CRNA Perceptions of a Quick Reference Guide for Aspiration Pneumonitis in Clinical Practice: A DNP Project

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Abstract

Aspiration pneumonitis is a rare but serious perioperative complication; timely recognition and effective management are essential for keeping patients safe during the administration of anesthesia. The purpose of this DNP project was to evaluate CRNAs' perceptions of a Quick Reference Guide (QRG) designed to support the prevention, recognition, and treatment of aspiration pneumonitis in the perioperative setting. A pre-implementation survey, PowerPoint presentation, distribution of the QRG, and two-week implementation period were conducted at two rural hospitals, followed by a post-implementation survey. Three CRNAs from one of two facilities completed both surveys. Results appeared to increase confidence in managing perioperative aspiration, particularly regarding guideline adherence for aspiration risk factors and withholding GLP-1 medications. Limitations of the project included a small sample size of three participants, potential bias from self-reported surveys, and a short implementation period of two weeks. Despite these constraints, the project results suggest that the QRG may be a valuable reference tool to reinforce evidence-based practice and support real-time decision-making in the event of an emergency. Future projects should consider expanding implementation to larger and more diverse anesthesia groups, incorporate longer evaluation periods, and provide formal training opportunities, such as gastric ultrasound education, to strengthen provider preparedness and improve patient safety outcomes.

Keywords: aspiration pneumonitis, anesthesia, CRNA, quick reference guide, quality improvement

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Section I. Introduction

Background

Pulmonary aspiration is defined as the process by which oropharyngeal or gastric contents enter the respiratory system below the vocal cords, potentially resulting in bacterial infection or chemical burning of lung tissue (Meeusen et al., 2023). Patients undergoing anesthesia are at risk of pulmonary aspiration due to loss of protective airway reflexes, an anticipated side effect of anesthetic medications. The following information describes the incidence of perioperative pulmonary aspiration, current clinical practices to reduce its occurrence, and the importance of competent anesthesia providers in managing this phenomenon.

Because of advancements in anesthesia, pulmonary aspiration is relatively uncommon in healthy patients undergoing elective procedures. Baldawi et al. (2024) estimate the average incidence of pulmonary aspiration for elective cases to be one in 2,500 procedures. Risk increases based on characteristics such as patient population, type of procedure, and patient comorbidities. Emergent procedures have six times the risk of elective procedures, and for patients with multiple comorbidities, the risk can rise as high as nine times that of elective procedures (Pytka & Crosby, 2017). In obstetrical populations, aspiration accounts for one in 15 anesthesia-related deaths, while pediatric cases carry an average risk of one in 1,000 anesthesia-related deaths. Other populations at increased risk of death related to aspiration include those with neurological impairment, patients with delayed gastric emptying due to Diabetes Mellitus (DM) or traumatic injuries, patients with alcohol in their system, and any patient with an American Society of Anesthesiologists (ASA) score greater than three. Undergoing certain procedures can also increase patients' risk of aspiration, notably abdominal and thoracic

surgeries (Nason, 2015). Because many factors can increase aspiration risk, anesthesia providers must remain current on appropriate clinical practices pertaining to the prevention, identification, and management of perioperative aspiration pneumonitis.

The incidence of pulmonary aspiration has decreased over the last two decades, but it remains a serious cause of airway-related deaths in anesthesia. The United Kingdom National Audit Project noted aspiration as the "single most common cause of death related to airway management," and death or brain damage resulted in 11 out of the 34 reported cases in the study (Zdravkovic et al., 2023, para 2). Zhang et al. (2020) estimate the incidence to be from 0.1% - 19%, depending on the individual risk factors discussed above, with a mortality rate of 9%. In a closed-claim analysis, 16 of the 115 pulmonary aspiration cases studied resulted in permanent injury, and 65 resulted in death (Warner et al., 2021). Inadequate anesthesia practice was determined to be a contributing factor in 59% of the cases.

A root-cause analysis of aspiration events in thoracic surgery patients demonstrated that highly skilled anesthesia providers in the operating room were critical to improving patient outcomes (Nason, 2015). Pytka and Crosby (2017) estimate that each anesthesia provider will experience between four and 14 aspiration events, and most acknowledge that assessing known risks and preventing pulmonary aspiration in patients is a routine part of their practice. Currently, the main treatment for pulmonary aspiration is supportive management; therefore, most current professional standards and continuing education focus on providers' ability to recognize risk factors and introduce evidence-based guidelines and clinical expertise to optimize prevention strategies for pulmonary aspiration (Warner et al., 2021).

Current clinical practices, including appropriate fasting times, thorough risk assessment, and the use of maneuvers such as cricoid pressure during rapid sequence intubation, have

dramatically reduced the incidence of aspiration of gastric contents during procedures (Pytka & Crosby, 2017). Point-of-care ultrasound (POCUS) has gained popularity for its use in determining gastric residual volume for both low- and high-risk patients. Despite these advances and adherence to ASA guidelines, anesthesia providers have observed an increasing number of high-risk aspiration cases. This is now being attributed to the growing use of glucagon-like peptide-1 receptor agonists (GLP-1 RAs) like Ozempic and Wegovy (Anesthesia Patient Safety Foundation [APSF], 2023). Although first approved for DM management in 2005, GLP-1 RAs gained popularity in 2021 when the Food and Drug Administration (FDA) approved their use for chronic weight management (Latif et al., 2023).

Since the approval of GLP-1 RAs for chronic weight management, anecdotal evidence from anesthesia providers nationwide and case studies discussing emergency airway situations for patients taking these medications have increased markedly. As concern for aspiration risk grew, the ASA released new guidance addressing this patient population (ASA, 2023). Harris (2024) estimates that one in eight adults in the United States (U.S.) currently use or have used GLP-1 RAs. As GLP-1 RAs are currently available for purchase by retailers and wellness centers as weight-loss drugs, it can be difficult to identify which patients are at risk. The ASA cites a limited body of evidence to further guide practice surrounding this issue (ASA, 2023). Therefore, having adequate resources for quick risk identification, diagnosis, and treatment of pulmonary aspiration to aid CRNAs in applying their clinical knowledge is imperative to maintaining current safety standards.

Organizational Needs Statement

The partnering organization represents a facility with a high volume of surgical procedures, performing approximately 27,000 operations annually ([redacted]

Department of Surgery, 2024). Despite the high volume of surgeries and level-one trauma center designation, there is currently no guideline within the anesthesia department for pulmonary aspiration prevention, recognition, or treatment. The incidence of pulmonary aspiration at the partnering facility likely falls within the range of the national average. The geographical region served by the organization includes a patient population with a high incidence of cardiac disease, obesity, stroke, and DM, all of which increase the risk for pulmonary aspiration (North Carolina Department of Health and Human Services, 2021). The ASA and APSF both promulgate up-to-date guidelines surrounding perioperative aspiration and how to approach specific patient populations, such as those taking GLP-1 RAs (ASA, 2023; APSF, 2023). There is no cognitive aid focused on aspiration pneumonitis for CRNA use identified at the partnering organization. With a high-risk patient population and a high volume of surgical cases, the organization may benefit from assessing anesthesia provider perceptions regarding perioperative pulmonary aspiration to improve patient safety and may find a cognitive aid useful in CRNA practice.

Problem Statement

Despite interventions, pulmonary aspiration remains a major concern for anesthesia providers as the leading cause of adverse airway events in perioperative patients. The incidence of pulmonary aspiration in surgical patients varies from 0.1% to 19%, depending on patient-specific risk factors, with a mortality rate reported as high as 9% (Zhang et al., 2020). Additionally, pulmonary aspiration increases intensive care unit (ICU) admissions, overall hospital length of stay, and costs to patients and healthcare systems.

Purpose Statement

The purpose of this Doctor of Nursing Practice (DNP) quality improvement (QI) project is to assess CRNA perceptions of the adequacy of a newly developed quick reference guide

designed to aid in the prompt identification of at-risk patients and provide prevention strategies and treatment options for perioperative aspiration pneumonitis. It is anticipated that knowledge gained from this project can be used in future QI projects to improve this rare but potentially catastrophic perioperative event at the partnering organization.

Section II. Evidence

Description of Search Strategies

The purpose of this literature review is to examine current evidence and recommendations regarding aspiration pneumonitis prevention, risk factor stratification, current treatment options, and existing quality improvement initiatives aimed at reducing aspiration pneumonitis in the perioperative setting. To guide this literature search, the following PICOTS (Patient/Problem, Intervention, Comparison, Outcome, Time, Setting) question was developed: *In CRNAs, does the implementation of a reference tool improve provider confidence in preventing, recognizing, and/or treating aspiration pneumonitis during the perioperative period?*

The primary concepts used in this search were *anesthesia provider*, *reference tool*, *prevention,* and *aspiration pneumonia* (See Appendix A). Keywords for the search included, but were not limited to, CRNA, perioperative, checklist, management, nurse anesthetist, Mendelson's syndrome, aspiration, and anesthesia. The Boolean Operators "AND" and "OR" were used to combine these keywords. Searches were conducted in the scholarly databases Medline, PubMed, and CINAHL (Cumulative Index to Nursing and Allied Health Literature) and the search engine Google Scholar. Appendix B provides a complete list of keywords, MeSH terms, subject terms, and the number of articles found and retained.

The initial search strategy for PubMed included the MeSH Terms (Nurse Anesthetists) AND (Checklist) AND (Pneumonia, Aspiration). The initial search strategy for CINAHL included the MH terms ((Certified Registered Nurse Anesthetist) OR (Anesthetist)) AND (Reference Tools) AND (Pneumonia, Aspiration). The search strategies yielded zero results in both databases. Due to this lack of results, the MeSH term (Checklist) was removed from the

PubMed search strategy, and the MH term (Reference Tool) was removed from the CINAHL search strategy. To assess the literature on the use and effectiveness of quick reference guides in nursing as direct support for this project, a separate search strategy for both PubMed and CINAHL was used. The following search strategy was used in both databases: ((anesthesia) OR (nurse) OR (anesthetist) OR (CRNA) OR (perioperative) OR (emergency)) AND ((checklist) OR (cognitive aid) OR (reference tool) OR (visual aid)). Limits applied were English language and years 2019-2024. The PubMed search strategy yielded six results. Four articles were kept based on title and abstract review. After a full-text review, two of the four articles with high levels of evidence and relevance were retained. These two articles provide support for the creation of a QRG about aspiration pneumonitis that serves as the basis for this DNP project. The CINAHL search strategy yielded five results. Based on a title and abstract review, no articles were kept due to duplications from the PubMed search and lack of relevance to the project and population.

In PubMed, the adjusted search strategy was (anesthesia) AND (pneumonia, aspiration) AND ((prevention) OR (treatment)), with limits of peer-reviewed articles, English language, and years 2019-2024. Of the 91 articles found, 17 were retained after title and abstract screening. Exclusion criteria included non-human studies, settings outside of the perioperative area, studies on aspiration due to surgical complications rather than anesthesia, and ventilator-associated pneumonia. After a full-text review, two articles were kept based on relevance, evidence level, and result strength. This information served as a basis for the content of the QRG to be dispersed to CRNAs for this DNP project.

CINAHL was searched with subject headings like those used in PubMed, including *anesthesia, certified registered nurse anesthetist, anesthetist, American Association of Nurse Anesthetists, and pneumonia aspiration.* The initial limits were English language and years 2019-

2024, but the range was later expanded to 2013-2023 due to limited results. Of the seven articles found, five were retained based on title and abstract screening. Articles were excluded if they were duplicates from previous searches or not directly relevant. Articles deemed not relevant included those focused on animal studies and those that covered broad anesthesia-related deaths instead of aspiration pneumonitis-specific deaths. After a full-text review, one article was retained for relevance and evidence strength. This article supported content for the QRG related to methods of prevention of aspiration pneumonitis.

Google Scholar was searched using the same strategy as PubMed. Limits included English language and year range of 2022-2024 to ensure the latest information was reviewed. This search strategy yielded 11,100 results. The first ten pages of results were screened, resulting in the retention of 15 articles based on title and abstract. After a full-text review, none were relevant to this topic. Additional sources were identified from reference lists of retained articles, and four of these were included after full-text review. Professional organizations such as the ASA, the American Association of Nurse Anesthetists (AANA), and APSF were also reviewed, resulting in four additional sources for this project. One seminal article (Mendelson, 1946), cited frequently in pertinent articles, was included in the literature despite falling outside the 2013-2024 search range.

The level of evidence of each article was categorized based on the Melnyk and Fineout Overholt (2019) hierarchy of evidence, with Level I being the highest level of evidence and Level VII being the lowest level of evidence. The articles used for the literature review in this project included: one systematic review (Level I), two randomized controlled trials (RCTs) (Level II), two non-randomized controlled trials (Level III), four controlled observational studies

(Level IV), one descriptive study (Level VI), and four expert consensus sources (Level VII). See Appendix C for the full literature matrix.

Selected Literature Synthesis

The literature selected for this synthesis focuses on current evidence and guidelines surrounding known risk factors for perioperative aspiration, strategies aimed at preventing pulmonary aspiration in both healthy and high-risk patients, and management of aspiration and subsequent pneumonitis. The review also highlights recent findings on the impact of GLP-1 agonists on aspiration risk and examines emerging evidence supporting the use of gastric POCUS as an aid in anesthetic decision-making in the perioperative setting. Additionally, the selected literature analyzes use of cognitive aids in perioperative and airway management settings, informing the development of the QRG implemented in this QI project.

Risk Factors for Perioperative Aspiration Pneumonitis

Perioperative pulmonary aspiration is a significant risk for patients undergoing anesthesia. Chaitra et al. (2023) report a mortality rate of up to 5% for aspiration pneumonitis, with an incidence of 1:4,000, including in healthy patients who have fasted. Major risk factors include emergent procedures, ASA physical status, alterations in gastric emptying, airway and intubation difficulties, and neurological impairments affecting motor function and consciousness (Pytka & Crosby, 2017).

Pytka and Crosby (2017) identify emergency surgery as the most common factor associated with increased aspiration risk. Traumatic injuries and other emergencies can delay gastric emptying for up to a week post-injury. Critically ill intensive care unit (ICU) patients often require multiple surgeries and often have decreased gastric emptying. These patients frequently have unknown fasting times and are treated with “full stomach” protocols by

anesthesia providers. Emergency surgeries typically occur between 6:00 p.m. and 6:00 a.m., and increase aspiration risk by six times, which may be associated with reduced staffing, fatigue, and less-experienced anesthesia providers.

