CRNAs' Perceptions of a Quick Reference Guide for Aspiration Pneumonitis: A Quality Improvement Project

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Abstract

Perioperative aspiration pneumonitis continues to be a relevant complication in anesthesia as it is one of the leading causes of morbidity and mortality. The purpose of this Doctor of Nursing Practice quality improvement project is to assess the perceptions of CRNAs working at a partnering facility regarding the adequacy of a Quick Reference Guide (QRG) designed to aid in the prompt identification of at-risk patients and provide prevention strategies and treatment options for perioperative aspiration pneumonitis. A newly designed aspiration QRG was distributed to CRNAs working at an outpatient surgery center for use during a two-week implementation period. A pre- and post-implementation survey was used to collect data. By comparing survey results, CRNAs showed an increased awareness of fasting guidelines, GLP-1 agonist recommendations, and the use of gastric ultrasound to assess aspiration risk. Post-implementation survey results showed mixed reviews on the usefulness of the QRG and CRNAs' likelihood of using it again. However, the post-implementation survey did indicate a desire for more hands-on training in the use of gastric ultrasound as a tool to assess aspiration risk.

Keywords: anesthesia, aspiration, ultrasound, guide

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Section I. Introduction

Background

Despite its low incidence, aspiration is one of the leading causes of anesthesia-related morbidity and mortality (Zdravkovic et al., 2020). Aspiration can lead to aspiration pneumonitis, a chemical injury caused by an acidic substance traveling into the airway, resulting in an inflammatory response (Pytka & Crosby, 2017). The volume, particularity, and pH of aspirate influence the degree of injury. Inflammatory substances are released, leading to more permeable alveolar capillaries, neutrophil migration, and furthered airway edema. This contributes to increased airway resistance and decreased lung compliance. As a result, patients can have ventilation-perfusion mismatch, hypoxemia, and atelectasis. Attempting to neutralize aspirate with a higher pH solution can further irritate the lung, causing more inflammation. Aspiration pneumonitis can be challenging to differentiate from pneumonia given the similar findings on X-ray and clinical picture; however, aspiration pneumonitis is often an acute response to aspiration of gastric contents during the perioperative period and when mild resolves within 24 hours with supportive oxygen therapy while aspiration pneumonia is more often the result of aspiration of bacterial growth from colonized oropharyngeal secretions, especially in those who have required prolonged ventilatory support or those with comorbid conditions.

While the incidence of aspiration is suspected to be around 1:2000 to 1:4000 cases, prevention of aspiration pneumonitis is a topic of interest due to its associated high rate of morbidity and mortality (Pytka & Crosby, 2017). A closed claims study found that the claims associated with perioperative aspiration resulting in death in 61% of cases (Warner et al., 2021). A first step in prevention is identifying patients at increased risk. Patients at increased risk for perioperative aspiration include those with delayed gastric emptying, with certain medication

usage, with full stomachs or increased gastric volume, at either end of the age spectrum, and those classified as American Society of Anesthesiologists (ASA) class IV and V (Pytka & Crosby, 2017).

The ASA has published guidelines for preventing aspiration. Their most recent guidelines advise on pre-operative fasting for elective surgery with respect to clear liquids, breast milk, non-human milk and formula, light meals, and fat-containing meals (ASA, 2017). The guidelines also address use of pre-operative medications for healthy and at-risk patients, such as anticholinergics, gastric acid secretion-blocking medications, non-particulate antacids, and antiemetics.

The increasing popularity of glucagon-like peptide receptor agonists (GLP-1 agonists) has presented additional challenges to mitigating the risk of aspiration as these medications delay gastric emptying, which predisposes patients to this event (Beam & Guevara, 2023). The ASA has released recommendations for how long GLP-1 agonists should be held prior to elective surgery and recommendations for patients taking GLP-1 agonists who are undergoing emergency surgery or who are unable to hold their medication prior to surgery (Joshi et al., 2023). The ASA also outlines the usefulness of gastric ultrasound when assessing the risk of aspiration. The American Association of Nurse Anesthesiology (AANA) also released considerations regarding care for patients taking GLP-1 agonists. The AANA guidelines mirror the ASA guidelines with respect to holding the medication prior to surgery and recommendations for use of ultrasound to estimate gastric volumes to further evaluate the patient's risk of aspiration (AANA, 2024). Since the presence of gastric contents is one of the largest modifiable risk factors influencing the prevention of aspiration, ultrasound imaging of the stomach may become a future standard of care, especially in high-risk patients (Cieslak et al., 2020).

A common practice to mitigate the risk of aspiration is utilizing a rapid sequence induction on patients at higher risk of aspiration who require general anesthesia (Pytka & Crosby, 2017). However, an international survey of over 10,000 anesthetists and airway experts revealed a lack of consensus among providers in their approach to managing aspiration risk (Zdravkovic, et al., 2020). Current recommendations for managing aspiration pneumonitis after it has occurred largely support oxygenation and ventilation therapy in accordance with the patient's needs (Pytka & Crosby, 2017).

Checklists are frequently used for low-frequency, high-risk patient scenarios (Turkelson et al., 2020). A checklist or quick reference guide (QRG) can accurately display up-to-date, best-practice guidelines, improving a provider's confidence in potentially stressful situations. A QRG may help lead to a current and standardized approach to identifying at-risk patients and managing aspiration pneumonitis. In an era of evolving research on medications that increase the risk of aspiration, such as GLP-1 agonists, QRGs offer current approaches to determining the risk of aspiration using ultrasound imaging.

Organizational Needs Statement

While every anesthesia provider is aware of the possibility and seriousness of aspiration pneumonitis, the partnering facility for this quality improvement project has no organizational policy specific to aspiration pneumonitis. This is not uncommon. Anesthesia practitioners refer to the national guidelines and recommendations set forth by the ASA and the AANA. However, given the severity of this low-frequency event and evolving research pertaining to patients taking GLP-1 agonists, CRNAs at this site may benefit from a QRG to aid in identifying at-risk populations and provide prevention strategies and treatment options for the management of perioperative aspiration pneumonitis should it occur.

Problem Statement

Perioperative aspiration pneumonitis continues to be a relevant complication in anesthesia as it is one of the leading causes of morbidity and mortality. The incidence of perioperative aspiration is estimated to be between 1:2000 and 1:4000 cases, making it an event most anesthetists will encounter in their careers (Pytka & Crosby, 2017). Perioperative aspiration can lead to adverse outcomes, increased length of stay, and increased incurred costs to the patient and hospital (Reed & Haas, 2020).

Purpose Statement

The purpose of this Doctor of Nursing Practice quality improvement project is to assess the perceptions of CRNAs working at the partnering facility regarding the adequacy of a QRG 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 quality improvement projects aimed at improving this rare but potentially catastrophic perioperative event at this partnering facility.

