Assessing CRNA Perceptions of a Cognitive Aid Focused on Aspiration Pneumonitis: A DNP Project

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Notes from the Author

This paper goes out to my dog, Cobia. Thanks for always being there for me.

Abstract

Perioperative aspiration pneumonitis is an uncommon yet potentially devastating complication of anesthesia associated with significant morbidity and mortality. This Doctor of Nursing Practice (DNP) quality improvement project evaluated Certified Registered Nurse Anesthetists' (CRNAs) perceptions of a newly developed quick reference guide (QRG) designed to support the identification of at-risk patients and provide evidence-based prevention and management strategies. Guided by the plan-do-study-act (PDSA) framework, the project was implemented in a Level 1 trauma center and assessed through pre- and post-implementation surveys. Findings indicated improved alignment with current practice recommendations, increased confidence in recognizing aspiration risk factors, and positive perceptions of the QRG's accessibility and utility. Despite limited participation, results suggest that integrating a QRG into anesthesia practice at this facility may enhance provider preparedness, improve patient outcomes, and reduce perioperative complications. Future research with larger samples and extended timelines is recommended to strengthen these findings.

Keywords: aspiration pneumonitis, nurse anesthetists, perioperative

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Section I. Introduction

Background

Aspiration pneumonitis is an injury that occurs as a result of inhaling acidic substances into the lungs, causing a chemical burn to the lung tissues (Marik, 2001). This condition is also referred to as Mendelson's Syndrome. Aspiration pneumonitis occurs in individuals with diminished consciousness who are unable to protect their airway, often related to conditions such as seizures, cerebrovascular incidents, or administration of anesthesia. Mendelson's Syndrome was first identified in 1946 when increasing cases were noted for patients receiving general anesthesia for obstetrical procedures. Patients who have inhaled gastric contents often present with symptoms of shortness of breath, pulmonary edema, and hypoxemia, which can progress to respiratory failure or death. Many patients present with minimal symptoms, including coughing and wheezing (Marik, 2001). Aspiration pneumonitis progresses to a secondary bacterial pneumonia in approximately 25% of patients (Dragan et al., 2018).

A patient with a full stomach is at the highest risk for aspiration. Nil per os (NPO) guidelines, also known as fasting guidelines, are in place to achieve an "empty" stomach prior to surgery. These guidelines, however, do not guarantee an empty stomach, and gastric residual volumes can remain variable for many physiological reasons. Some reasons for delayed gastric emptying include certain pharmacological administration, alcohol ingestion, obesity, and diabetes. With current technology, practitioners are beginning to verify the gastric content and volumes prior to surgery by utilizing ultrasound imaging. Ultrasound imaging provides reliable quantitative data to evaluate the risk of aspiration related to gastric content and volumes (Pytka & Crosby, 2017).

Two common risk factors for aspiration pneumonitis are emergency surgery and high American Society of Anesthesiologists (ASA) status. The incidence of aspiration has been found to increase by a factor of 10 as the patients increase in ASA class I to class IV, as well as those with emergency distinction. This may be related to physiological changes that occur with stress slowing gastrointestinal mobility. Another major factor includes the lack of adherence to current fasting guidelines.

Physiologically, aspiration can occur when the pressure in the gastroesophageal sphincter lacks the ability to keep gastric contents within the stomach, and the pressure of the stomach on the fluids force those contents to back up the esophagus. It has been found that gastric pressure can increase three times during laparoscopy (Pytka & Crosby, 2017).

Due to the demographics of North Carolina that includes a high incidence of diabetes and obesity, there is an increased risk for aspiration pneumonitis. In 2022, North Carolina had 3,836 recorded deaths attributed to Diabetes Mellitus, 426 attributed to obesity, and 656 attributed to pneumonitis related to inhalation of gastric contents (North Carolina Department of Health and Human Services [NCDHHS], 2024). These statistics indicate that the population served at the partnering organization is at an increased risk for perioperative aspiration pneumonitis. Current literature emphasizes the importance of anesthesia providers remaining current about prevention, identification, and management strategies pertaining to aspiration pneumonitis. There is an indication that a quick reference guide (QRG) could aid in this. This Doctor of Nursing practice (DNP) project will assess current practitioners' perceptions of a QRG in assisting them in managing patients to prevent the incidence of aspiration pneumonitis.