The ASA physical status classification system categorizes patients based on comorbidities, medical history, current health status, and anesthesia risk (ASA, 2020). A higher ASA classification correlates with increased aspiration risk, and patients with an ASA classification of IV or V face a seven-fold increase compared to those with ASA I (Pytka & Crosby, 2017). For patients with an ASA classification of IV or V undergoing emergent procedures, the aspiration incidence is as high as 1:343. Notably, most aspiration-related fatalities involve patients with ASA classifications of IV or V.

Delayed gastric emptying is another significant factor, often due to comorbidities and other physical states. The APSF (2023, p. 69) asserts that regurgitation of gastric contents is the most common cause of aspiration and emphasizes that "for this reason, recognition of patient populations at elevated risk for increased gastric volume is key to delivering a safe anesthetic." The ASA's preoperative fasting guidelines recommend adjustments for conditions that alter gastric emptying or fluid volume (ASA, 2017). The APSF (2023) echoes this sentiment, stating that traditional fasting recommendations may require reevaluation in this population.

Known populations with delayed gastric emptying include those with pregnancy, type two diabetes mellitus (T2DM), obesity, neurological conditions, and GLP-1 agonist use. Dr. Curtis Mendelson first identified aspiration pneumonitis (later termed "Mendelson's syndrome") in obstetric patients during labor and delivery (Mendelson, 1946). Pregnant women remain at increased risk of aspiration due to relaxation of the lower esophageal sphincter (LES) and progesterone-induced delayed gastric emptying (Pytka & Crosby, 2017). By taking up space

inside the abdomen, the uterus increases intra-abdominal pressure. Subsequently, intragastric pressure increases from 7.3 centimeters of water (cm H2O) to 17.2 cm H2O on average. Other factors contributing to delayed gastric emptying in laboring patients include pain associated with labor, excess stress, and opioid analgesics that are used during this time.

Dr. Mendelson's findings led to heightened awareness of aspiration risks in obstetric anesthesia and spurred practices aimed at reducing these risks. His work contributed to several preventative measures, including fasting protocols for pregnant patients, the use of antacid prophylaxis, and a shift towards using regional anesthesia for labor and delivery when possible (Mendelson, 1946). Although the risk of aspiration in pregnant patients has decreased over the last eighty years, the risk of aspiration is 1:661 during cesarean section under general anesthesia (Pytka & Crosby, 2017).

Neither obesity nor T2DM independently increases aspiration risk, but complications related to these conditions do. Obesity is associated with delayed gastric emptying, especially in the presence of T2DM, as well as higher incidences of gastroesophageal reflux disease (GERD) (Pytka & Crosby, 2017). Chaitra et al. (2023) demonstrated a correlation between increased body mass index (BMI) and larger gastric antral cross-sectional area (CSA) in ultrasound assessments, with statistically significant associations between T2DM and larger CSA. Progressive T2DM with autonomic neuropathy carries an even higher incidence of delayed gastric emptying.

The recent rise of GLP-1 agonists has raised concerns in the anesthesia community. The APSF (2023) discussed two case studies involving patients on Semaglutide (SG), a GLP-1 agonist. The first patient expressed feelings of fullness despite adherence to fasting times. POCUS revealed solid gastric contents, prompting cancellation of the procedure. Silveira et al. (2023) also found that SG use correlated with increased residual gastric volume (RGV) when

digestive symptoms were present. Current ASA guidelines recommend holding daily-dose GLP-1 agonists for one day and weekly-dose agonists a week before surgery (ASA, 2023). Providers are advised to consider delays in surgery for symptomatic patients and the use of POCUS for decision support.

Neurological disease and decreased level of consciousness (LOC) highly correlate with increased aspiration risk (Pytka & Crosby, 2017). Decreased LOC is associated with lower and upper esophageal sphincter dysfunction, delayed gastric emptying, and loss of protective reflexes. Conditions such as Parkinson's disease and Multiple Sclerosis increase aspiration risk by impairing muscle control and swallowing coordination. Head and spinal cord trauma also delay gastric emptying due to catecholamine surges. Any degree of alcohol ingestion is associated with significant delays in gastric emptying, and even small amounts of less than 300 milliliters or a beverage with an alcohol content of 4% can have large effects. This is equivalent to one 12-ounce beer, which typically has an alcohol content of 5%.

Finally, conditions that complicate airway management and intubation increase aspiration risk. Prolonged intubation is associated with a higher incidence of regurgitation and aspiration (Pytka & Crosby, 2017). When the number of laryngoscopy attempts exceeds two, the incidence of regurgitation increases from 1.9% to 22%, and aspiration rates increase from 0.8% to 13%. Pregnant patients face additional airway challenges due to engorgement of blood vessels, edematous airway tissue, and increased breast mass. T2DM patients are prone to "diabetic stiff joint syndrome," which limits neck and jaw range of motion, further complicating airway management and increasing aspiration risk (Chaitra et al., 2023).

Prevention Strategies for Perioperative Aspiration Pneumonitis

Due to the large number of patients at high risk for perioperative pulmonary aspiration, anesthesia providers have developed comprehensive prevention strategies that have evolved over the years. These strategies form a multifaceted approach that includes preoperative assessment, fasting protocols, pharmacologic interventions, and specific anesthetic techniques. This literature review highlights key strategies available to anesthesia providers, including the use of cricoid pressure (CP) for rapid sequence intubation (RSI) and evolving guidelines for patients on GLP-1 receptor agonists.

A thorough preoperative assessment is essential to identify patients at increased risk for aspiration. The ASA (2017) states that an adequate preoperative assessment includes reviewing medical records, performing a physical examination, and interviewing the patient. This assessment should be documented in the medical record to ensure continuity of care, though it should never replace an anesthesia provider's point-of-care evaluation. Any risk factors identified during the assessment should be further evaluated for specific implications on the patient's procedure and anesthetic plan.

The ASA (2017) updated preoperative fasting guidelines, widely followed in U.S. surgical settings, apply only to healthy patients undergoing elective procedures. Clinical judgment is crucial when applying these guidelines to patients who do not meet these criteria. Pytka and Crosby (2017) emphasize that fasting will not guarantee that a patient has an empty stomach, as RGV can vary significantly among individuals. The ASA fasting guidelines for healthy patients undergoing elective procedures are as follows: fried, fatty foods and meat should be held eight hours before surgery; light meals, non-human milk, and infant formula should be held six hours before surgery; breast milk should be held six hours before surgery; and clear

liquids not including alcohol should be held two hours before surgery. Chaitra et al. (2023) investigated RGV related to fasting duration and found that extended fasting of ten to 15 hours correlated with higher RGV than fasting for six to ten hours. The researchers attributed this to a possible increase in ghrelin, a hormone that stimulates gastric secretions and often rises with hunger. This finding suggests that exceeding recommended fasting times may increase RGV as well, underscoring the importance of strict guideline adherence for effective gastric emptying.

The ASA (2017) reviewed the available literature on pharmacologic interventions to reduce aspiration risk. While many medications have been shown to have an effect in decreasing gastric volume and increasing gastric pH during the perioperative period, the evidence for their ability to reduce aspiration risk in healthy patients is insufficient. Pytka and Crosby (2017) also note that most studies on pharmacologic intervention for aspiration risk focus on healthy patients and do not demonstrate improved outcomes for patients who experience aspiration. Nonetheless, GI stimulants, gastric acid blockers, and non-particulate antacids may be beneficial for patients at higher aspiration risk, although preoperative anticholinergics are no longer recommended (ASA, 2017). Chaitra et al. (2023) found that patients taking at-home histamine blockers had a larger gastric CSA and RGV than those taking proton pump inhibitors, suggesting differential effects among pharmacologic agents.

A common anesthetic technique used for high-risk patients is the application of CP during RSI. CP, also known as the Sellick Maneuver, is defined as “occlusion of the upper esophagus by backward pressure on the cricoid ring against the bodies of the cervical vertebrae to prevent gastric contents from reaching the pharynx” (Zeidan et al., 2014, p.1). The purpose of CP is to occlude the esophagus during RSI for patients who have an increased risk of regurgitation and aspiration (Ahmed et al., 2023). The use of CP has been highly debated over

the last thirty years, and critics largely point to a lack of high-level evidence to support its use (Pytka & Crosby, 2017). Regardless, CP remains a currently recommended technique in the difficult airway algorithm (Zeidan et al., 2014).

A main concern with CP is the possibility that it can compromise the airway or decrease the effectiveness of airway interventions (Pytka & Crosby, 2017). CP has been shown to cause an array of problems, including but not limited to difficulty ventilating, closure of the vocal cords that prevent the placement of a tracheal tube, prolonged time to successful intubation, worsening laryngeal view, and airway obstruction. The use of CP has been associated with LES relaxation, nausea, vomiting, and esophageal rupture on occasion (Zeidan et al., 2014). In a study of 79 patients, laryngeal entrance narrowing and abduction of the vocal cords occurred with CP in 30 patients. The presence of gastric contents in the oral airway despite CP has also been reported. Some research suggests that in cases where the esophagus is not in a direct midline location, CP may not be effective in rendering the esophagus adequately compressed. Zeidan et al. (2014) assert that most issues associated with CP can be attributed to mistakes regarding its application. According to Noll et al. (2019), only 1.3% of people who regularly provided CP could reach and sustain a force of 30 Newtons (N), the pressure required to facilitate safe endotracheal intubation.

Despite the above findings, support for CP remains high, and its clinical application by anesthesia providers continues in most practices. Research demonstrates that applying CP leads to fewer intubation attempts, faster intubation times, and higher success rates compared to intubation without CP (Pytka & Crosby, 2017). CP has not been found to obstruct airway insertion with video laryngoscopy. A randomized, double-blind trial by Zeidan et al. (2014) attempted to study the effectiveness of CP. In all 79 participants, attempts to insert orogastric

tubes of varying sizes into the esophagus were unsuccessful when CP was applied. When no CP was applied, esophageal patency was observed in all patients. This study also challenged the assertion that CP is ineffective in patients where the esophagus is not directly midline because the trial included participants with left lateral, midline, and right lateral esophageal positions, which had no impact on the outcome. While CP remains a recommended strategy for reducing aspiration risk in high-risk patients, research does indicate that providers should consider releasing CP if attempts to insert an endotracheal tube become difficult (Pytka & Crosby, 2017).

Gastric POCUS is emerging as a useful tool for a more definitive determination of gastric volume and may play a crucial role as an adjunct to clinical decision-making (Chaitra et al., 2023; Pytka & Crosby, 2017). POCUS is non-invasive, cost-effective, quick, and easily performed at the bedside. A study conducted to determine the accuracy of POCUS in detecting gastric contents found that POCUS is highly reproducible and carries high interrater reliability (Kruisselbrink et al., 2019).

However helpful, POCUS remains a relatively subjective measure of stomach contents, and researchers state that it is most effective when the gastric volume is unknown (Chaitra et al., 2023). POCUS assessments are meant to inform airway management and anesthetic plans for specific patient populations and should not be used as a replacement for fasting guidelines. The ASA (2023) currently recommends the use of gastric POCUS assessment for patients taking GLP-1 agonists who complain of digestive symptoms on the day of surgery or for patients where it is unknown when the last dose was taken. More research is needed to determine the sensitivity and reliability of ultrasonography for this use, but it currently shows promise as a tool for anesthesia providers in preventing perioperative pulmonary aspiration.

Management of Aspiration Pneumonitis

Most available literature recommends supportive care as the primary approach for managing pulmonary aspiration should it occur. Current research emphasizes risk factor identification and prevention strategies, with treatment largely mirroring that of bacterial pneumonia. In the event of perioperative aspiration, it is recommended to immediately elevate the head of the bed to 30 degrees, provided there are no contraindications, and turn the patient's head to the left side to prevent additional gastric contents from entering the lungs (Pytka & Crosby, 2017). The upper airway should be thoroughly suctioned, and supplemental oxygen should be administered as needed.

Decisions regarding whether to terminate or proceed with the surgical procedure should be guided by clinical judgment (Pytka & Crosby, 2017). Providers should consider the severity of aspiration, the patient's current physical status, and the potential risks of delaying the procedure. Following the event, the patient should be closely observed for any signs of pneumonitis over the coming days. Symptoms to watch for include wheezing, coughing, dyspnea, and cyanosis. Severe complications, such as pulmonary edema, hypotension, and acute respiratory distress syndrome, may also develop and require prompt intervention.

Certain treatments have fallen out of favor in the management of aspiration pneumonitis over the past decade. Routine antibiotic administration solely because aspiration has occurred or is suspected is no longer recommended (Pytka & Crosby, 2017). The evidence supporting antibiotic therapy in this context is largely related to bacterial colonization rather than the aspiration of gastric contents and is therefore not applicable to most cases of aspiration pneumonitis. Antibiotics should be reserved for cases in which pneumonia develops and causative organisms are identified. Similarly, corticosteroids, once believed to improve

pneumonia symptoms due to their anti-inflammatory properties, ability to reduce platelet aggregation, and capacity to enhance peripheral release of oxygen, are now discouraged. Studies have consistently failed to provide these benefits and have instead found increased mortality rates due to secondary infections stemming from their immunosuppressive properties.

Evidence for Cognitive Aids

In high-stakes environments such as emergency departments and operating rooms, where crises can arise rapidly, cognitive aids such as checklists and QRGs have gained popularity as tools to reduce human error and improve patient outcomes. This synthesis examines research regarding the effectiveness of cognitive aids in emergency scenarios where swift action is necessary for patient safety. Additionally, it explores supporting evidence for implementing a QRG in perioperative care, alongside the limitations, key considerations in design, and best practices for deployment.

Cognitive aids have been demonstrated to be effective in high-risk industries like aviation, nuclear power, and space exploration (Greig et al., 2023). These industries acknowledge difficulties and significant safety risks when responding to crises. Although healthcare has been slower to adopt these tools, notable examples include the World Health Organization's *Surgical Safety Checklist* and the Association of Anaesthetists' *Quick Reference Handbook*. Cognitive aids can reduce cognitive overload during a crisis and enhance performance (Ben-Haddour et al., 2022).