Section II. Evidence

Description of Search Strategies

The problem, intervention, comparison, outcome, time, and setting (PICOTS) question used to guide the literature search regarding the practice problem was: Does a quick reference guide improve CRNAs' knowledge of aspiration pneumonitis during the perioperative period? The main concepts used when searching the literature for information, shown in Appendix A, were *quick reference guide, CRNA, and aspiration pneumonitis.* The Boolean Operators AND and OR were used to combine the keywords/concepts into search strategies. Searches were conducted in the databases PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the search engine Google Scholar was also used to identify current literature. For literature to be kept for full review, the article needed to focus on risk factors, prevention, recognition, and treatment of aspiration pneumonitis not related to a specific disease. For searches related to a quick reference guide or educational tool, the article needed to explore the usefulness of an educational tool for high-risk, low-frequency events. The literature search log can be found in Appendix B.

In PubMed, the search strategy was (Anesthesia OR Anesthetists OR Nurse Anesthetists) AND (Pneumonia, Aspiration). The search originally included the term "checklist," but limited results were returned. Limits applied to the search were published within the years 2019 and 2024, human subjects, English language, and full text. Seventy articles were found in the initial search. Nine articles were kept after screening for relevance based on the title and abstract. However, after a full review of the nine articles for relevance to the topic, integrity of the study, setting, and population, none were used in the literature synthesis.

In CINAHL, the search strategy used was (MH “Reference Tools”) OR (MH “Reference Books”) OR (MH “Checklists”) AND (MH “Certified Registered Nurse Anesthetists”) OR (MH “Anesthetists”) OR (MH “Anesthesia”) AND (MH “Pneumonia, Aspiration”). Limits applied were published between 2019 and 2024, English Language, peer-reviewed, and journal article. The search yielded 187 articles. Four articles were kept for full-text review after screening for relevance based on the title and abstract. Articles kept for full-text review focused on aspiration pneumonitis not from a specific cause. Upon full-text review of the four articles for relevance to the topic, the integrity of the study, setting, and population, none of the articles were included in the literature synthesis.

Additionally, Google Scholar was searched using the same search strategies as PubMed. This search produced 14,300 results. The first 20 pages of results were reviewed. Eight articles were kept based on the title and abstract, however, none were used in the synthesis of literature due to low relevance.

While none of the database or search engine results yielded articles used in the literature synthesis, references included in those articles found were relevant to the topic of focus. Professional organizations, including the AANA, ASA, and the Anesthesia Patient Safety Foundation, were also searched for relevant evidence. Additionally, article recommendations from the project chair are included in the synthesis of current literature.

The levels of evidence of the nine articles included in the literature synthesis were determined according to the Melynk and Fineout Overholt (2019) hierarchy of evidence framework, with level I being the highest level and level VII being the lowest level. Upon full review, one randomized control trial (Level II), one quasi-experimental study (Level III), one descriptive study (Level IV), one quality improvement project (Level VI), and five expert

opinions (Level VII) were identified as pertinent to this project. A literature matrix, found in Appendix C, was created to organize information about these sources.

Selected Literature Synthesis

The literature synthesized focuses on the current recommendations to prevent and manage perioperative aspiration pneumonitis. Perioperative aspiration, while a low-frequency event, has a high degree of morbidity and mortality, making it an important topic for anesthesia research (AANA, 2024; ASA, 2017; Beam & Guevera, 2023; Cieslak et al., 2020; Joshi et al., 2023; Zdravkovic et al., 2020). Common themes identified in the literature include fasting and pharmacologic guidelines for elective surgery, identifying patients at increased risk for aspiration, emerging recommendations for patients taking GLP-1 agonists, the role of ultrasound in determining aspiration risk, inconsistencies among providers when managing patients at risk for aspiration, and the potential use of checklist-style tool to improve patient care.

One of the first steps in preventing aspiration pneumonitis is to determine the degree of aspiration risk (ASA, 2017; Beam & Guevera, 2023; Cieslak et al., 2020; Pytka & Crosby, 2017). A major component of aspiration risk assessment is the fasting status of a patient. In 2017, the ASA updated their fasting guidelines (ASA, 2017).For fasting before surgery, they now recommend: clear liquids be stopped two hours before surgery, breast milk at four hours, formula and non-human milk at six hours, and fried, fatty food or meat at eight hours before surgery. They do not recommend routine use of any medications to reduce the risk of aspiration in healthy patients. Drugs that may be considered for use in patients at an elevated risk for aspiration include gastric acid secretion-blocking medications, non-particulate, antacids, and antiemetics. These recommendations are echoed by the AANA (2024) and in the textbook chapter by Pytka & Crosby (2017).

Patients classified as trauma patients, obese patients, pregnant patients, critically ill patients, patients with neurological issues, and patients with diabetes mellitus are at an increased risk for aspiration due to delayed gastric emptying (ASA, 2017; Beam & Guevera, 2023; Cieslak et al., 2020; Pytka & Crosby, 2017; Zdravkovic et al., 2020). Patients with chronic opioid use are also at increased risk. Patients with a full stomach or those with an increased gastric volume, such as those with gastrointestinal obstructions, are also at higher risk. Contributing to delayed gastric emptying and increasing the risk of aspiration is the widespread use of GLP-1 agonists (AANA, 2024; Beam & Guevera, 2023; Cieslak et al., 2020; Joshi et al., 2023). Gastric ultrasound may be used to determine gastric residual volume and inform airway management decisions (AANA, 2024; Beam & Guevera, 2023; Cieslak et al., 2020; Joshi et al., 2023, Pytka & Crosby, 2017; Zdravkovic et al., 2020). Gastric ultrasound may be especially useful given there are no additional fasting guidelines for patients taking GLP-1 agonists (Joshi et al., 2023). Despite this, recommendations for holding GLP-1 agonists prior to surgery are: stop taking daily GLP-1 agonists the day before elective surgery, stop taking weekly administered GLP-1 agonists the week before elective surgery, and manage patients taking GLP-1 medications who are undergoing emergency surgery or who are unable to follow the advised fasting instructions as full stomach patients (AANA, 2024; Joshi et al., 2023).

There are several common practices to mitigate the risk of aspiration in patients at high risk who require surgery. These include administration of gastrointestinal stimulants, gastric acid secretion blockers, anti-emetics, anticholinergics, antacids, performing rapid sequence induction with or without the application of cricoid pressure during induction, placement of a gastric tube, as well as various patient positioning approaches (ASA, 2017; Pytka & Crosby, 2017; Zdravkovic et al., 2020). However, a worldwide survey of over 10,000 anesthesia providers

demonstrated great variability in anesthetists' approach to managing patients at risk of aspiration (Zdravkovic et al., 2020).

Quick reference guides, checklists, and other cognitive aids are being increasingly used to inform practice and improve outcomes during critical events (Arriaga et al., 2013; Turkelson et. al., 2020). Cognitive aids have been shown to improve provider confidence as well as improve adherence to best practice guidelines during low-frequency, high-risk events. A QRG may improve provider confidence in assessing aspiration risk, strategizing approaches to mitigate the risk, interpreting gastric ultrasound, and managing peri-operative aspiration, should it occur. The information from this literature synthesis will be used to create a QRG for CRNA use at the partnering facility.

