1 on the next page contains the questions used during the interviews. Questions were asked to all subjects in the same order to obtain consistent data. Notes were taken during the interview. No identifying information was recorded.

Table 1

Interview Questions

Tell me about whether you have ever received formal training in regard to LMA insertion and use. When and where did that occur?
What is your actual clinical experience with LMAs?
Are you familiar with the American Society of Anesthesiologist's difficulty airway protocol? If yes, are you familiar with the recommendations related to use of an LMA?
When would you most likely use an LMA and why?
When would you not use an LMA and why?
Are there any airway protocols in your facility? If yes, does the protocol include LMAs?
What type of LMAs are available in your facility?
What are the barriers to using an LMA in your practice or in the facility?
Any other thoughts you can share about LMA use?

Data Analysis

Qualitative content analysis involves condensing raw data into categories or themes based on valid inference and interpretation (Zhang & Wildemuth, 2009). Qualitative content analysis was used to analyze the responses to the open-ended interview questions. Data were sorted by question and organized into identifiable themes.

Themes were reviewed and combined as indicated. Through inductive reasoning, themes and categories emerge from the data by careful examination and constant comparison (Zhang & Wildemuth, 2009).

Next, study results will be presented.

Results

A total of 11 CRNAs participated in the study. All participants responded to every question. Table 2 summarizes the participants' responses to the first four questions and Table 3 summarizes the responses to the last five questions.

Table 2

Responses to interview questions # 1-4

Question	Response
Tell me about whether you have ever received formal training in regard to LMA insertion and use. When and where did that occur?	Yes had formal training (100%; n =11) During anesthesia school (64%; n = 7) During practice post anesthesia school (36%; n =4)
What is your actual clinical experience with LMAs?	Use LMAs in 20-30% of all cases including non general anesthesia (45%; n=5) Cases under genera anesthesia use the LMA in 45%-60% of cases (54%;n=6) Depends on facility and most cases in a surgery center are done with an LMA (27%;n=3)
Are you familiar with the ASA's difficult airway protocol? If so are you familiar with the recommendations related to the use of an LMA?	Familiar with both (100%; n=11)
When would you most likely use an LMA and why?	Cases that doesn't require paralyses (63%;n=7) Short procedures (18%; n=2) Supine position (100%; n=11);prone (9%;n=1); lateral and beach chair position (27%;n=3)

Of the 11 CRNAs interviewed, 100% had formal training related to how to use an LMA. Most reported learning about the use of an LMA while in school (n=7). Regarding actual clinical experience with an LMA, most CRNAs reported using an LMA in a surgery center the majority of the time. All 11 CRNAs were familiar with the ASA Difficult Airway Algorithm and the use of an LMA regarding a difficult airway. Situations in which a CRNA would use an LMA included cases that don't require paralysis (65%) and supine position (100%). Only 9% of the CRNAs questioned would use the LMA in the prone position.

Table 3 summarizes the responses to the last five questions.

Table 3

Responses to interview Q #5-9

Question	Response
When would you not use the LMA and why?	Uncontrolled GERD; pregnant patient (36%;n=4) Full stomach (72%;n=8) Prone position (45%;5) Would use it as a rescue device in a prone case, but not as a primary device (9%; n=1) History of N/V with anesthesia, previous gastric bypass, obesity, uncontrolled DM (27%; n=3) If surgeon requested (9%;n=1)
Are there any airway protocols in your facility? If yes, does the protocol include LMAs?	Yes we have the ASA difficult airway algorithm (73%; n=8) Unaware of any airway protocol (27%;n=3)
What type of LMAs are available in your facility?	Every kind (18%;n=2) Classic disposable LMAs, Proseal, Unique (63%;n=7) We lack supreme (18%;n=2)
What are the barriers to using an LMA in your practice or in the facility?	No barriers (63%;n=7) Limited types of LMAs available, lack supreme LMA (18%;n=2) Surgeon or attending anesthesiologist preference (9%;n=1)
Any other thoughts you can share about LMA use?	LMAs are underused (27%; n=3) Less trauma and faster emergence (18%;n=2) “Enjoy using LMAs, fabulous device.” (9%;n=1) “In cases that one can mask ventilate the patient an LMA is a reasonable device. It is not a replacement for an ETT.” (9%;n=1) “We should be more selective. It is not my favorite airway. Often times it doesn’t sit well.” (9% ; n = 1)

When asked when the CRNA would not use an LMA, the majority mentioned they would not use in a full stomach (72%). The availability of different typed of LMAs varied between locations. Eighteen percent of CRNAs reported having all kinds, at the different facilities they provide services, but all the different types of LMAs are not available at Fatima Hospital. The most common types available included the LMA Unique and the LMA Proseal. The majority (63%) did not identify barriers to use. In response to a request for open comment, 27% (n = 3) stated the LMA was underused, while 2 CRNAs (18%) reported there was less airway trauma and faster emergence when using an LMA compared to an ETT.