A meta-analysis of 13 randomized controlled trials (RCTs) found that cognitive aids have potential to: strengthen team coordination and simplify processes, enhance clinician confidence when facing infrequently experienced situations, and facilitate smooth transitions for clinicians between institutions and departments (Grieg et al., 2023). Specifically, cognitive aids reduced the

rate of missed steps from 43.3% to 11% and decreased the incidence of errors. Additionally, their use led to improvements in clinical teamwork skills, non-technical skills, and perceived conflict resolution. In a simulated environment, Ben-Haddour et al. (2022) found that a cognitive aid developed for emergency department physicians and nurses improved adherence to guidelines and reduced the number of critical steps that were missed during crises.

Despite these benefits, cognitive aids have faced criticism for their potential to introduce delays in critical situations. Researchers are unsure whether the time spent using cognitive aids outweighs the benefit of adhering to critical steps in a process. Ben-Haddour et al. (2022) argue that, particularly in the absence of respiratory distress, slightly longer preparation times may result in better outcomes by allowing more thorough preparation. Their study found that cognitive aids increased preparation time by an average of two minutes, with intubation time increasing by 12 seconds. However, the impact of this delay on patient outcomes remains unclear due to the simulated nature of the study. Similarly, Grieg et al. (2023) reported that in unfamiliar situations, clinicians often engage in creative decision-making, a cognitively demanding process that can be time-intensive. In these situations, cognitive aids may help streamline decision-making, although the meta-analysis points out “the risk of delivering slower but more complete care against quicker but incomplete care should be balanced on a case-by-case basis” (p. 353).

The effectiveness of cognitive aids is influenced by several factors, including content, presentation, and user familiarity (Grieg et al., 2023). Studies suggest their success improves when clinicians are well-trained and familiar with the tools. Cognitive aids should not attempt to replace all memory-based actions but should focus on frequently forgotten or critical information. Clear design principles, readability, and simplicity are essential for effective implementation (Ben-Haddour et al., 2022). To ensure successful deployment, clinicians must

receive training on the proper use of cognitive aids and their content (Greig et al., 2023). These principles will guide the development of this project's QRG. Participants will receive a pre-implementation PowerPoint presentation that outlines the content and provides a detailed explanation of how to use the QRG effectively.

Project Framework

The framework used for this project is the Institute for Health Care Improvement (IHI) model using a single plan-do-study-act (PDSA) cycle (IHI, 2022). This is a structured process that includes four steps and helps teams test changes, measure outcomes, and refine processes to achieve better results. The *plan* step involves identifying a goal, defining objectives, and outlining necessary steps needed for implementation. The *do* phase involves implementing the plan on a small scale and collecting data about the intervention. The *study* step requires analysis of data collected in the previous step of the cycle and reflection on what was learned. The *act* phase is the portion of the project where a decision will be made to adapt, adopt, or abandon the change that was implemented. This decision is based on insights gained throughout the rest of the process. From here, adjustments can be made, and the process begins again.

The *plan* phase for this project included identifying the clinical problem of aspiration pneumonitis followed by a literature review of risk factor identification, prevention strategies, and management for this phenomenon. The literature was also searched for effective interventions to combat this issue. The development of the project tool included creating a QRG with an associated PowerPoint presentation. The presentation aims to provide background information on the potential need for the QRG and instruct CRNAs on the intended use of the QRG in practice. The *do* phase of the PDSA cycle was completed by providing CRNAs with education related to aspiration pneumonitis and a QRG to use at their discretion during the

implementation period. Data were collected through administering pre- and post-implementation surveys to participants. These data were analyzed during the *study* phase of the cycle. Finally, the *act* phase concluded the project and included disseminating recommendations for future PDSA cycles.

Ethical Considerations and Protection of Human Subjects

No ethical concerns related to this project were identified. The benefits and risks of the project will apply equitably to all CRNA participants, no patients will be part of the target population, and all activities will fall within acceptable practice standards. This DNP project will not involve any direct patient interaction. Providing the educational content within this project will not involve any known risk or harm to CRNA participants aside from typical work-related stress. To prepare for formal project approval, training was completed through the Collaborative Institutional Training Initiative (CITI) program modules (https://about.citi.program.org/) by the project lead before project implementation.

The organizational approval process required for this quality improvement project includes a screening process through the College of Nursing at East Carolina University (ECU), and its purpose is to determine if this project falls within the realm of quality improvement. This process is a collaboration between the College of Nursing and the ECU University Medical Center Institutional Review Board (UMCIRB). As this project is intended for quality improvement, it will be exempt from the full IRB approval process. Additionally, facility approval through the research office of the partnering organization in collaboration with the UMCIRB will be obtained before project implementation. Additional approval to collect data and general awareness that the project will be occurring in the perioperative area will be obtained

through the collection of a signature from the local contact personnel. See local facility approval in Appendix D.

Section III. Project Design

Project Setting

The setting for this project includes a combination of two rural hospitals. The primary site is a 25-bed critical access hospital with a seven-bed emergency department consisting of three shared inpatient and ambulatory operating rooms and one endoscopy operating room. The site offers programs and services to 110,000 people across six counties, and the emergency department sees approximately 16,000 patients yearly ([redacted], n.d.-b). The secondary site is a 114-bed community hospital that provides services to approximately 40,000 people across four counties ([redacted], n.d.-a). It contains a 15-bed emergency department, five inpatient and ambulatory operating rooms, one labor deck, and one endoscopy suite, which all serve approximately 21,000 patients every year. Across both hospitals, approximately 12 CRNAs are employed.

Project Population

The project population consists of CRNAs employed and working with the partnering facilities. The number of participants is small, with five CRNAs volunteering to participate in this QI project. This small sample size may serve as a barrier to project implementation and may skew results. However, it could serve as an accurate benchmark for smaller, more rural critical-access sites for future quality improvement projects. Compared with larger academic centers with more resources available and higher staffing numbers, these rural locations may benefit from a quick reference guide on aspiration pneumonitis to facilitate faster and more accurate implementation of timely interventions in preventing, recognizing, and managing aspiration pneumonitis.

Conversely, a current lack of resources at the partnering facilities may prove to be another barrier to implementation. One important aspect of the quick reference guide, point-of-care gastric ultrasound use, may not be applicable as access to ultrasound technology can be limited at smaller hospitals. The increased time needed to view the PowerPoint presentation and QRG, as well as the added time needed to utilize the QRG in practice, may also prevent participation in the project.

Project Team

The project team consisted of this author, a Student Registered Nurse Anesthetist (SRNA), who served as the project leader, as well as three additional SRNAs who collaborated on the initial creation of the QRG, informational PowerPoint presentation, and pre-and post-implementation Qualtrics survey questions. All aspects of implementation and data analyses at the partnering facilities were completed by this author, the project leader. The project chair is a CRNA and the founding program director of this author's DNP Nurse Anesthesia Program. The course director is a Nurse Practitioner and DNP Nurse Anesthesia Program faculty member who aided in project development, implementation, and project completion. Project implementation was also facilitated by the current Nurse Anesthesia Program Director and on-site contact person at both partnering facilities.

Methods and Measurement

The purpose of this QI project is to assess CRNA's perceptions of a newly developed QRG focused on the prevention, recognition, and management of aspiration pneumonitis (Appendix E). This project used a single PDSA cycle to review current literature, distribute a project tool and educational PowerPoint via email that provided evidence-based support for the project and instructions for participation (Appendix F), and collect data through pre- and post-

implementation surveys via Qualtrics to be completed by participating CRNAs (Appendix G). Five CRNAs volunteered to participate in this QI project, and ultimately, three pre- and post-implementation surveys were completed. Although implemented at two facilities, only one facility's CRNAs participated in the QI project.

In the *plan* phase, this author reviewed current literature regarding the incidence, mortality, and morbidity of aspiration pneumonitis in the perioperative setting; factors increasing the risk of aspiration pneumonitis; methods aimed at preventing aspiration pneumonitis in this population; and the recognition and subsequent management of aspiration pneumonitis by anesthesia providers. An initial PICOT question and concept table were formulated, and search strategies were developed for the databases PubMed and CINAHL and the search engine Google Scholar to explore the current literature. Relevant information from the literature review was compiled in a literature matrix (Appendix C) and synthesized to create the QRG and PowerPoint presentation. Three meetings were conducted with the project chair and three other collaborating SRNAs over four months to facilitate the creation of the QRG, refine the project statement and project purpose, and develop the pre-and post-implementation surveys for participating CRNAs. A form was submitted to the College of Nursing Institutional Review Board with project details to request approval as a QI project. Pre- and post-implementation survey questions were then finalized by this author, the collaborating SRNAs, the project chair, and the course director for future distribution to CRNA participants. The Qualtrics surveys included questions with nominal, ordinal, and free-form data in the form of Likert-type scales, dichotomous responses, percent ranges, and open-ended questions.

In the *do* phase, a project approval request was drafted and sent to the partnering facilities' health system for permission to complete the QI project at the two partnering facilities.

After approval was obtained, participants were selected by the on-site clinical contact and were emailed a pre-implementation survey via Qualtrics, a narrated PowerPoint presentation describing evidence-based support for the project that included instructions for the surveys as well as how to use the QRG, and an electronic copy of the QRG. Participants were asked to use the project tool over two weeks. After the two-week period, participating CRNAs were then emailed a post-implementation Qualtrics survey for completion.

During the *study* phase, data were collected confidentially through the Qualtrics survey, de-identified, and entered into an Excel spreadsheet for analysis. In the *act* phase, suggestions for changes to the project tool were made based on the analysis of the results received from the project. The data and suggested changes were then synthesized and placed on a poster for visual representation and distribution of the results via public presentation.

Section IV. Results and Findings

Results

This DNP project aimed to assess CRNA perceptions of the adequacy of a newly developed quick reference guide designed to aid in the prompt identification of at-risk patients and provide prevention strategies and treatment options for perioperative aspiration pneumonitis. The target population of the project was CRNAs at two rural hospitals. Emails were sent at set intervals throughout the implementation period. The emails included links to pre-implementation and post-implementation surveys, a PowerPoint presentation that provided context and background information on aspiration pneumonitis, and a PDF file of the QRG. Additional laminated copies of the QRG were placed in the anesthesia lounge for use by CRNAs at one facility. Pre-implementation survey responses were received over a six-day period, and post-implementation survey responses were received over a five-day period. Three pre-implementation survey responses and three post-implementation survey responses were collected using Qualtrics survey software. Data was analyzed using Microsoft Excel.

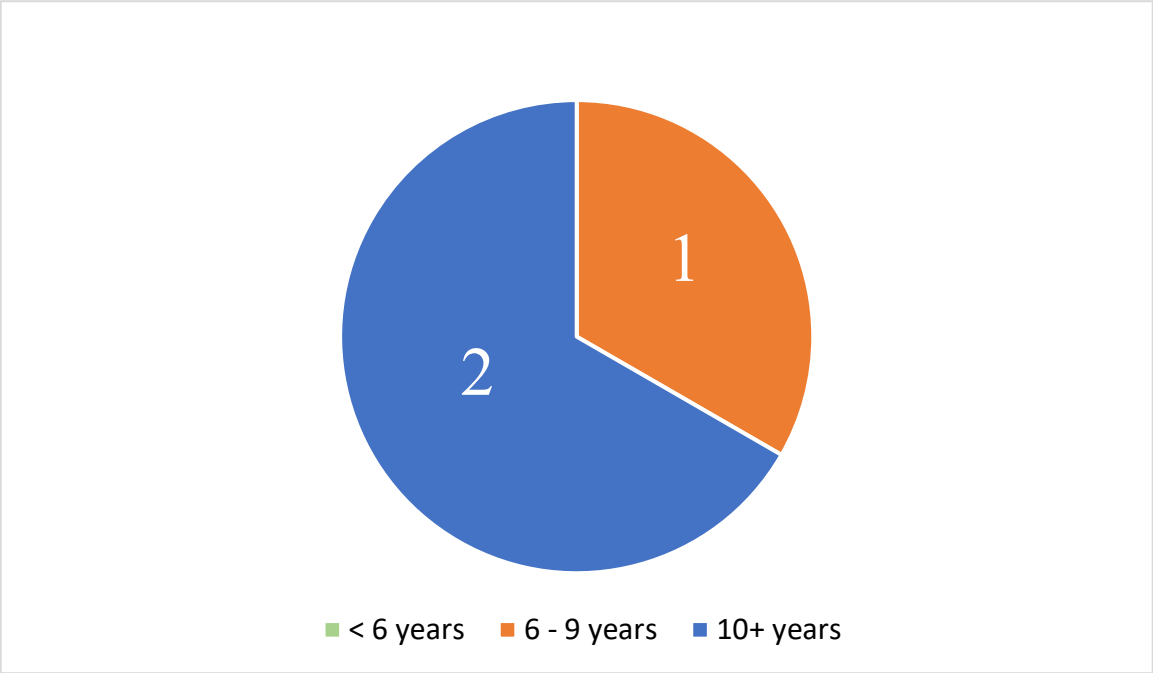
Data Presentation

Three pre- and post-implementation survey results were collected from one clinical site, and none were collected from the second clinical site. These surveys explored questions related to each CRNA's various experience levels, the current understanding of risk factors related to aspiration pneumonitis, and practice guidelines surrounding the prevention of and treatment for aspiration. Questions also assessed CRNA confidence levels for POCUS for gastric volume assessments. The first two questions were posed to gain an understanding of the level of training in POCUS that participants had prior to implementation and to assess the level of experience of the participants, respectively. The first question explored whether the participants had any formal

training in gastric POCUS. All three participants responded *no*. The second question assessed the participants' years of practice as a CRNA. One of the three participants selected *between six and nine years of experience*, and the remaining two participants selected *ten or more years of experience*. Figure 1 displays the data gathered about the CRNAs' years of experience.

Figure 1

Years Spent Practicing as a CRNA



Note. n=3.