Project Framework

This project utilizes the Institute for Health Care Improvement (IHI, 2022) model for improvement by implementing a plan-do-study-act (PDSA) cycle of quality improvement. The *Plan* phase involves developing the question to be answered, an intervention, and a method to test the change implemented. This project sought to assess the perceptions of CRNAs working at the partnering facility regarding the adequacy of a QRG designed to aid in the prompt identification of at-risk patients and provide prevention strategies and treatment options for perioperative aspiration pneumonitis. The *Do* phase requires running the project on a small scale and collecting data about it. The project implementation would consist of a two-week utilization period at the partnering facility and completion of pre and post-implementation surveys. The *Study* phase involves analyzing the pre and post-implementation surveys' data to determine perceptions of the QRG and solicitations of providers' recommendations for future use. The *Act*

phase involves using the analyzed data to make recommendations for modifications for future use of the QRG.

Ethical Considerations and Protection of Human Subjects

No ethical concerns were identified for this quality improvement project, which provided a QRG of current practice recommendations and a survey to assess CRNAs' perceptions of it. This project is aimed at CRNAs' perceptions only; no patients were part of this quality improvement project. This implementation applies equitably to CRNAs working at the project site. Participation was voluntary, and participant responses were kept confidential. No personal information was collected.

Preparation and completion of the formal review process consisted of the project lead, the author of this paper, as well as the other project team members completing the Collaborative Institutional Training Initiative (CITI) program course: Human Research Group 2. Social/Behavioral Research Investigators and Key Personnel Basic Course. (https://about.citiprogram.org/). To complete the organizational approval process, a quality improvement screening process was accomplished through the College of Nursing as a collaboration between the College of Nursing and the East Carolina University (ECU) University Medical Center Institutional Review Board (UMCIRB). Once deemed a quality improvement project, this project was exempted from a full IRB approval process. Once the project was ready to implement, facility approval through the UMCIRB in conjunction with the research office of ECU Health was granted. Subsequently, local facility approval to collect data was obtained. (See Appendix D)

Section III. Project Design

Project Setting

This project took place at a 10 operating room outpatient surgical center. Patients at this facility undergo elective surgery and generally have fewer comorbidities and possibly less risk for perioperative aspiration than those at an inpatient facility. This surgical center provides care to a high volume of patients, which may facilitate CRNA use of the QRG. On the other hand, the rapid pace of this facility may provide a barrier to some pre-operative additional assessments outlined in this QRG. For example, one could speculate a fast paced environment may not allow for a pre-operative gastric ultrasound to be performed on all patients at risk for pulmonary aspiration. However, there is no data to support this. Additionally, those most at risk could theoretically be sent to an inpatient facility for surgery.

Project Population

The target population for this project is CRNAs working at the partnering facility. CRNAs are advanced practice nurses who are trained to independently administer anesthesia to patients across the lifespan in any setting. At this facility, CRNAs work as part of a medically directed care team alongside anesthesiologists. A facilitating factor to working with this population is that the CRNAs at this facility are familiar with the quality improvement process and accustomed to Student Registered Nurse Anesthetists (SRNAs) implementing projects at this site. A potential barrier is the fast pace because there is rarely inactive time for the CRNAs during working hours to complete the pre and post-implementation surveys for this project. Another potential barrier is the number of potential participants. This facility has less than ten core staff members, limiting potential respondents.

Project Team

The project team includes four SRNAs, three faculty members from the nurse anesthesia program, and a contact coordinator at the partnering facility. This author served as the team lead. This author, in addition to the three other SRNAs, completed the background work necessary to develop the QRG, pre and post-implementation survey questions, as well as a PowerPoint educational presentation on the topic. This author was responsible for the implementation and analysis. The nurse anesthesia faculty includes the course director, who guided the steps for this project. The program director served as the clinical contact. The project chair faculty member is an experienced CRNA and researcher whose experience served as an invaluable resource for this project.

Methods and Measurement

This project aimed to assess the perceptions of CRNAs at moderately sized surgical center in the Southeastern United States about a newly developed perioperative aspiration QRG. This QRG included a dictated PowerPoint presentation that was made available to participants (Appendix E: Quick Reference Guide). The QRG and PowerPoint were delivered via email to participants (Appendix F: Email to Participants). Data was gathered via Qualtrics Surveys (Appendix G: Copy of Qualtrics Survey Questions). General outcome measures included how often participants used the QRG during the implementation period, ease of use, satisfaction with the QRG, and likelihood of future use of the QRG, and suggestions for improvement.

Implementation Plan

Implementation of this project followed the PDSA cycle. The *Plan* phase included this author along with three other students identifying the topic of peri-operative aspiration pneumonitis. A literature search was conducted and identified common themes such as a varied

approach to rapid sequence induction, emerging evidence regarding aspiration risk in patients taking GLP-1 agonists, and the role of pre-operative gastric ultrasound in identifying patients at risk for peri-operative aspiration. A QRG was subsequently developed to assist CRNAs assess aspiration risk, strategize approaches to mitigate the risk, perform gastric ultrasound, and manage peri-operative aspiration, should it occur. A narrated PowerPoint presentation was also emailed to participants. The target population was CRNAs practicing at a 10-operating-room outpatient surgical center. Pre and post-implementation survey questions were written to assess participants' perceptions of the QRG, ability to identify risk factors for aspiration, and confidence or interest in performing pre-operative gastric ultrasound. Survey questions were a mix of Likert-style questions and multiple-choice questions. The post-implementation survey included a free-response section for recommendations to improve the QRG.

In the *Do* portion of the PDSA cycle, participants were sent emails explaining the project. In the email, participants received the QRG, narrated PowerPoint, and the pre-implementation survey via Qualtrics. They were then asked to use the QRG during a two-week implementation period and complete a post-implementation survey via Qualtrics. All participation was voluntary, and participant information was kept confidential.

In the *Study* portion of the PDSA cycle, data collected from pre and post-implementation surveys was analyzed to determine the CRNAs perceptions of the QRG and its usefulness. Finally, the project moved to the *Act* phase where opportunities to improve the QRG were explored. The results were shared with participants and members of the public.

Section IV. Results and Findings

Results

This DNP project aimed to assess CRNAs' perceptions of adequacy of a QRG designed to aid in the identification of patients at increased risk of and prevention strategies for perioperative aspiration pneumonitis. The target population of CRNAs at a partnering surgical center received an email with the QRG, a narrated PowerPoint presentation, and an anonymous link to a pre-implementation survey. After a two-week implementation period, participants received an email with a link to a post-implementation survey. Outcomes included CRNAs' perceptions of the tool and perceived confidence in identifying patients at risk for aspiration pneumonitis. Survey responses were recorded via Qualtrics. Data was analyzed using Microsoft Excel.

Data Presentation

This DNP project used Qualtrics surveys to assess CRNAs' perceptions of a newly designed QRG on aspiration pneumonitis. The QRG was employed during a two-week implementation period. Participants were asked to complete both pre- and post-implementation surveys via an email link. Five CRNAs completed the pre-implementation survey, and three CRNAs responded to the post-implementation survey.