Organizational Needs Statement

Despite the high number of anesthetics administered annually at the project site, there is currently no written policy about best practices for preventing and treating perioperative aspiration pneumonitis (M. McAuliffe, personal communication, September 24, 2024). In 2019, the American Association of Nurse Anesthesiology (AANA, 2019) introduced the twelfth standard of care, which is to "participate in the ongoing review and evaluation of anesthesia care to assess quality and appropriateness to improve outcomes." Therefore, implementing a standardized tool that provides CRNAs with latest evidence on aspiration pneumonitis could be beneficial in both preventing this serious complication and ensuring proper treatment should it occur. Participation in this project will also maintain organizational compliance with AANA standard 12.

Problem Statement

Perioperative aspiration pneumonitis remains a significant complication in anesthesia. Gastric content aspiration is associated with 5% of malpractice claims in the United States related to anesthesia. Although this rate is relatively low, patients who develop aspiration pneumonitis face a mortality rate of 57% (Warner et al., 2021). Aspiration during the perioperative period can result in adverse outcomes, longer hospital stays, and higher costs for both patients and healthcare facilities.

Purpose Statement

The purpose of this Doctor of Nursing Practice (DNP) quality improvement 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 quality improvement projects to improve this rare but potentially catastrophic perioperative event at the partnering organization.

Section II. Evidence

Description of Search Strategies

A systematic literature review regarding perioperative care of patients at risk or with aspiration pneumonitis was conducted between September and October of 2024. This search was guided with a problem, intervention, comparison, outcome, and time (PICOT) question: Does a quick reference guide increase confidence level of anesthesia providers in dealing with aspiration pneumonitis within the perioperative area? After the PICOT question was developed, the primary concepts identified for searching the literature were aspiration pneumonitis, anesthesia, and treatment. Boolean operators were utilized to combine keywords to develop search strategies. Based on these concepts and addressed in Appendix A, keywords for the literature review included aspiration pneumonia, therapeutics, anesthesia, and general anesthesia.

The literature was searched utilizing the databases PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL), as well as the search engine Google Scholar. As noted in Appendix B, the PubMed search strategy was (pneumonia, aspiration) AND (anesthesia) AND (therapeutics). The search strategy was then adjusted to include only the key concepts of (pneumonia, aspiration) AND (anesthesia). Limitations applied to this search were publication from 2021-2024, English language, full text available, and study conducted on humans. This resulted in 28 scholarly sources reviewed by title and abstract. There were 25 sources excluded due to irrelevance to anesthesia practice, lack of full-text availability, or not being relevant to aspiration of gastric contents. This resulted in 3 sources for full-text review.

The CINAHL search strategy was (MH “aspiration pneumonia”) AND (MH “therapeutics”) AND ((MH “anesthesia”) OR (MH “anesthesia, general”)). Limitations applied to this search were publication from 2021-2024, English language, and full text available. This

resulted in 28 scholarly sources reviewed by title and abstract. The 28 sources were all excluded due to irrelevance to anesthesia practice, lack of full-text availability, or not being relevant to aspiration of gastric contents, resulting in zero sources kept for full text review.

The Google Scholar search strategy was (pneumonia, aspiration) AND (therapeutics) AND (anesthesia). Limitations applied to this search were publication within or after 2023. This resulted in 3850 scholarly sources. Of these sources the first ten pages were reviewed by title and abstract. Only one source was kept for full-text review. All other articles were excluded due to irrelevance to anesthesia practice, only relevance to animal models, lack of full-text availability, or not being relevant to aspiration of gastric contents

The results from PubMed, CINAHL, and Google Scholar were evaluated using the same inclusion and exclusion criteria. Inclusion criteria include: publication from an anesthesia related professional organization, pertinence to the topic of interest, review for statistical significance, review for key topics, and relevance to anesthesia. Using these inclusion criteria, four sources were identified for full-text review. Two sources were found from evaluating the references of these four sources. Four sources were found in gray literature and two additional sources were provided by the project chair. A total of ten sources were deemed relevant to this project after full-text review. See Appendix C for the complete list of these on the Literature Matrix.