Five questions in the pre- and post-implementation surveys assessed participants' knowledge of risk factors for aspiration pneumonitis, the current guidelines for prevention, and treatment. Comparison between pre-implementation and post-implementation responses offered insight into whether the QRG increased provider confidence in adhering to these recommendations when managing patients at risk for aspiration pneumonitis. The first question was designed to assess the participants' ability to recognize patients at high risk for aspiration. The correct answer, indicating the only choice that was not considered high risk, was *lower*

esophageal sphincter pressure exceeds intraabdominal pressure. All three participants chose the correct answer in both the pre- and post-implementation surveys. The second question assessed the participants' knowledge of current ASA NPO (nothing by mouth) recommendations for healthy patients undergoing elective surgery. The correct answer was *light meals should be held six hours before the procedure*. In the pre-implementation survey, one participant incorrectly selected *breast milk should be held two hours before the* procedure, and two participants correctly selected *light meals should be held six hours before the procedure*. In the post-implementation survey, all three participants chose *light meals should be held six hours before the procedure*.

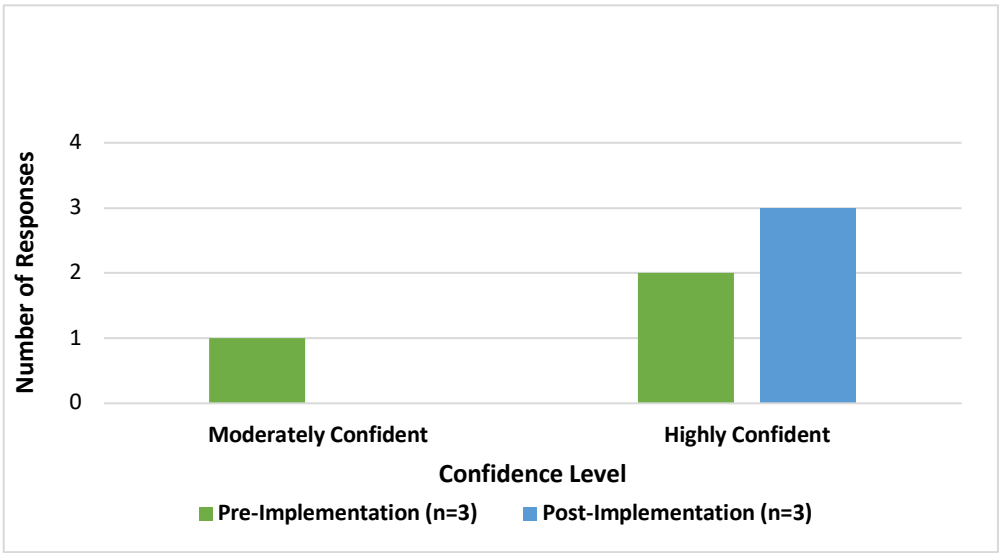
The third question in this category served to assess the participants' knowledge of current recommendations regarding the withholding of GLP-1 medications before elective surgery. The two correct answers were *weekly administered medications should be held one week prior to the procedure* and *daily administration should be held the day before the procedure*. In the pre-implementation survey, two participants selected both correct answers. One participant selected *weekly administered medications should be held one week prior to the procedure* and *daily administered medications should be held on the morning of the procedure*. In the post-implementation survey, all three participants chose the two correct answers. The fourth question assessed the participants' knowledge of current recommended interventions for patients who experience perioperative aspiration. The correct answer, indicating the only incorrect option, was *administer antibiotics and steroids prophylactically*. In the pre-implementation survey, two participants selected *aggressive tracheal suction,* and one participant selected *administer antibiotics and steroids prophylactically*. In the post-implementation survey, all three participants chose *administer antibiotics and steroids prophylactically*.

The final question in this category aimed to assess participant knowledge of gastric volumes on ultrasound that indicate a full stomach, one of the key steps to assessing aspiration risk via POCUS. The correct answer was *>1.5 mL/kg*. In the pre-implementation survey, one participant answered *>1 mL/kg*, one participant answered *>1.5 mL/kg*, and one participant answered *>2 mL/kg*. In the post-implementation survey, two participants selected *>1.5 mL/kg* and one participant selected *>2 mL/kg*.

In both the pre- and post-implementation surveys, participants were asked how confident they felt in recognizing patient risk factors associated with aspiration pneumonitis. In the pre-implementation survey, one participant selected *moderately confident,* and two selected *highly confident*. In the post-implementation survey, all three participants selected *highly confident*. See Figure 2 below.

Figure 2

Confidence Recognizing Patient Risk Factors for Aspiration Pneumonitis



Participants were also asked to indicate their confidence level in identifying stomach contents accurately on ultrasound. In the pre-implementation survey, one participant answered

not confident at all, and two participants answered *slightly confident*. In the post-implementation survey, one participant answered *slightly confident*, and two participants answered *moderately confident*.

Several post-implementation questions assessed the accessibility, applicability, and readability of the QRG to identify potential adjustments for future PDSA cycles. All three participants *strongly agreed* that the QRG was easily accessible and that the content included was applicable. Two participants *somewhat agreed* that the QRG was easy to read and understand, and one participant *strongly agreed*. Two participants *somewhat agreed* that the QRG had the potential to improve the quality of care delivered in the anesthesia department, and one participant *strongly agreed*.

When asked how many times they viewed the QRG over the two-week implementation period, all three participants selected *1-2*. The next question asked how much additional time, on average, it took to reference the QRG per patient scenario. One participant selected *<1 minute*, and two participants selected *1 - <2 minutes*. When asked how likely the participants were to use the QRG in the future, two participants selected *somewhat likely*, and one participant selected *moderately likely*.

The post-implementation survey also assessed participants' interest in an in-service regarding gastric POCUS. Two participants selected *yes*, and one participant selected *no interest*. An open-ended free-text box was included in the post-implementation survey for participants to share any feedback about the QRG. One participant responded with *Great tool!,* and another participant wrote *flow chart or decision tree for POCUS would be more clear*. The third participant left the text box blank.

Analysis

After reviewing the data gathered from the pre- and post-implementation surveys, it is suggested that the QRG did increase perceived confidence levels of CRNAs in preventing, recognizing, and treating aspiration pneumonitis. This increase in perceived confidence may be attributed to the information first being presented in the PowerPoint presentation and subsequently being reviewed in the QRG. The content presented in both formats was the same, but the variation in how the information was presented and the repetition of important details may have contributed to the information being better retained, as evidenced by the improvement in survey responses from the pre-implementation survey to the post-implementation survey.

Although not an intended outcome of this QI project, the results also suggested that the participants' knowledge regarding guidelines for aspiration pneumonitis also increased. This may again be a result of the CRNAs' experience levels being high at the partnering facility. New CRNAs are more likely to have encountered recent practice guideline changes in their educational programs. Although published by several national anesthesia associations, it is possible that the participants were not aware of certain guideline changes related to aspiration pneumonitis risk. All three participants correctly answered the knowledge-based questions on the post-implementation survey, which was an improvement compared to the pre-implementation answers. This is particularly notable in the questions regarding GLP-1 medication management and NPO guidelines. This may be because GLP-1 medication management is a relatively new issue in the field of anesthesia that has become more prominent in recent years, and the guidelines related to it have changed several times in that time frame and will likely change again soon. All three participants selected *highly confident* when asked specifically about recognizing risk factors for aspiration pneumonitis, compared to mixed confidence levels prior to viewing the QRG. This could also be a result of recency bias or short-term memory retention

instead of an actual confidence increase, as it is not clear how soon after viewing the QRG the participants answered the post-survey questions. While confidence in gastric POCUS use also improved from pre- to post-implementation, it remained low overall. This aligns with the participants' acknowledgement of not receiving formal training using this diagnostic tool.

The results also indicate favorable perceptions of the QRG's accessibility and relevance. All participants reported that the tool was easily accessible and applicable to practice. The QRG was available in the anesthesia breakroom, and participants were encouraged to take it into the operating room if desired. The QRG handouts were laminated for ease of cleaning in the OR environment. The topic of aspiration is a patient safety consideration for anesthesia providers in every case, making it highly relevant to CRNA practice. The readability, however, of the QRG received varying feedback. While not explicitly stated, the suggestions for improvement to the QRG that were made in the free answer box were all related to the section on gastric POCUS. This is likely a result of how the POCUS content was organized on the QRG. While the PowerPoint presentation had more details for the content presented in this section, the QRG itself may lack the necessary flow to facilitate quick and easy understanding of the information. Without the background knowledge from the PowerPoint presentation, the information presented on the QRG may seem more truncated. Suggestions for improvement to the flow of information about gastric POCUS included incorporating a flow chart or decision tree.

All three participants indicated that the QRG was referenced during the implementation period, but the likelihood of future use varied. This may be a result of the higher experience level of the CRNAs at the participating facility. CRNAs with more years of experience may be more likely to rely on skills gained in past experiences of patient aspiration and their current knowledge of aspiration management than to take additional time to review the QRG. Although

emergency cases do occur at the partnering facility, most cases are elective. Elective cases may carry a lower risk and incidence of aspiration pneumonitis due to the previously discussed NPO guidelines. These observations highlight opportunities for increasing participant engagement in future PDSA cycles. Interest in additional educational opportunities, such as a formal in-service on gastric POCUS, also varied amongst participants. This may suggest that future educational initiatives on this topic may be needed to build confidence in the more technical aspects of ultrasound assessment. Mandating education on gastric POCUS may require that participants spend additional time at the partnering facility, which could be undesirable for those who live farther away.

Section V. Implications

Financial and Nonfinancial Analysis

Pulmonary aspiration, followed by aspiration pneumonitis, has reported a mortality rate of 9% (Zhang et al., 2020). As discussed previously, many factors place patients at risk for this perioperative complication, and there are various ways anesthesia providers can prevent its occurrence. The incidence of pulmonary aspiration varies from 0.1% to 19% depending on patient-specific factors. In the partnering facility, this creates a safety risk for approximately 27 to 5,130 patients in the main facility alone. This number increases when outlying satellite hospitals are factored in.

Secondary to its impact on patient safety is the added cost for both individuals and healthcare systems. Pulmonary aspiration increases ICU admissions and overall hospital length of stay. The direct cost to patients resulting from chemical or bacterial pneumonia after surgery is estimated at $10,161.00 per patient, with indirect costs of an additional $4,000.00 on average (Shin et al., 2023). It is challenging to determine from current literature exactly how much financial burden healthcare systems incur because of aspiration pneumonitis, as most studies focus solely on aspiration pneumonia. However, a one-year study of over 318,000 patients in a Maryland hospital system found that the average cost of caring for surgical patients was $14,000.00; that total charge jumped to $58,000.00 when aspiration pneumonia from perioperative complications occurred (Kozlow et al., 2003). The Maryland study also found that perioperative aspiration resulted in an average hospital length of stay of 25 days, compared to only five days without aspiration. The study estimates that aspiration pneumonia as a perioperative complication costs the hospital system an average of 23 million dollars per year. In light of this financial burden to both patients and healthcare facilities, the comparatively low cost

of implementing this QI project would be more than covered by preventing some incidences of aspiration pneumonitis and its costly sequelae.

To replicate this QI project, several key aspects must be considered. The total cost would depend on the pay rate for employees and the estimated time to complete a review of the QRG handout and PowerPoint material. Although minimal, additional time would be needed to fill out pre- and post-surveys as well. Primarily, four individuals created the materials, with each contributing approximately six hours of work. The average hourly rate of a CRNA in North Carolina is $158.00, so the average cost of replicating similar materials would be approximately $4,000.00 (Indeed, 2025). This initial work was done by SRNAs, which did not incur a cost to the facility. Microsoft Word and PowerPoint programs were utilized to create the materials, which were free. These programs are also accessible at the partnering facility at no additional cost. The cost of printing and laminating each handout was approximately $8.00. Alternatively, these materials could be distributed by electronic means in the future, which would eliminate the printing cost entirely. Materials and questionnaires were distributed via email, which was free.

Nonfinancial resources that added to the successful outcomes of this project included the organizational email system used to communicate between the project leader, project chair, and participants, which was Microsoft Outlook. The greatest potential benefits of this project would be to prevent patient harm and minimize the cost to individuals and healthcare systems. Anesthesia-related aspiration events remain a major cause of injury and death, increasing hospital systems' vulnerability to lawsuits due to preventable patient harm (Warner et al., 2021). The implementation of this QI Project may help mitigate this risk by ensuring that current and evidence-based guidelines are used consistently by providers.

Implications of Project

While the risk of aspiration pneumonitis remains low for healthy patients undergoing elective surgery, this risk dramatically increases in emergent patients, patients with multiple comorbidities, pregnant patients, and pediatric patients (Pytka & Crosby, 2017). Risk also increases for patients with neurological impairments, those suffering from traumatic injuries or neuromuscular diseases, and patients with delayed gastric emptying. Additionally, the recent increase in GLP-1 use has placed even more patients at risk of this complication. Maintaining the same standards of care regardless of patient characteristics is crucial for the anesthesia provider, as indicated in the AANA Professional Practice Manual (AANA, n.d.-b). Information placed on the QRG and disseminated via this project directly aligns with ASA guidelines regarding risk factors and prevention of aspiration pneumonitis.

The implementation of this QI project also aligns with the Anesthesia Patient Safety Foundation's and ASA's recommendations regarding assessment of patients taking GLP-1s and the appropriate steps for recognizing risk factors and preventing aspiration pneumonitis in this population. Although recommendations related to GLP-1 use are subject to change as new research is completed, the contents of this QRG reflect the most recent recommendations of the ASA. Future PDSA cycles of this project may include changes to information based on new research, evidence, and recommendations from national and state anesthesia institutions.

This project also reinforces publishing that highlights the value and effectiveness of QRGs in everyday practice. The primary focus of all anesthesia providers is to provide safe, quality patient care and protect patients from harm; this project supports those endeavors. Although small in scale, health organizations should be aware that these types of projects can have a positive impact on patients, staff, and the healthcare system overall. The AANA Code of

Ethics requires that CRNAs protect patients from harm and stay current on available treatments and prevention strategies to keep patients out of harm's way, and this project reflects those goals (AANA, n.d.-a).