The pre-implementation survey contained nine questions. All five respondents indicated having ten or more years of experience. When asked about confidence in recognizing risk factors for aspiration pneumonitis, one participant reported *completely confident*, two *highly confident*, and two *moderately confident*. When asked to identify risk factors of aspiration, two participants correctly identified which factor was not considered high risk for aspiration. When asked about current fasting recommendations, one participant identified the current recommendation.

Participants were asked to identify the correct guideline about the use of GLP-1 agonists. All five correctly identified the duration to hold weekly administered medications, but only three also selected the correct holding time for daily administered medications. When asked about the management and treatment of aspiration pneumonitis, four of five respondents correctly identified the evidence-based recommendation. The survey revealed that none of the participants had received formal training in gastric POCUS. When asked about their confidence in using gastric POCUS, all participants responded that they were *not at all confident*. One of the five respondents correctly identified the gastric volume in mL/kg associated with high risk for aspiration.

Three participants responded to the thirteen-question post-implementation survey. The survey began by assessing CRNAs' perceptions of the QRG itself with a multi-part question. It evaluated whether CRNAs believed the QRG had the potential to improve care. One response was recorded for each of the following: *strongly agree*, *somewhat agree*, and *strongly disagree*. Next, it assessed the applicability of the content. Two *strongly agreed*, while one *strongly disagreed*. Then, it assessed if the QRG was easily accessible. One *strongly agreed*, one *somewhat disagreed*, and one *strongly disagreed*. When asked if the QRG was easy to understand, two *strongly agreed*, and one *strongly disagreed*. Next, CRNAs were asked how often they viewed the QRG. One reported five to six times, while the other two reported one to two times. When assessing how long it took to view the QRG, all three reported that viewing took less than one minute. When assessing confidence in recognizing aspiration risk factors, one participant selected *completely confident*, one *highly confident*, and one *moderately confident*. Only two participants responded when asked to identify aspiration risk factors; both answered correctly. All participants selected correct responses when asked about fasting guidelines, GLP-1

medication guidelines prior to surgery, aspiration management, and the association between gastric volume and aspiration risk. When asked to indicate their level of confidence using gastric POCUS, one responded *moderately confident*, one *slightly confident*, and one *not confident*. All participants expressed interest in a gastric POCUS workshop. When asked about the likelihood of referencing the QRG in the future, one participant selected *moderately likely*, while the other two selected *somewhat likely*. None of the participants provided feedback in the space provided.

Figure 1 displays a comparison of the level of confidence CRNAs have in the pre- and post-implementation surveys when asked about identifying gastric contents on ultrasound.

Figure 1

How confident do you feel in identifying gastric contents on ultrasound pre- and post-implantation? (n=5, n=3)

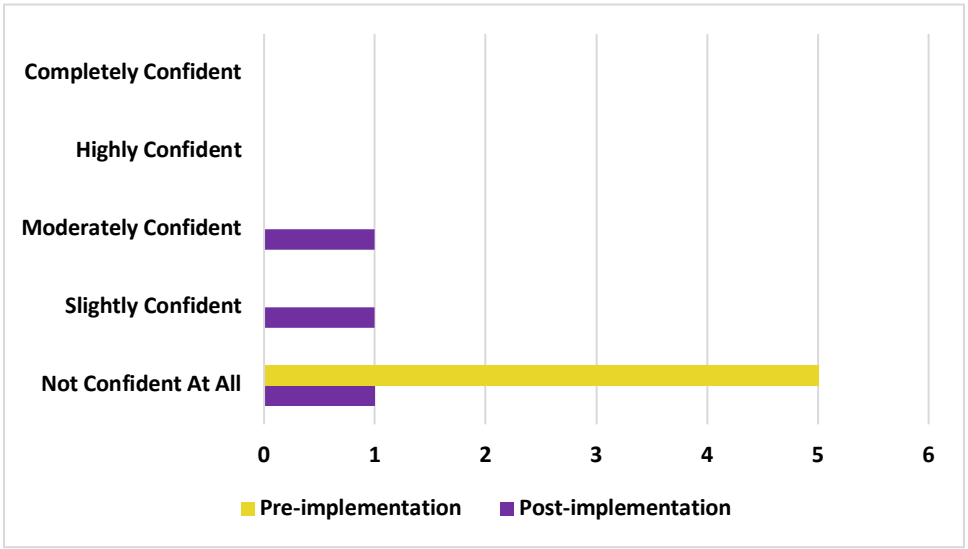
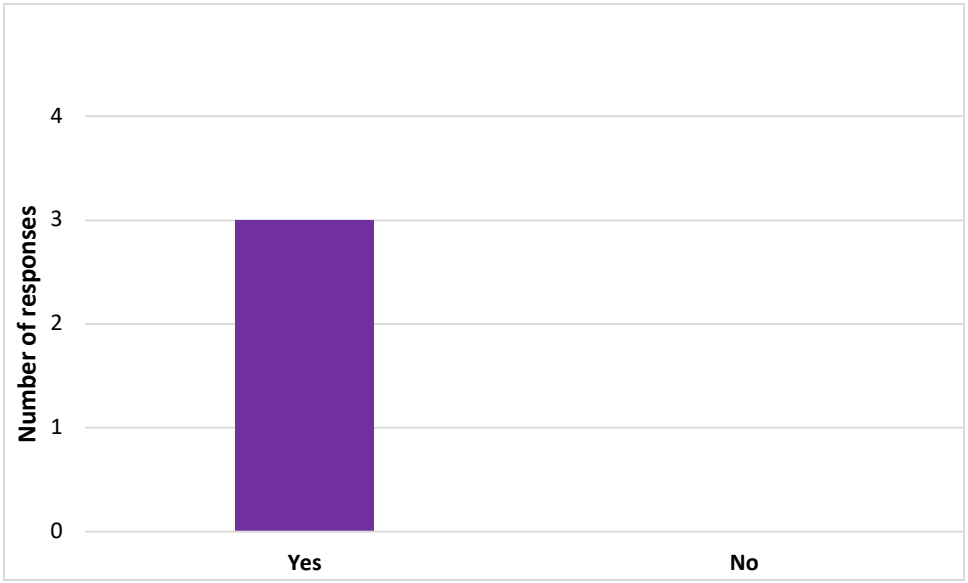


Figure 2 displays the results of question eleven in the post-implementation survey about interest in a gastric POCUS in-service.

Figure 2

Would you be interested in an in-service on gastric POCUS? (n=3)



Analysis

All participants were experienced CRNAs with more than ten years of experience. Even with a strong performance identifying risk factors for aspiration, fasting guidelines, and GLP-1 agonist withholding recommendations prior to surgery, CNRAs, after reviewing the QRG, more frequently answered these questions correctly in the post-implementation survey. Participant feedback was mixed on the accessibility of the QRG. This may be a result of limited physical copies and possible difficulty in locating the digital QRG from an email link. Providing a physical copy to each CRNA might have been more effective. All participants reported using the QRG required less than a minute. This could indicate that the QRG was very well organized and allowed for rapid location of necessary information, or the CRNA was moving on to a different resource or losing interest in the QRG. Responses assessing whether the QRG would improve care was also mixed. This response may have been influenced by the experience level of these providers and the location of the project. These experienced providers demonstrated in the pre-

implementation survey an already strong understanding of risk and mitigation, possibly making this reference less valuable on these items to an experienced provider in a setting with generally healthy patients. In contrast, the QRG could be more beneficial to a less experienced provider in a setting with patients more at risk for aspiration. Unfortunately, no participants utilized the text option to provide feedback on the QRG.