Levels of evidence for each of the ten sources were broken down into categories based on the Melnyk and Fineout-Overhold (2019) levels of evidence. Level I being the highest level of evidence and Level VII being the lowest level of evidence.” Of the ten sources two were classified as Level I (systematic review of literature or meta-analysis), one as Level II (randomized control trial), one as Level III (literature review), one as Level IV (retrospective cohort study), and five classified as Level VII (expert group opinions). Each of the ten sources

contributed to the understanding, identification, and treatment of aspiration pneumonitis in the perioperative setting or the use of reference tools in the healthcare setting.

Selected Literature Synthesis

The literature chosen for use in this project was kept for its aid in understanding aspiration pneumonitis in anesthesia practice. This includes understanding of symptomatology and supportive care. Understanding the historical use of rapid sequence induction with cricoid pressure and the new use of ultrasound imaging to help stratify risk of aspiration were also important topics explored in the literature. Finally, the studies selected support use of informatics to provide updated information to providers. These steps may aid anesthesia providers prevention, recognition, and management of patients with aspiration pneumonitis.

The presentation of symptoms for aspiration pneumonitis is similar to pneumonia. However, the treatment plan for these two conditions varies. In the event of aspiration pneumonia, symptoms of infection are present, and a sensitivity cross-referenced antibiotic regimen is indicated. (Marik, 2001). Conversely, in gastric content aspiration, the head of the bed should be elevated thirty degrees, and the upper airway suctioned to prevent further aspiration, supplemental oxygen should be applied after suctioning, the airway should be protected and intubation should occur if indicated (Pytka & Crosby, 2017).

The current standard of the sequence of interventions used for protection of an airway is the ASA guidelines. The ASA recommendations for difficult airway management, such as with aspiration pneumonitis, state that the provider should optimize oxygenation, when applicable refer to a cognitive aid, determine if restoring spontaneous breathing is advantageous, determine if invasive interventions are indicated and if an airway is unable to be secured initiation of extracorporeal membrane oxygenation is indicated (Apfelbaum et al., 2022). Bronchoscopy is

only indicated to remove large solid matter (Megahed et al., 2021). Prophylactic antibiotic therapy is not currently indicated as gastric contents are acidic in nature and do not promote bacterial growth (Dragan et al., 2018). The use of corticosteroids has been found to increase mortality, so is no longer recommended. Current supported treatment is to protect the airway, provide supplemental oxygenation as indicated, and monitor patients for at least two hours (Pytka & Crosby, 2017).

Anesthesia providers have been using rapid sequence induction (RSI) with cricoid pressure for the last fifty years on patients suspected to be at high risk for aspiration. Cricoid pressure allows providers to hold pressure on the esophagus to manually seal it closed and reduce the incidence of pressure in the gastric contents allowing reverse flow into the esophagus and subsequently airway. This pressure is held until the location of the airway is confirmed and endotracheal tube (ETT) cuff is inflated (Pytka & Crosby, 2017). Beckford et al. (2018) found that the technique of applying cricoid pressure was significantly improved in individuals who perform this technique regularly after educational interventions.

Perlas et al. (2024), after performing a meta-analysis, found that a new practice to be beneficial. Gastric point-of-care ultrasound (POCUS) can be utilized to measure contents of the stomach and definitively determine if the patient should be considered a full stomach. Patients that have health histories such as diabetes or obesity have been considered full stomach patients and, therefore, at risk for gastric aspiration. This is not always the case and the use of gastric POCUS can help determine the amount of gastric contents.