Sustainability

Considering the estimated costs that aspiration pneumonitis brings to the healthcare organization and the low overall cost of replicating this QI project, the partnering organization could likely sustain the implementation easily for a longer implementation period. If deemed successful, subsequent changes can be made each cycle. The only substantial cost to the organization would be paying the hourly rates of the staff who create the project materials, which would be, at maximum, $4,000.00 as stated previously. Alternatively, this task could be accomplished as part of the staff members' current roles and thus would not add to any increased costs. The facility could choose to create downloadable virtual files instead of printable handouts, which would incur less cost and be readily available. There would be indefinite use of the QRG, and the virtual copy could be edited with no cost if practice changes are released in subsequent years. Distribution of the materials would be free of cost. Anesthesia providers may improve prevention strategies, identification of, and treatment for aspiration pneumonitis, thereby reducing adverse outcomes. There is no endpoint for the project, as aspiration pneumonitis is an infrequent but serious event, and reference tools are shown to improve provider response during scenarios with these characteristics.

Potential issues include reduced need for using the reference tool over time as providers become more familiar with its content, although this addresses the initial goal of the project and would ultimately mean it has been successful. Other benefits include retention of knowledge and

provider competency. This reference tool can also be easily updated over time with digital formats and would thus contribute to providers staying up-to-date on current practice guidelines.

Dissemination Plan

A poster was created and presented to the anesthesia department members and College of Nursing faculty. Project participants were invited to attend. The presentation was available for viewing in person at East Carolina University College of Nursing or virtually via an online link. The final version of this paper, along with the poster, will be posted in The Scholarship, the East Carolina University digital repository that is available to the public.

Section VI. Conclusion

Limitations

This quality improvement project had several limitations that may influence the interpretation of the results. The most significant was the small sample size, with three CRNAs completing both pre- and post-implementation surveys. Because of the limited number of participants, the results may not reflect the perceptions of CRNAs at larger institutions or those in different practice settings, such as office-based anesthesia. Additionally, although the project was implemented at two rural hospitals, only one site participated in the survey process, further narrowing the applicability of the results. In-person clinical experience and interaction with participants only occurred at one of two facilities, which likely explains the lack of participation from the second facility. The CRNAs who participated in this QI project also had more than six years of experience, which means that information regarding how new CRNAs may interact with or perceive the QRG was omitted from the overall picture.

Another limitation was the reliance on self-reported data, which could introduce bias, particularly if participants responded in a way they believed was expected rather than reflecting actual practice change. Time constraints also posed a barrier; the two-week implementation period provided only a brief snapshot of how the QRG might be used in practice, and it did not allow for long-term assessment of knowledge retention or changes in clinical behavior. There is no way to tell, based on this project, how much time elapsed between when participants viewed the QRG and informative PowerPoint and when the post-implementation survey was completed. This means that recency bias may also play a part in skewing the results. Finally, access to resources such as ultrasound varied between facilities, limiting participants' ability to fully engage with all aspects of the QRG. During discussions with participants throughout the two-

week implementation period, it was stated that gastric ultrasound was not a common occurrence at this facility for the purposes of assessing gastric volume for aspiration risk, meaning that this portion of the project and QRG may not have been perceived as pertinent to participants.

Recommendations for Future Implementation and/or Additional Study

Future recommendations for a research project based on this QI project should include a larger and more diverse sample of CRNAs across multiple facilities to improve the sample size and more accurately reflect the CRNA profession. Expanding the project to academic medical centers, trauma hospitals, and large health systems would provide insight into whether the QRG is equally beneficial across practice settings with differing resources, CRNA experience levels, and patient populations. Increasing the length of the implementation period and creating interval assessments of post-implementation survey questions may also help determine whether the QRG influences long-term confidence, knowledge retention, and clinical practice change. This project could be implemented in several areas across health systems and may be generalized to other healthcare provider groups, such as nurses in the preoperative and postoperative care units, nursing assistants, ICU nurses, and anesthesiology residents.

Additionally, based on participant feedback, future versions of the QRG could incorporate visual decision trees such as flow charts or algorithms, particularly for the gastric POCUS section, to improve clarity and usability in high-stakes scenarios. Offering structured educational opportunities, such as in-service training or workshops on gastric ultrasound, may also strengthen provider confidence in this skillset. Finally, additional PDSA cycles could be conducted to refine the tool based on user feedback and evolving guidelines, especially as new evidence emerges regarding GLP-1 receptor agonist use and other patient-specific risk factors for aspiration.

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Appendix A

Concept Table

	Concept 1 Anesthesia provider	**Concept 2** Reference Tool	**Concept 3** Aspiration pneumonitis
Keywords	Certified Registered Nurse Anesthetist CRNA Nurse Anesthetist Nurse Anesthesiologist	Reference tool Educational tool Cognitive aid Checklist	Aspiration pneumonitis Aspiration pneumonia Mendelson's Syndrome
PubMed MeSH	("Nurse Anesthetists" [MeSH Terms])	("Checklist" [MeSH Terms])	("Pneumonia, Aspiration" [MeSH Terms])
CINAHL Subject Headings	(MH "Certified Registered Nurse Anesthetists") OR (MH "Anesthetists")	(MH "Reference Tools")	(MH Pneumonia, Aspiration)
Google Scholar	Certified Registered Nurse Anesthetist	Reference Tool	Aspiration pneumonia

Appendix B

Literature Search Log

Search date	Database or search engine	Search strategy	Limits applied	Number of citations found/kept	Rationale for inclusion/exclusion of items
9/12/24	PubMed	(anesthesia) AND (pneumonia, aspiration) AND ((prevention) OR (treatment)) (("anaesthesia"[All Fields] OR "anesthesia"[MeSH Terms] OR "anesthesia"[All Fields] OR "anaesthesias"[All Fields] OR "anesthesias"[All Fields]) AND ("pneumonia, aspiration"[MeSH Terms] OR ("pneumonia"[All Fields] AND "aspiration"[All Fields]) OR "aspiration pneumonia"[All Fields] OR "pneumonia aspiration"[All Fields]) AND ("prevent"[All Fields] OR "preventability"[All Fields] OR "preventable"[All Fields] OR "preventative"[All Fields] OR "preventatively"[All	5 years (2019-2024) English Language	91 found/17 kept	Non-human studies, perioperative settings, aspiration related to surgical complications vs. anesthesia, foreign body aspiration, ventilator-associated pneumonia, adult population

		Fields] OR "preventatives"[All Fields] OR "prevented"[All Fields] OR "preventing"[All Fields] OR "prevention and control"[MeSH Subheading] OR ("prevention"[All Fields] AND "control"[All Fields]) OR "prevention and control"[All Fields] OR "prevention"[All Fields] OR "prevention s"[All Fields] OR "preventions"[All Fields] OR "preventive"[All Fields] OR "preventively"[All Fields] OR "preventives"[All Fields] OR "prevents"[All Fields] OR ("therapeutics"[MeSH Terms] OR "therapeutics"[All Fields] OR "treatments"[All Fields] OR "therapy"[MeSH Subheading] OR "therapy"[All Fields] OR "treatment"[All Fields] OR "treatments"[All Fields]))			
9/12/24	CINAHL	((MH "Anesthesia") OR (MH "Certified Registered Nurse Anesthetists") OR (MH "Anesthetists")	10 years (2013-2023)	7 found/5 kept	Broad study of deaths related to anesthesia, duplicate from previous searches

		OR (MH "American Association of Nurse Anesthetists")) AND (MH "Pneumonia, Aspiration")	English Language		
9/12/24	Google Scholar	“anesthesia” OR “CRNA” OR “nurse anesthetist” AND “aspiration pneumonia” OR “aspiration pneumonitis” OR “mendelson’s syndrome” AND “prevention” OR “treatment” OR “recognition”	2 years (2022-2024) English language	11,100 found/15 kept (10 pages reviewed)	Duplicate from previous searches, non-human studies, journal articles and grey literature

Appendix C

Literature Matrix

Year	Author, Title, Journal	Purpose & Conceptual Framework or Model	Design and Level of Evidence	Setting	Sample	Tool/s and/or Intervention/s	Results
2023	Ahmed, A., Hoda, M., Shamim, F., Siddiqui, A. S., Samad, K., & Ismail, S. (2023). Enhancing patient safety through education in a low-to-middle-income country: Training in the correct application of cricoid pressure. *The Journal of Education in Perioperative Medicine, 25*(4). https://doi.org/10.46374/volxxv_issue4_Ahmed	Purpose: Assess the effectiveness of structured workshops on improving knowledge and skills related to the correct application of CP among anesthesia technicians and critical care nurses No framework or model noted.	Design: pre-post intervention design, non-randomized controlled trial Level of Evidence: III	Operating rooms, intensive care units, emergency rooms	102 participants across five workshops conducted over three years	Intervention: 5 hour workshop including didactic teaching, hands-on practice, video demonstrations Training tools: kitchen weighing scale, tracheostomy trainer model with a pressure sensor, and 50 mL syringe Focus was on teaching the correct amount of pressure (30-40 N) needed to apply CP effectively, using these practical tools to simulate real-life conditions	Knowledge scores improved 73% from pre to post-test. Skill scores showed 131% improvement in skill Skill retention: 2 months after the training, 73.5% of participants returned for reassessment → 20% reduction in skill retention, but skills overall still remained better than pre-workshop levels
2023	Anesthesia Patient Safety Foundation. (2023). *APSF newsletter,*	Purpose: To discuss the potential for GLP1 agonists to cause delayed gastric emptying, which	Design: descriptive, observational study (case reports)	Operating room, procedural area	2 cases	POCUS (gastric) for case 1 Orogastric tube insertion to evacuate	Case 1: procedure cancelled due to high aspiration risk after detecting solid gastric contents via ultrasound

	Volume 38, Issue 3. https://www.apsf.org/wp-content/uploads/newsletters/2023/3803/APSF3803.pdf	increases the risk of pulmonary aspiration during anesthesia, despite patients following standard fasting protocols No framework or model noted	Level of Evidence: VI			gastric contents in case 2	after an 18 hour fast → indicates patient safety issue, loss of revenue, systems delays Case 2: patient underwent surgery, but during emergence from anesthesia, she vomited particulate matter from food eaten 2-3 days prior. Fortunately (thanks to skill and expertise of the provider) the airway was protected and aspiration was prevented → highlights the impact on patient safety and the importance of having skilled and knowledgeable providers who know how to manage aspiration Article also lists pertinent risk factors that are used in the QRG and specific GLP-1 agonists and dosing methods
2023	American Society of Anesthesiologists. (2023, June). American society of	Purpose: inform the anesthesia community and general public of new ASA guidelines regarding the recently	VII	N/A	N/A	N/A	-For patients on daily dosing consider holding GLP-1 agonists on the day of the procedure/surgery. -For patients on weekly

	anesthesiologists consensus-based guidance on preoperative management of patients (Adults and children) on glucagon-like peptide-1 (GLP-1) receptor agonists. ASA Newsroom. https://www.asahq.org/about-asa/newsroom/news-releases/2023/06/american-society-of-anesthesiologists-consensus-based-guidance-on-preoperative	popularized GLP-1 receptor agonist class of drugs as well as provide additional resources for review Framework: None					dosing consider holding GLP-1 agonists a week prior to the procedure/surgery. This suggestion is irrespective of the indication (type 2 diabetes mellitus or weight loss), dose, or the type of procedure/surgery. If GLP-1 agonists prescribed for diabetes management are held for longer than the dosing schedule, consider consulting an endocrinologist for bridging the antidiabetic therapy to avoid hyperglycemia
2023	Chaitra, T. S., Palta, S., Saroa, R., Jindal, S., & Jain, A. (2023). Assessment of residual gastric volume using point-of-care ultrasonography in adult patients who underwent elective surgery. *The Ultrasound Journal, 15*(1), 7-	Purpose: determine residual gastric volume of preoperative patients using POCUS, compare to fasting times, and observe correlations between POCUS results and patient factors No framework or model noted	Design: observational study Evidence: IV	Hospital	411, aged 18-80, ASA status I or II, BMI < 35 Exclusion criteria: history of esophageal or gastric surgery, GIT abnormalities, gastric tumors, BMI >35	POCUS (qualitative and quantitative assessment) - Content type and antral shape - antral CSA - estimated GRV Quantitative variables compared with Mann-Whitney and Kruskal-Wallis Qualitative variables compared with Chi-	- As BMI increased, there was a statistically significant increase in mean GRV in both supine and RLD positions - DM correlated with a larger GRV - 13 patients had increased risk of aspiration despite fasting times, statistically insignificant overall

	7. https://doi.org/10.1186/s13089-023-00307-8					square or Fisher's exact test	
2023	Greig, P. R., Zolger, D., Onwochei, D. N., Thurley, N., Higham, H., & Desai, N. (2023). Cognitive aids in the management of clinical emergencies: A systematic review.*Anaesthesia, 78*(3), 343-355. https://doi.org/10.1111/anae.15939	Purpose: evaluate available literature regarding the use of cognitive aids in relation to improving clinical performance in *emergency situations*. Specifically looked at: completeness of care delivered, error reduction, team performance, and time to intervention	Design: Systematic Review of 13 RCTs Level of Evidence: I	Hospitals (study locations varied across anesthesia, medical, surgical, and trauma scenarios)	13 RCTs of varying size	Cognitive aids in each RCT included: checklists, algorithms, and decision aids. Primary outcome: completeness of care Secondary outcomes: reduction in errors, improvement in teamwork, non-technical skills, conflict resolution, and global team performance assessment	Cognitive aids: significantly reduced the incidence of missed care steps during clinical emergencies from 43% to 11% Decrease in incidence of errors and increase in correctly performed clinical steps Improved teamwork skills, non-technical skills, conflict resolution scores Effect on time to first intervention and time to complete care was inconsistent across studies (notes that this could be due to confounding factors such as type of emergency, experience of clinician, rarity of crisis) Highlighted the need for familiarization and training with cognitive aids (which we will do in our project via the PowerPoint/verbal instruction submitted to