Comparing participant confidence pre- and post-implementation in utilizing gastric POCUS to identify those at risk for aspiration showed an improvement after QRG utilization. Despite this improved confidence, **all** participants indicated an interest in receiving an in-service on the gastric POCUS. This highlights how the QRG increased CRNA knowledge of gastric ultrasound, but possibly more importantly, demonstrates a strong interest in learning more about the skill required to perform one.

Due to the small number of participants, these results should be viewed as exploratory. The lack of participation in the post-implementation survey might have improved if I had been on-site during the second week of implementation to remind CRNAs to fill out the post-implementation survey. However, results may be viewed as a pilot project, demonstrating the desire of experienced CRNAs for more training using gastric POCUS.

Section V. Implications

Financial and Nonfinancial Analysis

The average length of stay associated with intraoperative pulmonary aspiration is 15 days, with some of these days potentially requiring intensive care if the patient requires mechanical ventilation (Reed & Haus, 2020). In addition to the health burden of recovering from aspiration pneumonitis, there is a considerable financial cost associated with this increased length of stay, especially if this event occurs in patients expected to be discharged the same day as their surgery. Seventeen percent of patients with a diagnosis of aspiration pneumonitis require mechanical ventilation. The average cost of caring for patients requiring mechanical ventilation is $47,158 (Cieslak et al., 2020). Prevention of aspiration pneumonitis can prevent the increased health and financial burden associated with this event.

The cost to continue this project in the form of distributing the QRG to anesthesia staff is minimal. The QRG created for this project was produced free of charge to the partnering facility by nurse anesthesia students. The QRG is available in a downloadable PDF format for convenient distribution that does not distort the original QRG. The QRG can be used electronically for free or can be printed by the partnering facility if a physical copy is desired. This would only incur the cost of the paper and the ink.

However, if the project were to be continued by the partnering facility through several quality improvement cycles, there would likely be additional costs. The main cost of continuing the project would be the salary of the staff member appointed to manage it. While the project could be managed by an individual CRNA within the practice, especially one who has a doctorate in nursing practice and who is familiar with the quality improvement process, the project could also be managed by a quality improvement nurse or nurse educator within the

anesthesia practice. There may be no additional cost for the quality improvement nurse since this is likely a salaried employee already working for the facility.

Implications of Project

The AANA(2024) and ASA (2017) have established guidelines to help providers prevent and treat perioperative aspiration. More recently, recommendations regarding patients taking GLP-1 agonists have been published, including the use of gastric ultrasound in aspiration risk assessment (Joshi et al., 2023). These recommendations were included in the QRG. The post-implementation survey responses demonstrated that the QRG was associated with increased CRNAs' knowledge of evidence-based recommendations in identifying those at risk for aspiration pneumonitis and appropriate interventions. This project supports the partnering facility's commitment to a culture of safety by encouraging the use of current evidence-based practice in the pursuit of eliminating preventable harm.

This project highlights the CRNA staff's reported lack of confidence in using gastric ultrasound to identify patients at risk of aspiration pneumonitis and their desire to learn how to utilize ultrasound to predict those at risk. This may indicate the need to provide a gastric ultrasound in-service at the partnering facility in the future.

Sustainability

The partnering facility would be able to continue this quality improvement project. The QRG is shared as a free PDF and can be used on personal electronic devices. The continuation of this project could be continued under the direction of a quality improvement nurse, a CRNA familiar with the quality improvement cycle, or a nurse educator within the partnering facility. Expansion to other sites could potentially yield more robust results, potentially improving practice on a larger scale.

Dissemination Plan

A poster was created and presented to members of the nurse anesthesia department and faculty of the College of Nursing. Project members were also invited to attend. The presentation could be viewed in person or online. The final version of this paper and poster is available on The Scholarship, the East Carolina University digital repository that is available to the public.

Section VI. Conclusion

Limitations

Limitations of this project include a small sample size, in-person availability of the primary investigator, and potential lack of perceived value by the participants. The sample size of core staff surveyed was seven. The results, even if clinically meaningful, cannot be applied to other organizations. Additionally, the project team lead was only able to be on-site for one of the two weeks of implementation. Lastly, the staff at this facility participates in multiple quality improvement projects every year, so there may have been less enthusiasm for this project.

Recommendations for Future Implementation and/or Additional Study

A few changes may prove useful in advancing this project. A physical presence during both weeks of implementation, instead of one may lead to increased participation. To provide a physical reminder of the project, a laminated copy of the QRG could be placed in each operating room, rather than in just the supply room. Additionally, including CRNAs working at this surgical center who are not the core staff may lead to increased participation. Lastly, individualized links for the pre- and post-implementation surveys could allow for more targeted follow-up on completion of the surveys.

One outcome of this project is that the role of gastric ultrasound in identifying those at increased risk for aspiration could be explored in this setting. A quality improvement project could be conducted to see if pre-operative gastric ultrasound changes anticipated airway management. The project could also explore whether performing pre-operative gastric ultrasound significantly impacts productivity at a surgical center. If gastric ultrasound did influence airway management decisions, the facility could proceed with ultrasound training.

If the partnering facility were to train its staff to use gastric ultrasound in a future quality improvement project, there would be additional costs. CRNAs currently use ultrasound for vascular access and nerve blocks, so there is a baseline level of knowledge of how to use ultrasound. An experienced staff member would likely be able to teach the basics of gastric ultrasound in a one-hour, hands-on skill session. The partnering facility currently has ultrasound machines available for use by the anesthesia staff. If the skill is taught by a CRNA within the practice, the only cost would be the teaching time. The partnering facility in this project has a core staff of seven CRNAs. According to Indeed (2025), the average pay for CRNAs in North Carolina is $150 per hour. Training these seven staff members would cost approximately $1,050 in addition to the pay of the instructor if the teaching were done by another staff member knowledgeable about gastric ultrasound.