Next, summary and conclusions will be presented.

Summary and Conclusions

Improper airway management is one of the major concerns in providing anesthesia care. An algorithm has been developed by the ASA (2013) to assist practitioners with airway management, but despite the guidelines, malpractice claims related to failure to secure the airway persist (Lucisano & Talbot, 2012). The purpose of this study was to evaluate the factors that CRNAs consider when choosing the use of an ETT versus an LMA. The CRNAs employed at Our Lady of Fatima Hospital were eligible to participate; anesthesiologists were excluded.

After obtaining IRB approval, participant recruitment took place and a convenience sample of 11CRNAs agreed to participate. First, informed consent was obtained, and then the 11 CRNA participants were interviewed in a private setting at the hospital. The semi-structured interviews were conducted as person to person interviews and responses were recorded in written de-identified notes.

All 11 CRNAs (100%) had formal training with the use and insertion of LMAs. Most of the training occurred during anesthesia school (64%), with the remainder receiving training post graduation during practice “because the LMA did not become popular in this area until the 1990s” as stated by one of the participants. The LMA was used in 54% of cases that required general anesthesia, but its use varied by facility. The CRNAs that worked in a surgical center performing outpatient procedures, where the patients are expected to be discharged home after recovering from anesthesia, estimated that an LMA was used 99% of the time. All participants were familiar with the ASA’s difficult airway algorithm and its recommendation for the LMA use and 73% identified it as the algorithm/protocol used for airway management used in the facility. The term “airway protocol” was unfamiliar to the remaining 27%; they identified the algorithm as a guidance tool used during a difficult airway, but not as an airway protocol.

The LMA was most likely to be used when the case did not require the use of neuromuscular blocking agents (63%) and during procedures of less than an hour (18%). Positioning was also a major factor that was considered. When position is the only factor considered, the LMA was reported to be used in 100% of supine cases. Only one participant reported use in the prone position. The major concern with the use of LMA use was aspiration. Seventy-two percent were not likely to use in a patient with a full stomach. Twenty-seven percent stated they would not use it if the patient had a history of nausea and vomiting post anesthesia, obesity, gastric bypass or uncontrolled diabetes mellitus. One participant stated that their use of the LMA is based on surgeon request.

The types of LMAs available varied among the different facilities that the CRNAs covered. The “lack of the LMA supreme” was identified as a barrier to LMA by 18% (n = 2) of participants as it allows for the insertion of an orogastric tube through a built in drain tube. No barriers to the use of the LMA were identified by 63% of participants. One participant identified surgeon and attending anesthesiologist preference as a potential barrier to the use of an LMA. The LMA was identified as a great tool for airway management. It was believed that it is underused in practice by 27% (n = 3) of participants. Two noted (18%) that there is less trauma and faster emergence with an LMA. One participant stated that it is a great tool, but it is not a replacement of an ETT. It is not a secured airway and CRNAs should be selective with its use.

Limitations of this study included the small sample size. Also, no instrument specific to this specific research was found in the literature. Though the interview questions were derived from themes identified in the literature and was pilot tested, this measure was not further validated. Participants did appear to understand the questions and they were able to answer them in a relevant way. There are many factors that likely contribute to the decision-making process of the CRNA in relation to airway management and the ability of this small qualitative pilot study to identify a wide variety of them was limited. The pediatric population was not represented in this study as the pediatric cases performed in the facility were only dental restoration cases, which were all performed under nasal intubations with an ETT.

In conclusion, the results identified several factors that impact the decision-making process of the CRNA in relation to the use of the LMA. The concerns identified related to the use of an LMA were similar to those identified in the literature: it does not provide a secure airway and aspiration is a major concern when it is used. It is evident that CRNAs were familiar with the ASA guidelines and approached airway management in a strategic way, beginning with a thorough airway assessment. One must also anticipate difficulties and be prepared for difficult airway management, including having specialized equipment such as the LMA available. There are different types of LMAs availalable which provide different advantages; lack of availability of these airways may limit the use of LMAs in practice. There is also an associated cost issue which varies among facilities and the types of procedures that they provide. The LMA is a great adjunct to airway management and provides a variety of advantages including less airway trauma and faster turnover times, but its' use should be selective to each patient and case.

The CRNA has the knowledge and skills to consider the multitude of factors that must be evaluated when making a decision of what type of airway will be used.

Next, recommendations and implications for advanced practice will be discussed.