							CRNAs prior to and with dissemination of the tool) to maximize effectiveness AND aligning information with existing guidelines. Further refinement and proper integration of cognitive aids into clinical workflows are necessary for optimal results (which could be a point for future projects/adjustments in PDSA)
2023	Silveira, S. Q., da Silva, L. M., de Campos Vieira Abib, Arthur, de Moura, Diogo Turiani Hourneaux, de Moura, Eduardo Guimarães Hourneaux, Santos, L. B., Ho, A. M. -., Nersessian, R. S. F., Lima, F. L. M., Silva, M. V., & Mizubuti, G. B. (2023). Relationship between perioperative semaglutide use	Purpose: To determine if semaglutide is associated with delayed gastric emptying and increased gastric residual content in patients undergoing general anesthesia for elective EGD No framework or model noted.	Design: Single center, retrospective observational study with electronic chart review Evidence: IV	Hospital	404 (33 SG, 371 NSG) Inclusion: patients > 18 undergoing EGD under deep sedation/general anesthesia between the dates of July 2021 and March 2022 Exclusion: gastric outlet obstruction, gastric volvulus, frank/active esophageal/gastric/duodenal	Gastric Residual Content: defined as any amount of solid content, or > 0.8 mL/kg of fluid content measured from the suction cannister (within 30 days) two groups: patients who did take semaglutide vs. patients that did not take semaglutide	24.2% of patients in the semaglutide group were noted to have increased RGC in comparison with 5.1% of the non-semaglutide group, questions the length of time for patients to be off medications prior to surgery Patients at this facility are routinely instructed to stop taking Semaglutide 10-14 days prior to procedure as able. IRB approval gained, informed consent waived. No statistical power calculation was

	and residual gastric content: A retrospective analysis of patients undergoing elective upper endoscopy. *Journal of Clinical Anesthesia, 87*, 111091-111091. https://doi.org/10.1016/j.jclinane.2023.111091				bleeding, ASA Physical Status > IV, recent (< 2 mos) abdominal surgery, emergency endoscopic procedures, combined with other/surgical procedures, chronic renal and/or liver disease, achalasia, Zenker's diverticulum, linitis plastica, multiple myeloma, systemic collagenosis, amyloidosis, pregnancy, chronic opioid use, drug addiction, use of vasoactive agents, patients admitted to the intensive care unit, preoperative use/ingestion of medication known to affect gastric emptying (e.g.,		performed prior to the study. Selection bias: institution manages primarily complex oncological patients. 54.4% of medical records were excluded (given retrospective design). Several charts lacked the specific dosage and start date of GLP-1 therapy. Small sample of patients using Semaglutide (33) is not sufficiently powered to determine a recommendation. Fasting time in this study is significantly longer than ASA guidelines. Measurement was performed by different endoscopists – potential bias. Predominantly non-diabetic patients using semaglutide for weight loss. Future Recommendation for Study: Associated risk factors, Incidence of perioperative broncho-aspiration

					tricyclic antidepressants, opioids, pro-kinetics, histamine H2-receptor antagonists) other than semaglutide, and incomplete medical records		
2020	American Society of Anesthesiologists. (2020, December 13). *ASA physical status classification system*. American Society of Anesthesiologists. https://www.asahq.org/standards-and-practice-parameters/statement-on-asa-physical-status-classification-system	Describe the ASA classification system and its purpose in universal communication of each patient's medical comorbidities and preoperative anesthesia risk	Level VII (expert opinion)	N/A	N/A	N/A	ASA I: normal, healthy patient ASA II: mild systemic disease ASA III: severe systemic disease not incapacitating ASA IV: severe systemic disease that is a constant threat to life ASA V: moribund patient, not expected to survive without operation ASA VI: declared brain dead patients whose organs are being removed for donor purposes

2022	Ben-Haddour, M., Colas, M., Lefevre-Scelles, A., Durand, Z., Gillibert, A., Roussel, M., & Joly, L. (2022). A cognitive aid improves adherence to guidelines for critical endotracheal intubation in the resuscitation room: A randomized controlled trial with manikin-based in situ simulation. *Simulation in Healthcare : Journal of the Society for Medical Simulation, 17*(3), 156-162. https://doi.org/10.1097/SIH.0000000000000603	Purpose: To determine whether the use of a cognitive aid focusing on preintubation and postintubation tasks would improve the preparation and implementation of emergency endotracheal intubation in an emergency department setting. It also measured the times required for the procedure No framework or model noted.	Design: 2-center single-blind randomized controlled trial Evidence: II	Hospital	34 participants (17 physician-nurse pairs)	Cognitive aid developed from national guidelines and literature, used a 30-item checklist, with one point awarded for each item.	Simulation vs. real-world scenario Adherence to guidelines scores were significantly higher in the cognitive aid group than in the control group 2 of the 4 items that were significantly more performed in the CA group, and what accounted for the most global difference, are part of the 5 essential criteria that were considered "critical" according to guidelines Cognitive aid was consulted on average 10 times per sim, for a total average reading time of 86 seconds per simulation
2019	Kruisselbrink, R., Gharapetian, A., Chaparro, L. E., Ami, N., Richler, D., Chan, V. W. S., & Perlas, A.	to examine the accuracy (sensitivity, specificity, and likelihood ratios) of POC gastric ultrasound to detect a "full stomach"	Design: Prospective, randomized, observer-blinded Evidence: IV	Hospital	40 patients with 80 sessions total	Quantitative result possibilities: positive = any solid or > 1.5 mL/kg of clear fluid, Negative result = no solid and <1.5 mL/kg of clear fluid	2 subjects were excluded due to presenting with an already full stomach despite fasting 8 hours - This illustrates the fact that there is significant

	(2019). Diagnostic accuracy of point-of-care gastric ultrasound.*Anesthesia and Analgesia, 128*(1), 89-95. https://doi.org/10.1213/ANE.0000000000003372	Take home: Gastric PoCUS could be helpful (sensitivity of 1 and specificty of 0.975) in determining stomach contents when clinical uncertainty is involved but should not be used routinely for all patients as it has the possibility to detect false positives and delay patient care				Qualitative result possibilities: Nothing, clear fluid, or solid	individual variability in gastric emptying : results reflect the performance of the test under ideal circumstances and in a very well-controlled experiment, on subjects with normal body habitus. Therefore, the test may perform differently in clinical practice with a heterogeneous patient population who has ingested various types and quantities of food at different time intervals POCUS is highly reproducible with high intrarater and interrater reliability
2019	Noll, E., Shodhan, S., Varshney, A., Gallagher, C., Diemunsch, P., Florence, F. B., Romeiser, J., & Bennett-Guerrero, E. (2019). Trainability of cricoid pressure force application: A simulation-based study. *Anesthesia and*	Evaluate clinician's ability to apply CP at the recommended force levels to prevent aspiration during RSI	Design: Quasi-experimental Evidence: II	Hospital	100 (25 anesthesiologist attendings, 25 anesthesia residents, 25 CRNAs, 25 OR nurses	Simulation based 3D anatomical model of larynx used Force plate to measure CP	1.3% of participants were successful in meeting the target CP force. 96% of subjects failed to meet CP force in any of the initial trials

	Analgesia, 128(1), 109-116. https://doi.org/10.1213/ANE.0000000000003385						
2017	American Society of Anesthesiologists. (2017). Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: Application to healthy patients undergoing elective procedures: An updated report by the american society of anesthesiologists task force on preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary	Purpose: to synthesize available evidence and provide anesthesia providers the best available recommendations for practice regarding aspiration prevention in the perioperative patient No framework or model noted	Design: N/A (Expert opinion, review of literature) Evidence: VII	Procedural areas	N/A	N/A	Basis for information included in the QRG for the project Considered the current "standard" for elective surgery care Mix of expert opinion and scientific evidence (RCTs, etc.)

	aspiration. *Anesthesiology (Philadelphia), 126*(3), 376-393. https://doi.org/10.1097/ALN.0000000000001452						
2017	Pytka, S., & Crosby, E. (2017). Aspiration: Risks and prevention. In O. R. Hung & M. F. Murphy (Eds.), *Hung's difficult and failed airway management* (3rd ed.). McGraw-Hill Education. https://accessanesthesiology.mhmedical.com/content.aspx?bookid=2206&sectionid=171075369	Purpose: Chapter 5 provides an overview of the topic and specifically identifies the risk of aspiration in anesthesia, what the consequences or outcomes are, high-risk patient populations, and what is currently known (in 2017) about the interventions to prevent and manage it	Design: N/A Level of Evidence: VII	N/A	N/A	N/A	Relevant information on the history of cricoid pressure, benefit vs. risk, and how to perform Risk factors for aspiration (increases support for APSF, ASA guidelines) Management techniques for when aspiration occurs Resource for QRG per Dr. McAuliffe
2014	Zeidan, A. M., Salem, M. R., Mazoit, J., Abdullah, M. A., Ghattas, T., & Crystal, G. J. (2014). The effectiveness of cricoid pressure	Purpose: evaluate the effectiveness of CP No framework or model noted.	Design: Prospective observational study Evidence: III	Operating room	79 patients, anesthetized and paralyzed, ASA I and II status	CP of 30 N was applied with the purpose of occluding esophageal entrance and preventing aspiration Used Glidescope Video Laryngoscopy	Results showed that CP consistently prevented esophageal tube insertion, demonstrating a 95% success rate in occluding the esophagus.

	for occluding the esophageal entrance in anesthetized and paralyzed patients: An experimental and observational glidescope study. *Anesthesia and Analgesia, 118*(3), 580-586. https://doi.org/10.1213/ANE.0000000000000068					to visually assess the esophageal entrance with and without CP Gastric tubes were used as mechanical probes for insertion attempts into the esophagus Measured both visual and mechanical occlusion	Supports the use of CP to prevent aspiration in anesthesia (there is much controversy over whether this should be performed. But there is also no evidence to show that it is NOT helpful or causes harm to patients. Continues to be part of recommended guidelines)
1946	Mendelson, C. L. (1946). The aspiration of stomach contents into the lungs during obstetric anesthesia. *Anesthesiology (Philadelphia), 7*(6), 694-695. https://doi.org/10.1097/00000542-194611000-00040	Describe the phenomenon of aspiration pneumonitis for the first time, particularly in the realm of obstetric anesthesia	Design: retrospective observational study Evidence: IV	Hospital	66	N/A	-large food particles can block the airway and lead to immediate respiratory distress -aspiration of acidic gastric contents led to a severe inflammatory reaction in the lungs, causing hypoxia, respiratory distress, and death. Increased awareness of aspiration and eventually led to changes in anesthesia pressure (like CP, regional anesthesia) as well as placing a heavy emphasis on the importance of fasting

Note: Key to abbreviations used in chart: POCUS = Point of Care Ultrasound; ASA = American Society of Anesthesiologists; BMI = Body Mass Index; GIT = gastrointestinal tract; CSA = cross-sectional area; GRV = gastric residual volume; RLD = Right Lateral Decubitus; DM = Diabetes Mellitus; EGD = esophagogastroduodenoscopy; SG = semaglutide; NSG = non-semaglutide; RGC = residual gastric content; IRB = institutional review board; GLP-1 = glucagon-like peptide-1; PEM = printed educational material; QRG = quick reference guide; RCT = randomized controlled trial; CP = cricoid pressure; N = newtons; OR = operating room; RSI = rapid sequence intubation

Note: Key to Levels of Evidence: I: Systematic review/meta-analysis of randomized controlled trials (RCTs); II: RCTs; III: Nonrandomized controlled trials; IV: Controlled cohort studies; V: Uncontrolled cohort studies; VI: Descriptive or qualitative study, case study, EBP implementation and QI; VII: Expert opinion from individuals or groups. Adapted from: Melnyk, B. M. & Fineout-Overholt, E. (2019). *Evidence-based practice in nursing: A guide to best practice*. (4th ed., pp. 131). Philadelphia, Wolters Kluwer.

Adapted from Brown, S. J. (2018) *Evidence-based nursing: The research-practice connection*. (3rd ed.). Jones & Bartlett Learning.

Appendix D

CON/IRB Approval Forms

Human Subject Research Determination Form

This form should be completed and submitted for review by the service lines impacted by the work prior to project initiation (including, but not limited to, collection or analysis of baseline data). Projects that are "Not Human Subjects Research" are not required to submit an IRB application in ePirate. To help make that determination, you may utilize the Decision Chart provided by the Office for Human Research Protections along with this worksheet. For any project where there is a question as to whether it qualifies as Quality Improvement or Research, or if certification of "Not Human Subjects Research" is needed for publication, please route to the UMCIRB office via email: umcirb@ecu.edu.

Please check the Office of Clinical Research Website or UMCIRB website to make sure that you have the most recent version of this form.

Project Title	CRNA Perceptions of a Quick Reference Guide for Aspiration Pneumonitis in Clinical Practice: A DNP Project
Project Leader	Rachel Garrou
Project Leader Contact E-mail	Garrour15@students.ecu.edu
Department or Unit Affiliation	Anesthesia
Project Advisor (if applicable)[1]	Maura McAuliffe PhD, CRNA, FAAN

Additional Faculty, Staff, and Trainees Involved (add more rows if needed):

Name	Department or Unit	Role	Check this box if this team member will access PHI or PII for the purposes of this project.
Caitlin Davis	Anesthesia	Student project team member	☐
Eric LaRoque	Anesthesia	Student project team member	☐
John Dockery	Anesthesia	Student project team member	☐
			☐
			☐
			☐
			☐
			☐
			☐
			☐
			☐

[1] All student, resident, and fellow projects must have a faculty or unit leader designated as the advisor for the project.

			☐
			☐
			☐

Please answer the following questions to the best of your ability. If the answers to these questions change during the course of the project, please resubmit this form for review:

End Goal / Desired Outcome:

This Doctor of Nursing Practice (DNP) quality improvement project aims to assess Certified Registered Nurse Anesthetists' (CRNAs') perceptions of the adequacy of a newly developed cognitive aid regarding aspiration pneumonitis and any impact it may have on their confidence in managing aspiration pneumonitis. This project is relevant as it has been shown that using cognitive aids in unfamiliar circumstances can reduce cognitive overload during a crisis and enhance clinician confidence and performance, allowing for a reduction in errors and improving patient outcomes. This project will be successful if the newly developed cognitive aid is well-received and increases CRNA confidence in managing aspiration pneumonitis in the perioperative setting. Knowledge gained from this project could be used in future quality improvement and policy efforts to standardize anesthesia care and increase CRNA confidence in managing aspiration pneumonitis.