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Appendix A

Literature Concepts Table

	Concept 1 Quick Reference Guide	Concept 2 CRNA	Concept 3 Aspiration Pneumonitis
Keywords	Quick reference guide, reference tool, checklist	CRNA, Certified Registered Nurse Anesthetist, Anesthesia, Anesthetist	Aspiration pneumonitis, Mendelson's syndrome
PubMed MeSH	"Checklist"[MeSH Terms]	"Anesthesia"[MeSH Terms] OR "Anesthetists"[MeSH Terms] OR "Nurse Anesthetists"[MeSH Terms]	"Pneumonia, Aspiration"[MeSH Terms]
CINAHL Subject Headings	(MH "Reference Tools") OR (MH "Reference Books") OR (MH "Checklists")	(MH "Certified Registered Nurse Anesthetists") OR (MH "Anesthetists") OR (MH "Anesthesia")	(MH "Pneumonia, Aspiration")
Google Scholar	Quick Reference Guide OR Reference Tool OR Checklist	CRNA OR Certified Registered Nurse Anesthetist OR Anesthesia OR Anesthetist	Aspiration Pneumonitis OR Mendelson's Syndrome

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
09/12/2024	PubMed	(Anesthesia OR Anesthetists OR Nurse Anesthetists) AND (Pneumonia, Aspiration) **Advanced search:** (("anaesthesia"[All Fields] OR "anesthesia"[MeSH Terms] OR "anesthesia"[All Fields] OR "anaesthesias"[All Fields] OR "anesthesias"[All Fields] OR ("anaesthetist s"[All Fields] OR "anesthetist s"[All Fields] OR "anesthetists"[MeSH Terms] OR "anesthetists"[All Fields] OR "anaesthetist"[All Fields] OR "anaesthetists"[All Fields] OR "anesthetist"[All Fields]) OR ("nurse anesthetists"[MeSH Terms] OR ("nurse"[All Fields] AND "anesthetists"[All Fields]) OR "nurse anesthetists"[All Fields])) AND ("guide"[All Fields] OR "guided"[All Fields] OR "guides"[All Fields] OR "guiding"[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 ((y_5[Filter]) AND (fft[Filter]) AND (english[Filter]))	5 years 2019-2024 Human English Language Peer-Reviewed Full text	70 found / 9 kept	These focus on risk factors, prevention, recognition, and treatment of aspiration pneumonitis not related to a specific disease.
09/12/2024	CINAHL	(MH “Reference Tools”) OR (MH “Reference Books”) OR (MH “Checklists”) AND (MH “Certified Registered Nurse Anesthetists”) OR (MH “Anesthetists”) OR (MH “Anesthesia”) AND (MH “Pneumonia, Aspiration”)	5 years (2019-2024) English Language Peer-Reviewed Journal article	187 found/ 4 kept	These focus on risk factors, prevention, recognition, and treatment of aspiration pneumonitis not related to a specific disease.
09/12/2024	Google Scholar	(Anesthesia OR Anesthetists OR Nurse Anesthetists) AND (aspiration	5 years (2019-2024)	14,300 results	These focus on risk factors,

		pneumonitis OR Mendelson's syndrome)		20 pages reviewed 8 articles kept	prevention, recognition, and treatment of aspiration pneumonitis not related to a specific disease.

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
2024	American Association of Nurse Anesthesiology (AANA). (2024, March 11). AANA publishes considerations for anesthesia care of the patient on a GLP-1 receptor agonist [press release]. https://tinyurl.com/5n6hnxwh	Inform Anesthetists about considerations regarding patients taking GLP-1 receptor agonists. No framework or model noted.	Expert opinion Level VII	N/A	N/A	N/A	Perioperative guidelines regarding prevention of aspiration in patients taking GLP-1 agonists is an emerging topic of interest.
2023	Beam, B. B. & Guevera, L. R. (2023). Are serious anesthesia risks of semaglutide and other GLP-1 agonists under-recognized? Anesthesia Patient Safety Foundation, 38(3), 69-71. https://www.apsf.org/article/are-serious-anesthesia-risks-of-	Discuss perioperative aspiration risk of patients taking GLP-1 agonists Case Report	Expert opinion Level VII	Perioperative	N/A	N/A	GLP-1 use is associated with high gastric residual despite fasting. Pre-operative gastric ultrasound can be useful in determining aspiration risk

	semaglutide-and-other-glp-1-agonists-under-recognized/						
2023	Joshi, G., Abdelmalak, B., Weigel, W., Soriano, S., Harbell, M., Kuo, C., Stricker, P., Domino, K., & American Society of Anesthesiologists Task Force on Preoperative Fasting. (2023, June). American Society of Anesthesiologists consensus-based guidance on preoperative management of patients (adults and children) on glucagon-like peptide-1 (GLP-1) receptor agonists. *American Society of Anesthesiologists (ASA)*. https://www.asahq.org/about-asa/newsroom/news-releases/2023/06/american-society-of-anesthesiologi	Inform Anesthetists about considerations regarding patients taking GLP-1 receptor agonists. No framework or model noted.	Expert opinion Level VII	N/A	N/A	N/A	Outlines recommendations regarding patients taking GLP-1 agonists to minimize aspiration. Warns there is no evidence to suggest optimal fasting guideline for patients taking GLP-1 agonists. Has a nicely summarized chart of GLP-1 agonists.

	sts-consensus-based-guidance-on-preoperative						
2020	Cieslak, J. R., Rice, A. N., Gadsden, J. C., & Vacchiano, C. A. (2020). Does ultrasonographic measurement of gastric content influence airway management decisions? *AANA Journal, 88*(2), 107-113. https://www.proquest.com/scholarly-journals/does-ultrasonographic-measurement-gastric-content/docview/2392482503/se-2	Explore if ultrasonographic measurement of gastric content influence airway decisions. No framework or model noted.	Quality Improvement Level VI	Southeastern university medical center	Convenience sample of 100 anesthesia providers at a Southeastern university medical center	Comparison of anesthetic plan before and after gastric ultra sound was used to determine gastric residual in 100 patients receiving elective or urgent surgery	Utilization of gastric ultrasound influenced the change of airway management in nine percent of cases. Ultrasound is emerging as an objective way to assess risk of aspiration.
2020	Turkelson, C., Keiser, M., Sculli, G., & Capoccia, D. (2020). Checklist design and implementation: critical considerations to improve patient safety for low-frequency, high-risk patient events.	Explore if an aviation style checklist improve user confidence and reduce errors while taking care of patients requiring an LVAD in the cardiac intensive care unit.	Quasiexperimental prospective pre-post repeated measure design including surveys along with repetitive simulations Level III	High acuity cardiac intensive care unit	56 LVAD superusers in a cardiac intensive care unit.	Two aviation style checklists to be used by LVAD super users. Pre and post implementation surveys and scenarios used to evaluate effectiveness.	The presence of a checklist for low-frequency, high-risk patient event increased user confidence and demonstrated a reduction in errors.