Recommendations and Implications for Advanced Nursing Practice

The model of evidence-based practice set forth by Alice Magaw, often referred to as "the mother of anesthesia", places the practice of nurse anesthesia as an early pioneer in patient safety (Goode, 2015). Magaw had a great impact on anesthesia and the surgical community from 1893 to 1908 related to the development of protocols and a body of knowledge which are considered hallmarks of practice and standards set by the AANA. As an advanced practice nurse, the CRNA must make vital care management decisions with every patient. One of the most crucial of these decisions involves airway management. Using Magaw's evidence based practice philosophy will better ensure that one's practice is in line with the aims of the Institute of Medicine (IOM) to improve the delivery of care. These aims include safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity (Goode).

The CRNA must provide individualized care to each patient. Evidence based practice relies on collaboration among specialties as providers incorporate science into a plan that is directed at the characteristics of the patient including co-morbidities (Goode, 2015). The surgeon, anesthesiologist and CRNA must work together to provide the best possible care to each patient. Airway management should not be tailored to the preference of any member of the team if the request is neither evidence-based nor the best plan for that particular patient. Open communication and mutual respect between team members has the potential to improve care.

It can be challenging for the working CRNA to stay up-to-date on the most current literature and maintain the knowledge and skills acquired during his/her educational program. This is especially true if their current work setting doesn't allow for daily use of such skills. As of August 1, 2016 CRNAs are now recertified under the new Continued Professional Certification (CPC) program, which was developed by the National Board of Certification and Recertification for Nurse Anesthetist (NBCRNA). The program requires CRNAs to attain a minimum of 100 continuing education credits per four year cycle. CRNAs must complete educational modules in four content areas including airway management techniques, applied clinical pharmacology, human physiology and pathophysiology, and anesthesia equipment and technology. The CRNA must also pass a comprehensive examination every eight years. Airway management makes up 34% of the CPC examination. This new recertification process has not been widely accepted by members of the profession but this process has the potential to decrease knowledge gaps that occur overtime. The continuing education activities of the core modules should be used as a resource for the CRNA to practice based on the evolving evidence-based knowledge. Simulation training has also been proposed as a method in which the CRNA may stay up-to-date on current airway management techniques. Simulation training has shown benefits over short intervals of time such as six to eight weeks, but research related to the long-term benefits of simulation training is lacking (Lucisano & Talbot, 2012). Additionally, whether simulation lends itself to the cognitive process in addition to mechanical hand-eye muscle memory is yet to be determined.

The continuum of the healthcare delivery system is composed of four levels including the patient, microsystems, healthcare organizations, and healthcare environments (Goode, 2015). In order to improve the microsystem, where the delivery of healthcare occurs, evidence based practice must be incorporated to formulate policies and guidelines. The practice guidelines are official policy statements of a professional associated (Foster & Callahan, 2011). The practice guidelines are systematically developed recommendations that are supported by valid research. The policy statements made by professional organizations often become the policies that hospitals develop. The guidelines are not intended to be absolute requirements; they are structured to allow for flexibility and individual patient needs (Foster & Callahan). The CRNA can be influential in the development of evidence based policy guideline and in their incorporation across the four levels of the system.

The prevention of clinical complications and population health coincide with the mantra in anesthesia "Do no harm". The CRNA must make the safest decision for the patient. The decision of placing an LMA or an ETT should be made after all factors have been evaluated. The factors that contribute to the decision-making process when securing an airway are so vast that is difficult to incorporate them into an algorithm or create an airway protocol. This study supported that a variety of factors must be considered. One commonality was the difficult airway algorithm, which calls for an LMA to be placed as an emergency device in a "can't intubate, can't ventilate" situation (Mellanby et al., 2014). Other than this concrete concept, the placement of an LMA appears to be largely based on the CRNA's decision-making process, previous experience, resources, and patient co-morbidities. Further research is clearly indicated.

Research evidence is integrated into the evidence based nurse anesthesia practice and research and clinical outcomes guide the CRNA practice. The choice between utilizing an LMA or an ETT depends on multiple factors, ranging from cognitive and emotional aspects of the practitioner to the condition and comorbidities of the patient (Kremer, Collahan & Hicks, 2002). Geographical location in which the research is performed needs to be evaluated in future studies. Every community has different features, with some communities or regional areas having inordinately higher incidences of obesity (Myers, Slack, Martin & Heymsfield, 2015). Future research with larger national samples is needed. Further study of the decision process of CRNAs need to be examined in general and also specific to airway management.

The process of airway management is complex. Since its invention in 1981 the LMA has gained popularity by anesthesia providers. As new supraglottic airways are developed their use will continue to rise. The CRNA will need to be methodical in making decisions related to airway management.

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