Methodology / Intervention:

[The project framework is a single Plan, Do, Study, Act (PDSA) cycle using a pre- and post-implementation survey design. During the *plan* phase, a cognitive aid addressing aspiration pneumonitis in the perioperative settings will be designed based on current national guidelines and accepted practice standards within the practice site and will address a project site need. CRNA participants will be recruited, and their participation will be voluntary. During the *do* phase, project participants will be contacted via email and asked to complete a pre-implementation survey, watch an informational PowerPoint Presentation, utilize/assess the project tool during the implementation period, and complete a post-implementation survey evaluating the project tool based on their perceptions of its applicability to their clinical practice and any impact it may have on their confidence in managing aspiration pneumonitis. During the *study* phase, the project lead will analyze the data obtained from the pre- and post-implementation surveys to determine CRNA perceptions of the cognitive aid and any impact on their confidence in managing aspiration pneumonitis in the perioperative period. Knowledge gained from this project could be used in future quality improvement and policy efforts to standardize anesthesia care and increase CRNA confidence in managing aspiration pneumonitis.

Data to be collected:

[Data will be gathered confidentially and directly from participants through Qualtrics pre- and post-implementation surveys delivered and completed electronically. Qualtrics survey software is accessed through ECU and involves multifactorial password protection. The surveys will contain nominal, ordinal, and free response data. No PHI will be collected for this project.
Aside from participant emails, no identifiable data will be gathered. Data of interest are participant perceptions of the adequacy of the cognitive aid in clinical practice and any impact it may have on their confidence in managing aspiration pneumonitis.
Once collected, the data will be transferred to Excel for deidentification and analysis. Data in Excel will be stored on a password-protected spreadsheet and laptop. The deidentified data will be analyzed, and the results will be shared via a poster presentation to the ECU Nurse Anesthesia Program students and faculty, with project participants invited to view the presentation remotely. If requested, a presentation of results to the participating department will be provided. Data will be stored in Qualtrics and Excel files (de-identified) until student graduation, anticipated in the spring of 2026. Additionally, the analysis of results will be discussed in a DNP Project Paper, the completion of which is required for program graduation. This paper will be posted in the ECU digital repository, The Scholarship.

Complete the following questions to guide leadership's determination of this project's status:

	True	False
The PRIMARY purpose of the proposed activity or project is limited to: - implementing a standard practice to improve the quality of patient care and to collect data regarding that implementation for clinical, practical, or administrative purposes, and/or - delivering healthcare and measuring and reporting provider performance data for clinical, practical, or administrative uses.	☒	☐
The activity or project would be carried out even if there was no possibility of publication in a journal or presentation at an academic meeting.	☒	☐
The activity or project falls under well-accepted care practices/guidelines and are designed to bring about immediate improvements in health delivery or quality of care. If "true" and the project is related to clinical activity, please provide a citation below as evidence that project activities fall within standards of care. Projects not directly related to clinical activity, such as medical education, do not need to provide a citation. Project activities fall within the standards of care related CRNA prevention, recognition, and management of aspiration pneumonitis. Pytka, S., & Crosby, E. (2017). Aspiration: Risks and prevention. In O. R. Hung & M. F. Murphy (Eds.), *Hung's difficult and failed airway management* (3rd ed.). McGraw-Hill Education. https://accessanesthesiology.mhmedical.com/content.aspx?bookid=2206&sectionid=171075369	☒	☐
The activity or project involves "no more than minimal risk" procedures. (i.e., the probability and magnitude of harm or discomfort anticipated are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests).	☒	☐

Please submit this form to your supervisor (or designee) for review and approval. Signature on this form certifies that that the below individual is in support of this project taking place and agrees with the project leader's answers to the above questions:

Supervisor's Name	Ryland Elliott	Brandon Faucette

Docusign Envelope ID: 0F59E0C1-9A5D-4F8F-8EBC-D7A9241B63AF

Signature	DocuSigned by: [redacted] 2DAD3BC3A56B498...	Signed by: [redacted] 9C7CE1FE9AB441A...
Date	2/10/2025 | 5:37 PM PST	2/26/2025 | 12:06 PM EST

For Project Leaders: From the list below, please check the boxes for each service line where interventions may take place or where data may be collected. For each selected area, please route for signature for both the physician leader and administrator (preferably via DocuSign). Send a completed copy of the form to qualityimprovement@ecu.edu.

For Service Line Leaders: Signature on this form certifies that you are in support of this project taking place and agree with the answers to the above questions. If you are not in support of the proposed project, please discuss with the project leader, supervisor, and UMCIRB as needed.

	SERVICE LINE	SIGNATORY
☐	Adult Medicine (Medical Critical Care, Infectious Disease, Hospital Medicine, Pulmonology, Endocrinology, Allergy, Dermatology, & Nephrology)	Paul Bolin, MD
☒	Adult Surgical Service (Anesthesiology, Trauma, ENT, Benign Urology, Plastics, Ophthalmology, Transplant Surgery, & Acute Care Surgery)	Signed by: [redacted] Eric DeMaria, MD Signed by: [redacted] Wendy Leutgens, MSN
☐	Behavioral Health (Child / Adolescent Psychiatry, Behavioral medicine, & Adult Psychiatry)	Michael Lang, MD Todd Hickey, MHA
☐	Cancer (Breast cancer, Lung cancer, Gynecologic cancer, hematology, GI cancer, Urologic cancer, and Head & Neck cancer)	Emmanuel Zervos, MD Todd Hickey, MHA
☐	Children's Health (Pediatric Surgery, General Pediatrics, Well Newborn, Newborn & Pediatric Critical Care, Pediatric Hem-Onc, Neonatology, Pediatric medicine, Medicine subspecialities, surgical subspecialties)	Matthew Ledoux, MD Tara Stroud, DNP
☐	Emergency Services (Emergency Preparedness, Emergency Management, & Emergency Services)	Leigh Patterson, MD Debra Hernandez, MHA
☐	Heart & Vascular	

	(Interventional Cardiology, Electrophysiology, Cardiac Surgery, Advanced Heart Failure, Cardiac Critical Care, Vascular Surgery, Cardio pulmonary rehab, Structural heart, & Thoracic Surgery)	Mark D. Iannettoni, MD Jay Briley, MHA
☐	Neuro Sciences (Neurology, Neurosurgery, Neuro Degenerative Disease, Neuro Critical Care, Stroke, Neuro Radiology, & Spine)	Stuart Lee, MD Jay Briley, MHA
☐	Nursing	Trish Baise, DNP
☐	Orthopedics (Joints, Orthopedic Surgery, Rheumatology, Sports medicine, Orthopedic medicine, & Orthopedic Trauma)	Deanna Boyette, MD Van Smith, MBA/MHA
☐	Pathology & Lab Services	Craig Steffee, MD Dave Harlow, PharmD
☐	Physical Medicine & Rehab (Rehab, Therapy (OT, PT, SLP), Pain, Wound Care, & Audiology)	Clint Faulk, MD Dave Harlow, PharmD
☐	Primary Care (Family medicine, Med-Peds, General Internal Medicine, Palliative Care, Geriatrics, & Sleep Medicine)	Jonathon Firnhaber, MD Dan Drake, PhD
☐	Radiology	Eric Martin, MD, PhD Dave Harlow, PharmD
☐	Women's Health (Gynecology, Obstetrics, & Maternal Fetal Medicine)	James Whiteside, MD Tara Stroud, DNP
☐	Projects that do not fit in the above service line areas	

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Niti Armistead, MD

Brian Floyd, MBA

Optional Determination:
For any project where there is a question as to whether it qualifies as Quality Improvement or Research, or if certification of "Not Human Subjects Research" is needed for publication, please route to the UMCIRB office via email: umcirb@ecu.edu.

☒ **Not Human Subjects Research:** The UMCIRB office has determined that based on the description of the project, approval by the IRB is not necessary. Any changes or modifications to this project may be discussed with the UMCIRB office at that time to ensure those changes do not elevate the project to human research that would need IRB approval.

☐ **Human Subjects Research:** This project requires review by the IRB prior to initiation. An application in the electronic IRB submission system should be submitted.

UMCIRB Office Staff Signature: Signed by: [redacted] 05370E520AB34D3... **Date:** 4/3/2025 | 8:03 PM EDT

The UMCIRB office will contact you if any further information is needed to make this determination. Please note that if the UMCIRB office determines the activity is not human subjects research, then any presentation, publication, etc. should not refer to the activity as such.

Appendix E

Quick Reference Guide

ECU COLLEGE OF NURSING

Aspiration Pneumonitis

Maura McAuliffe, PhD., CRNA, FAAN, Project Chair
Caitlin Davis, BSN, RN, SRNA
John Dockery, BSN, RN, SRNA
Rachel Garrou, BSN, RN, SRNA
Eric LaRoque, BSN, RN, SRNA

Risk Factors for Aspiration

Delayed gastric emptying
- Pregnancy
- Obesity
- Diabetes Mellitus
- Neuromuscular Disorder
- Neurological Disorder
- GLP-1 agonist use
- Opioids

Age
- Elderly
- Children <3 years

Intra-abdominal Pressure Exceeds Esophageal Pressure
- Obstruction
- Hiatal Hernia
- GERD

Emergency Surgical Status
ASA Status IV or V
Gastric pH >2.5
Gastric Volume >25mL

5

ASA Fasting Guidelines for Elective Procedures for Healthy Patients

Ingested Material	Fasting Period
Clear liquids	2h
Breast milk	4h
Infant formula	6h
Nonhuman milk	6h
Light meal	6h
Fried foods, fatty foods, meat	8h

1-19% of adult general anesthesia patients experience pulmonary aspiration!

2

Cricoid Pressure for RSI

Apply at the start of induction and do not release until intratracheal position of the tube is confirmed.[5]
Goal is to occlude the esophagus between cricoid cartilage and cervical vertebrae *without* occluding the airway.[5]

How much is enough?

30-40 N of pressure[1]
Pushing to **33 mL** on a 50 mL syringe **OR 3 kg** on a kitchen food scale.[1]

Management of Aspiration

- Aggressive tracheal suctioning
- Administer supplemental oxygen
- Avoid excess PEEP
- ABG
- Bronchoscopy and/or chest X-ray if large particulate matter
- Post-operative observation for complications
- No prophylactic antibiotics → use only if pneumonia occurs post-injury

5

ASPF & ASA GLP-1 Agonists Holding Parameters:

Daily dosed medications should be held the day before surgery.

Weekly dosed medications should be held one week before surgery.

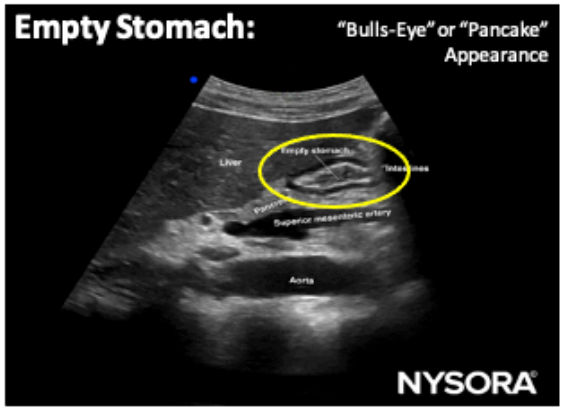
	GLP-1 Agonists	Clinical Dosing	Pharmacokinetics HALF-LIFE	Pharmacokinetics ELIMINATION	Special Considerations
1st Generation	Exanetide (Byetta®, Bydureon®)	SQ, twice daily (IR), weekly (ER), uptitrated	3 hours	Renal	Associated with immune-mediated thrombocytopenia
1st Generation	Lixisenatide (Adlyxin®)	SQ, daily, uptitrated	3 hours	Renal	No longer available in United States
2nd Generation	Semaglutide (Wegovy®, Ozempic®) (Rybelsus®)	SQ, weekly, uptitrated Oral, daily, uptitrated	7 days	Renal	Approved (SQ formulation only) for weight loss
2nd Generation	Liraglutide (Saxenda®, Victoza®)	SQ, daily uptitrated	12.5 hours	Renal	Approved for weight loss
2nd Generation	Dulaglutide (Trulicity®)	SQ, weekly	4.5 days	Renal	
	GLP-1/GIP Agonist				
	Tirzepatide (Mounjaro®)	SQ, weekly	5 days	Renal	Approved for weight loss

SQ = Subcutaneous.

2, 3

Gastric Point-of-Care Ultrasound

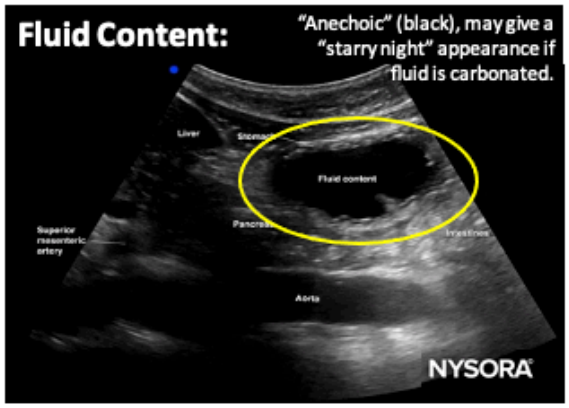
Grade 0	**Empty stomach:** No content is visualized in the supine and RLD position
Grade 1	**Low risk:** Fluid content is visualized and calculated to be **less than 1.5 mL/kg**
Grade 2	**High risk:** Fluid content is visualized and exceeds **1.5 mL/kg**



Patients are scanned in 2 positions: supine and right lateral decubitus

Supine: Assess for type and amount of content

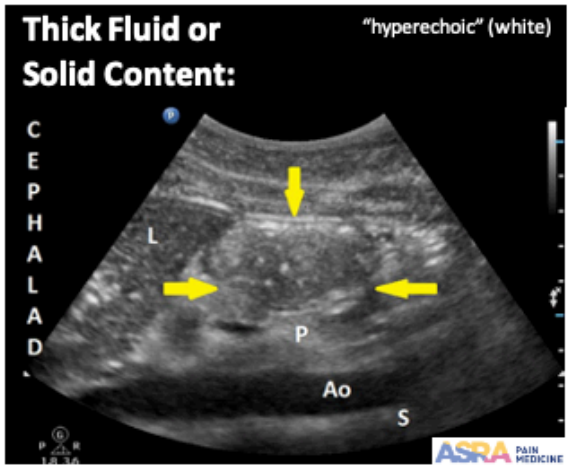
RLD: Assess for grade of risk based on the gastric volume present



Gastric volume (mL) = 27.0 + (14.6 x CSA of antrum in RLD) – (1.28 x age)

Gastric UltraSound
A Point-of-care tool for aspiration risk assessment

Right lat CSA	Age(y) 20	30	40	50	60	70	80
2	31	18	5	0	0	0	0
3	45	32	20	7	0	0	0
4	60	47	34	21	9	0	0
5	74	62	49	36	23	10	0
6	89	76	63	51	38	25	12
7	103	91	78	65	52	40	27
8	118	105	93	80	67	54	41
9	133	120	107	94	82	69	56
10	147	135	122	109	96	83	71
11	162	149	136	123	111	98	85
12	177	164	151	138	125	113	100
13	191	178	165	153	140	127	114
14	206	193	180	167	155	142	129
15	220	207	194	182	169	156	143
16	235	222	209	200	184	171	158
17	249	236	224	211	198	185	173
18	264	251	239	226	213	200	187
19	278	266	253	240	227	214	202
20	293	281	268	255	242	229	217
21	307	295	282	269	256	244	231
22	323	310	297	284	271	259	246
23	337	324	311	298	285	273	260
24	352	339	326	313	301	288	275
25	366	353	340	327	315	302	289
26	381	368	355	343	330	317	304
27	395	382	369	357	344	331	318
28	410	397	385	372	359	346	333
29	424	411	398	386	373	360	347
30	439	427	414	401	388	375	363



Appendix F

Initial Pre-Survey Email and PowerPoint to Participants

Dear ECU Health Chowan Hospital CRNAs,

Thank you for considering participating in a quality improvement project titled "CRNA Perceptions of a Quick Reference Guide for Aspiration Pneumonitis in Clinical Practice: A DNP Project." The purpose of this project is to assess the perceptions of CRNAs at ECU Health Chowan Hospital related to the adequacy of a quick reference guide designed to aid in the prompt identification of at-risk patients and provide prevention strategies and treatment options for perioperative aspiration pneumonitis.