	BMJ Simulation & Technology Enhanced Learning, 6(3), 148–157. https://doi.org/10.1136/bmjstel-2018-000353	No framework or model noted.					
2020	Zdravkovic, M., Berger-Estilita, J., Sorbello, M., & Hagberg, C. A. (2020). An international survey about rapid sequence intubation of 10,003 anaesthetists and 16 airway experts. Anaesthesia, 75(3), 313-322. https://doi.org/10.1111/anae.14867	Generate data on worldwide practices used to mitigate the risk of aspiration during induction of anesthesia No framework or model noted	Descriptive Study Level IV	International survey	10,003 anesthetists in addition to 16 international airway experts	Online survey	Underscores the importance and lack of consensus about techniques used to mitigate the risk of aspiration during induction of high risk patients.
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	Outline guidelines for preoperative fasting and pharmacologic agents to reduce the risk of pulmonary aspiration and the severity of its complications. No framework or model noted.	Expert Opinion Level VII	Pre-procedural setting	N/A	Guidelines are based on information from meta-analyses, randomized control trials, and expert opinions.	Includes widely used fasting guidelines and pharmacologic recommendations to prevent aspiration.

	report by the american society of anesthesiologists task force on preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration. (2017). 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	Serve as a resource to teach current and future anesthetists. No framework or model noted.	Expert Opinion Level VII	N/A	N/A	N/A	Serves as a resource about aspiration including history, incidence and risk, populations at risk, strategies to minimize aspiration, and cricoid pressure.
2013	Arriaga, A. F., Bader, A. M., Wong, J. M., Lipsitz, S. R.,	Explore if checklist increase adherence to	Randomized Control Trail Level II	High fidelity simulation lab	17 operating room teams from one academic	106 simulations of operating room crises	Failure to adhere to best practice guidelines was less common

	Berry, W. R., Ziewacz, J. E., Hepner, D. L., Boorman, D. J., Pozner, C. N., Smink, D. S., & Gawande, A. A. (2013). Simulation-based trial of surgical-crisis checklists. The New England journal of medicine, 368(3), 246–253. https://doi.org/10.1056/NEJMsa1204720	evidence based best practice during operating room crises. No framework or model noted.			medical center and two community hospitals	were performed with and without checklists to compare adherence to best practice guidelines.	when a checklist was used.

Note: Key to abbreviations used in the chart: AANA: American Society of Nurse Anesthesiologists. ASA: American Society of Anesthesiologists. GLP-1: Glucagon-like peptide-1. LVAD: Left ventricular assist device.

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 studies, EBP implementation and QI; VII: Expert opinion from individuals or groups. Adapted from *Evidence-based practice in nursing: A guide to best practice.* (4th ed.), by 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

Approval Forms

CON QI determination form

Name of Project Leader: John Dockery, SRNA

Project Title: Aspiration Pneumonitis DNP Project

Brief Description of Project/Goals:

This quality improvement project aims to assess anesthesia providers' perceptions of the adequacy of a newly developed quick reference guide (QRG) for prevention and treatment of perioperative aspiration pneumonitis. The guide is designed to aid anesthesia providers to quickly identify at-risk populations and provide appropriate strategies for prevention and treatment.

Process: A quick-reference perioperative aspiration pneumonitis guide will be developed based on accepted national guidelines. Anesthesia providers at ECU Health will be asked several questions (through Qualtrics) about their perceptions of the adequacy of their currently used processes. The newly developed QRG will be available to them, and they will be asked to use it for two weeks. Upon completing the two-week utilization period, they will be asked to complete a questionnaire about their perceptions of the adequacy of the QRG in their current practice. Qualtrics survey software will be used to deliver the intervention link and gather participant perceptions pre-and post-implementation of the project. No patient information will be recorded or maintained during this project.

CON QI Project Approval Questions

1. Will the project involve testing an experimental drug, device (including medical software or assays), or biologic (i.e., vaccines, blood products, gene therapy, tissues)?
    a. No
2. Has the project received funding (e.g., federal, industry) to be conducted as a human subject research study?
    a. No
3. Is this a multi-site project (e.g., there is a coordinating or lead center, more than one site participating, and/or a study-wide protocol)?
    a. No
4. Is this a systematic investigation designed with the intent to contribute to generalizable knowledge (e.g., testing a hypothesis, randomization of subjects, comparison of case vs. control,, observational research; comparative effectiveness research, or comparable criteria in alternative research paradigms)?
    a. No
5. Will the results of the project be published, presented or disseminated outside of the institution or program conducting it?
    a. No
6. Would the project occur regardless of whether individuals conducting it may benefit professionally from it?
    a. Yes

7. Does the project involve "no more than minimal risk" procedures (meaning 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)?
    a. No
8. Is the project intended to improve or evaluate the practice or process within a particular institution or a specific program, and falls under well-accepted care practices/guidelines?
    a. Yes

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's Perceptions of an Aspiration Quick Reference Guide: A DNP Project
Project Leader	John Dockery
Project Leader Contact E-mail	Dockeryj23@students.ecu.edu
Department or Unit Affiliation	Anesthesia
Project Advisor (if applicable)[1]	Dr. Maura McAuliffe

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.**
Dr. Nikki Roebuck	Anesthesia	Course Director	☐

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

Dr. Travis Chabo	Anesthesia	Clinical Contact		☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐

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:

The purpose of this quality improvement project is to assess anesthesia providers' perceptions of the adequacy of a newly developed quick-reference guide addressing perioperative aspiration pneumonitis. The quick-reference guide addressing aspiration pneumonitis will be developed based upon accepted national guidelines. Anesthesia providers at [redacted] will be administered a pre-survey asking about their familiarity with their current practice with aspiration pneumonitis. Then, a quick reference guide addressing aspiration pneumonitis will be made available to them, and they will be asked to use the guide for two weeks. Upon completion of the two-week utilization period, they will be asked to complete a post-survey about their perceptions of the adequacy of the guide. Qualtrics survey software will be used to gather data. No patient information will be recorded or maintained during this project. This project will be deemed a success if the quick-reference guide is well received and positively impacts CRNA

Methodology / Intervention:

The project will consist of a single Plan, Do, Study, Act cycle using a pre-and post-implementation survey design. This project's tool will be a newly created informational quick reference guide focused on aspiration pneumonitis, which is based on current evidence and falls within currently accepted practice standards within the facility. CRNA participants will be contacted via email and asked to complete a pre-implementation survey. They will then utilize a quick reference guide based on current evidence that aligns with practices currently accepted within the facility to support their practice regarding aspiration pneumonitis. After two weeks, they will be asked to complete a post-implementation survey addressing their perceptions of the intervention and their practice. The project lead will be available electronically, by phone, or in-person to consult with participants as needed.

Data to be collected:

Data will be gathered directly from participants through completion of Qualtrics pre- and post-surveys delivered and completed electronically. Aside from participant emails, no identifiable data will be gathered. Data of interest is participant opinions and perceptions of practice and the

newly developed informational tool. All data will be gathered using Qualtrics survey software and then transferred to Excel for analysis. The only identifying information will be email addresses. Qualtrics survey software is accessed through ECU and involves multifactorial password protection. Data in Excel will be on a password-protected spreadsheet and laptop. Email addresses will be deleted from Excel files after both surveys are completed and analysis of results begins. No PHI will be collected for this project. Data will be stored in Qualtrics and in Excel files (de-identified) until student graduation, anticipated to be spring of 2026. The deidentified data will be analyzed with results shared via a poster presentation to the ECU Nurse Anesthesia Program students and faculty, with participants invited to view the presentation remotely. If requested, a presentation of results will be provided to the participating department. Additionally, the analysis of results will be addressed in a DNP Project Paper, 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. Joshi, G., Abdelmalak, B., Weigel, W., Soriano, S., Harbell, M., Kuo, C., Stricker, P., Domino, K., & American Society of Anesthesiologists Task Force on Preoperative Fasting. (2023, June). American Society of Anesthesiologists consensus-based guidance on preoperative management of patients (adults and children) on glucagon-like peptide-1 (GLP-1) receptor agonists. American Society of Anesthesiologists (ASA). https://www.asahq.org/about-asa/newsroom/news-releases/2023/06/american-society-of-anesthesiologists-consensus-based-guidance-on-preoperative		
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	Lynette Atkinson
Signature	[redacted]
Date	2/13/2025 07:51 AM 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)	[redacted] Eric DeMaria, MD [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	
		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.