Participation is voluntary and will involve completing a short pre-implementation survey, viewing a brief video, utilizing a quick reference guide in your CRNA practice for two weeks (at your discretion), and completing a short post-implementation survey when the two-week implementation period is over.

Each survey should take less than 5 minutes to complete. The surveys were created and are completed using Qualtrics® survey software. The use of the quick reference guide falls within currently accepted practice in your work area. Your participation is voluntary and confidential. We will share the results of this QI study with you upon completion.

First, complete the pre-implementation survey linked here.

Following completion of the survey, view the informational PowerPoint attached to this email. Quick reference guides are available at the end of the PowerPoint and physical copies are available for on-site use in the anesthesia lounge.

Again, thank you for your participation in our quality improvement project. If you have any questions, I will be at ECU Health Chowan Hospital from June 9 until June 19. You may also reach out to me or Dr. Maura McAuliffe by email at any time.

Sincerely,

Rachel Garrou, SRNA
Email: garrour15@students.ecu.edu

Maura McAuliffe, PhD, CRNA, FAAN, Project Chair
Email: mcauliffem@ecu.edu

Pre-Survey and PowerPoint Reminder Email to Participants

Hello ECU Health Chowan Hospital CRNAs,

I just wanted to send a quick reminder about the ongoing DNP Project on aspiration pneumonitis (original email below). Thank you if you've already completed the pre-survey and viewed the PowerPoint. If you haven't had a chance to do so yet, it's not too late and would be very helpful and much appreciated. There are still quick reference guides in the anesthesia lounge if you haven't already received one. You may use these at your discretion. After the end of next week, I will begin sending out the post-surveys.

Links:
Pre-survey

Please let me know if you have any questions and thank you again for your participation.

Sincerely,

Rachel Garrou, SRNA
ECU Nurse Anesthesia Program
Class of 2026

Post-Survey Email to Participants

Dear ECU Health Chowan Hospital CRNAs,

Thank you to everyone who has already completed my pre-survey and viewed the video. It's now time to complete the brief post-survey.

If you have not filled out a pre-survey, I would really and truly appreciate your participation (it's just surveys and a PowerPoint!). The link to the pre-survey is here, and you can follow it up by watching the introductory PPT attached to this email. Quick reference guides are available for your use if you would like them, but their use is not mandatory for participation in this project.

If you've already completed the first survey, please complete the post-survey here. It should take less than 2 minutes.

If anyone has questions or issues with any of these links, please let me know. Again, thank you to everyone for your help and for being excellent preceptors. I look forward to coming back to ECU Health Chowan Hospital soon.

Sincerely,

Rachel Garrou, SRNA
ECU Nurse Anesthesia Program
Class of 2026

Final Thank You Email to Participants

Dear ECU Health Chowan Hospital CRNAs,

I just wanted to say thank you so much to everyone for helping me out with my DNP Project! I have collected all the data I need to proceed with data analysis and will then be finishing my paper. Once it's complete, you all will be able to read it if you'd like. If you liked the quick reference guide and found it useful, you can find additional copies in the anesthesia lounge for use when desired.

Thank you again! I hope to work with you more in the future.

Take care,

Rachel Garrou, SRNA
ECU Nurse Anesthesia Program
Class of 2026

Appendix G

Qualtrics Surveys

How many years have you been practicing as a CRNA?

- ○ Less than 1 year
- ○ 1 - < 3 years
- ○ 3 - < 6 years
- ○ 6 - 9 years
- ○ 10 or more years

How confident do you feel in recognizing patient risk factors associated with increased risk for aspiration pneumonitis?

- ○ Not confident at all
- ○ Slightly confident
- ○ Moderately confident
- ○ Highly confident
- ○ Completely confident

Which condition is NOT considered high risk for pulmonary aspiration?

- ○ Delayed gastric emptying
- ○ ASA status of IV and V
- ○ Emergency surgical status
- ○ Lower esophageal sphincter pressure exceeds intra-abdominal pressure
- ○ Gastric pH < 2.5 or gastric volume > 25mL

Which of the following NPO recommendations from the ASA for healthy patients undergoing elective surgery is correct? (choose one)

- ○ Clear liquids should be held at midnight before the procedure.
- ○ Formula should be held for 8 hours before the procedure.
- ○ Breast milk should be held 2 hours before the procedure.
- ○ Light meals should be held 6 hours before the procedure.

Which of the following guidelines regarding GLP-1 agonists are correct? (Select all that apply)

- [ ] Weekly administered medications should be held one week prior to the procedure.
- [ ] Daily administered medications should be held on the morning of the procedure.
- [ ] Weekly administered medications should be held one month prior to the procedure.
- [ ] Daily administration should be held the day before the procedure.

Which is NOT a current evidence-based recommendation for the management and treatment of pulmonary aspiration?

- ○ Aggressive tracheal suction
- ○ Administer supplemental oxygen
- ○ Avoid excess PEEP when possible
- ○ Perform a bronchoscopy for large particulate matter or significant volume of aspirated contents
- ○ Administer antibiotics and steroids prophylactically

Have you received any formal training on point-of-care gastric ultrasound (POCUS)?

Yes	No
○	○

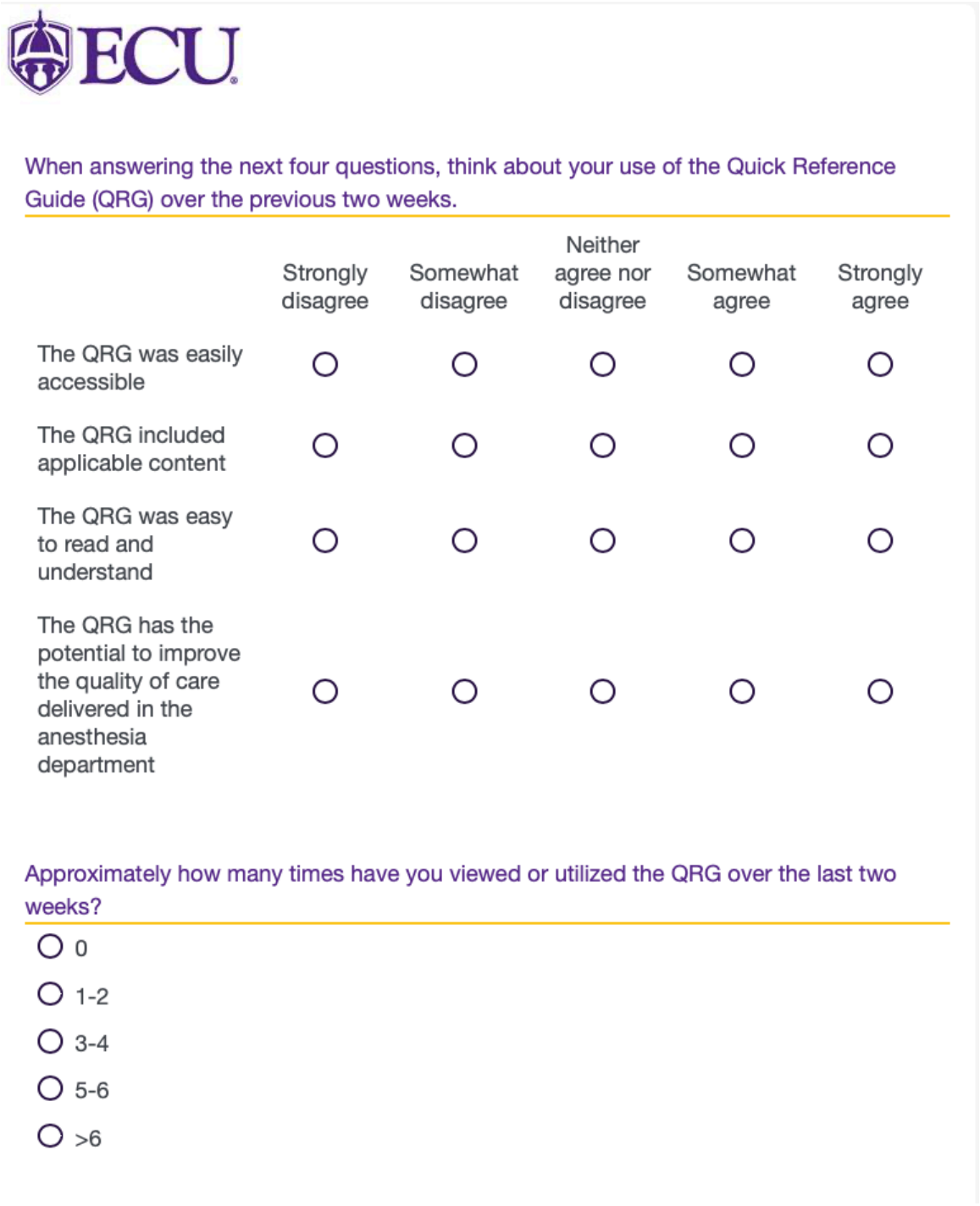
How confident do you feel about identifying stomach contents on an ultrasound?

- ○ Not confident at all
- ○ Slightly Confident
- ○ Moderately confident
- ○ Highly confident
- ○ Completely confident

Which gastric volume is considered to be significant content (i.e. a “full stomach”) with potential aspiration risk?

- ○ > 0.5 mL/kg
- ○ >1 mL/kg
- ○ >1.5 mL/kg
- ○ >2 mL/kg

Qualtrics Surveys



When answering the next four questions, think about your use of the Quick Reference Guide (QRG) over the previous two weeks.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The QRG was easily accessible	○	○	○	○	○
The QRG included applicable content	○	○	○	○	○
The QRG was easy to read and understand	○	○	○	○	○
The QRG has the potential to improve the quality of care delivered in the anesthesia department	○	○	○	○	○

Approximately how many times have you viewed or utilized the QRG over the last two weeks?

- ○ 0
- ○ 1-2
- ○ 3-4
- ○ 5-6
- ○ >6

If utilized, how much additional time (on average) did it take to reference the QRG per patient scenario?

- ○ Not Applicable
- ○ < 1 minute
- ○ 1 - < 2 minutes
- ○ 2 - < 5 minutes
- ○ > 5 minutes

After reviewing the QRG, how confident are you in your ability to recognize patient risk factors associated with increased risk for aspiration pneumonitis?

- ○ Not confident at all
- ○ Slightly confident
- ○ Moderately confident
- ○ Highly confident
- ○ Completely confident

Which condition is NOT considered high risk for pulmonary aspiration?

- ○ Delayed gastric emptying
- ○ ASA Status of IV and V
- ○ Emergency surgical status
- ○ Lower esophageal sphincter pressure exceeds intra-abdominal pressure
- ○ Gastric pH <2.5 or gastric volume >25mL

Which of the following NPO recommendations from the ASA for healthy patients undergoing elective surgery is correct? (choose one)

- ○ Clear liquids should be held at midnight before the procedure.
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- ○ Light meals should be held 6 hours before the procedure.

Which of the following guidelines regarding GLP-1 agonists are correct? (Select all that apply)

- [ ] Weekly administered medications should be held one week prior to the procedure.
- [ ] Daily administered medications should be held the morning of the procedure.
- [ ] Weekly administered medications should be held one month prior to the procedure.
- [ ] Daily administration should be held the day before the procedure.

8. Which is NOT a current evidence-based recommendation for the management and treatment of pulmonary aspiration?

- ○ Aggressive tracheal suction.
- ○ Administer supplemental oxygen.
- ○ Avoid excess PEEP when possible.
- ○ Perform a bronchoscopy for large particulate matter or significant volume of aspirated contents.
- ○ Administer antibiotics and steroids prophylactically.

Which gastric volume is considered to be significant content (i.e. a “full stomach”) with potential aspiration risk?

- ○ >0.5 mL/kg
- ○ >1 mL/kg
- ○ >1.5 mL/kg
- ○ >2 mL/kg

After reviewing the QRG, how confident do you feel using an ultrasound to identify gastric contents preoperatively?

- ○ Not confident at all
- ○ Slightly confident
- ○ Moderately confident
- ○ Highly confident
- ○ Completely Confident

Based on the information provided about using POCUS for gastric volume assessment, would you be interested in an in-service on the topic?

- ○ Yes
- ○ No

How likely are you to continue using the QRG when encountering patients at risk for aspiration pneumonitis in the future?

- ○ Not likely at all
- ○ Somewhat likely
- ○ Neutral
- ○ Moderately likely
- ○ Highly likely

13. Please share any feedback you have about the QRG.