[X] **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: [redacted] **Date:** 04/3/2025

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

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

Age
- Elderly
- Children <3 years

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®) (Rybelsis®)	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

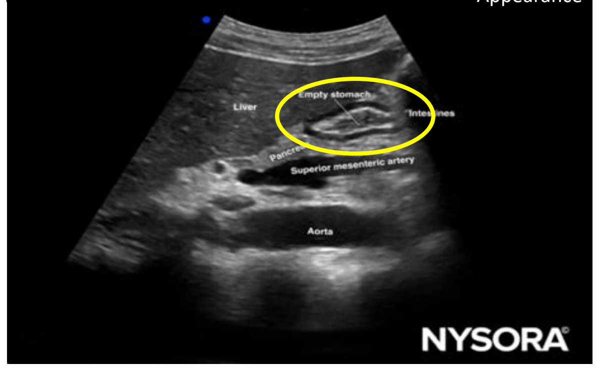
SQ = Subcutaneous.

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**

Empty Stomach: "Bulls-Eye" or "Pancake" Appearance

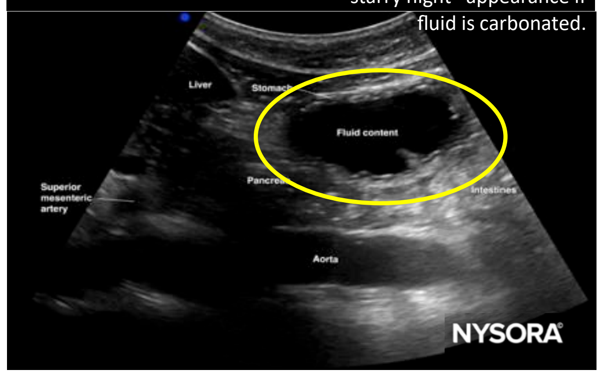


Patients are scanned in 2 positions: supine and right lateral decubitus

Supine: Assess for type and amount of content

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

Fluid Content: "Anechoic" (black), may give a "starry night" appearance if fluid is carbonated.

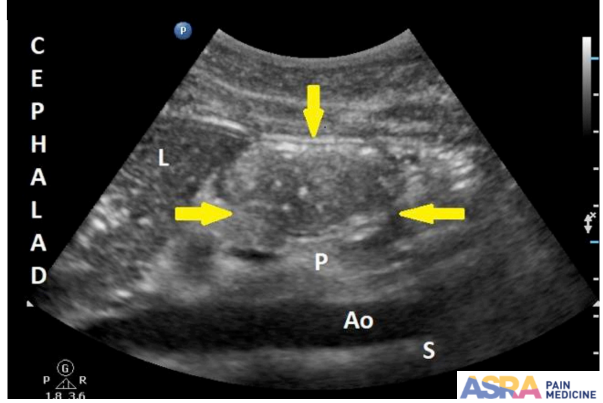


Gastric volume (mL) = 27.0 + (14.6 x CSA of antrum in RLD) – (1.28 x age)

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	164	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

Thick Fluid or Solid Content: "hyperechoic" (white)



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Appendix F

Participant Emails

Initial Pre-Survey and PowerPoint Email to Participants

Dear ECU Health SurgiCenter CRNAs,

Thank you for considering participating in a quality improvement project titled "CRNA's Perceptions of an Aspiration Quick Reference Guide: A DNP Project." The purpose of this project is to assess CNRA's perceptions of a newly created quick reference guide at [redacted]

Participation is voluntary and will involve filling out a brief pre-implementation survey, using a quick reference guide in your CRNA practice for two weeks (at your discretion), and completing a short post-implementation survey once the two-week implementation period concludes.

Each survey should take less than 2-4 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, please complete the pre-implementation survey provided https://ecu.az1.qualtrics.com/jfe/form/SV_3rzvOeTAZWHg4Ga.

Following completion of the survey, please view the aspiration quick reference guide attached to this email.

Again, thank you so much for your participation in our quality improvement project! I will be at [redacted] from April 8th to April 11th if you have any questions. Feel free to reach out to me at any time via email. My email is dockeryj23@students.ecu.edu. My project chair, Maura McAuliffe, is also available to answer any questions you might have via email at mcauliffem@ecu.edu .

Sincerely,
John Dockery, SRNA, dockeryj23@students.ecu.edu
Maura McAuliffe, PhD., CNRA, FAAN. Mcauliffem@ecu.edu

Pre-Survey and PowerPoint Reminder Email to Participants

Hello [redacted] CRNAs,

I just wanted to send a quick reminder about the ongoing DNP Project on Aspiration. If you've already completed the pre-survey and viewed the PowerPoint, thank you. If you haven't had a chance to do so yet, it's not too late and would be very helpful and much appreciated. I have attached the quick reference guide to this email in case you need it. Use of this quick reference guide is completely up to your discretion. After the end of next week, I will begin sending out the post-surveys.

Link to the pre-implementation survey: https://ecu.az1.qualtrics.com/jfe/form/SV_3rzvOeTAZWHg4Ga

Please let me know if you have any questions. Thank you again for your participation!

Sincerely,
John Dockery, SRNA
ECU Nurse Anesthesia Program
Class of 2026

Post-Survey Email to Participants

Dear [redacted] CRNAs,

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

If you have not completed a pre-survey, I would greatly appreciate your participation. The link to the pre-survey is https://ecu.az1.qualtrics.com/jfe/form/SV_3rzvOeTAZWHg4Ga.

If you've already completed the first survey, please complete the post-survey at: https://ecu.az1.qualtrics.com/jfe/form/SV_3z7V6jEmWirw5H8 . 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 the SurgiCenter soon!

Sincerely,
John Dockery, SRNA
ECU Nurse Anesthesia Program
Class of 2026

Final Thank You Email to Participants (4)

Dear [redacted] CRNAs,

Thank you so much to everyone for helping me out with my DNP Project! I have collected all of the data necessary to complete my DNP paper. Once it's complete, you can read it if you'd like. If you enjoyed the quick reference guide, feel free to continue using it!

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

Sincerely,
John Dockery, SRNA
ECU Nurse Anesthesia Program

Appendix G

Pre- and Post-Implementation Surveys

Pre-Implementation Survey

Default Question Block

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

Post Implementation Survey

Default Question Block

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)

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- ☐ 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.

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