Other patients considered to be at risk are those taking glucagon-like peptide-1 receptor agonists (GLP1; ASA, 2023). When a patient presents with unknown gastric contents or the amount of gastric contents needs to be verified, providers can perform a non-invasive gastric

POCUS at the bedside to then decide an appropriate and measured plan of care for that patient (ASA, 2023).

The use of a QRG has been found to be an effective way for evolving guidelines in healthcare to be accessible to providers (Rubinelli et al., 2022). The World Health Organization found that abbreviated reference materials were specifically beneficial to healthcare workers. The ASA also discusses reference guides in their guidelines to practice (Apfelbaum et al., 2022). The goal of this quality improvement project was to assess the perceptions of anesthesia providers with regards to a QRG focused on aspiration pneumonitis. This project tool was chosen due to availability of resources and with the support of evidence both on QRG and the included content.

Project Framework

The plan-do-study-act (PDSA) cycle of quality improvement is the model for improvement implemented for this project. This model originates from the Institute for Health Care Improvement (IHI, 2022). The PDSA cycle encompasses a cyclic process where one creates a plan to create change, implements that plan, reviews the findings from implementation, and finally acts on that plan and how it may be improved for the future. This cycle repeats until no additional changes are indicated.

The PDSA cycle was implemented with the plan phase by identifying and researching a problem as indicated with the PICOT question. The do phase of the cycle was performed by providing the QRG and reference materials to the anesthesia staff. Pre and post implementation surveys were sent to participants during this phase. The study phase was the analysis of the survey data. The final phase, act, was performed by revision of the QRG and reference materials based on survey results and providing indications for further projects.

Ethical Considerations and Protection of Human Subjects

This project implemented a QRG and focused on anesthesia providers' perceptions of its usefulness in preventing and managing perioperative aspiration pneumonitis. Anesthesia providers in the partnering organization were asked to participate voluntarily. All evidence-based recommendations on the QRG were within the scope of practice of the participants. No personal information was gathered in this study. All results remained confidential. This project added no increased risk to individuals outside of their standard workday. Patients were not involved in this project, and no protected patient information was gathered.

The project lead completed ethics training and education prior to this project through the Collaborative Institutional Training Initiative (CITI; https://about.citiprogram.org) module Behavioral Research Investigators and Key Personnel. A project screening was completed through the East Carolina University (ECU) College of Nursing and the University and Medical Center Institutional Review Board (UMCIRB), in which the project was deemed quality improvement and did not require full IRB review. Approval through the partnering organization was obtained by that organization and the UMCIRB. Local approval to collect data was obtained by the local contact person whose signature was required on the organization's approval form. See Appendix D for approval processes.

Section III. Project Design

Project Setting

The setting for this project was within the operating room suite conducting cardiovascular, thoracic, and vascular surgeries, within a Level 1 trauma center serving Eastern North Carolina. The overall facility houses a total of 37 operating rooms, including this thoracic and vascular suite, the main facility, and an offsite ambulatory surgery center. Within this facility, there are a variety of surgical procedures performed annually including but not limited to: general surgery, transplantation, pediatric, vascular, thoracic, plastics, cardiovascular, oncologic and trauma. There are approximately 27,000 surgeries performed at this facility each year. This occurs concurrently with over one million inpatient visits across the multi-hospital network annually.

The partnering facility is associated with a state university system. This affiliation may have served as a project facilitator for this project by having providers open minded towards students and particularly DNP projects within the anesthesia department. Access to mobile devices intra-operatively is not well supported among staff which can contribute to a limitation in the use of the reference materials.

Project Population

The focused population for this DNP project included anesthesia staff working assignments in the thoracic, cardiovascular, and vascular operating rooms. The staff included were limited to full-time and part-time CRNA employees so as to ensure the staff had access to the reference materials for the extent of the project. The CRNAs at the participating facility work in collaboration with the anesthesiologists while also practicing autonomously throughout the

perioperative time. These CRNAs maintain and ensure patient safety by remaining present for the entire duration of the surgical procedure.

One barrier to participation in this project may have been lack of participant adherence to the project. The demanding schedule and caseload of CRNAs and operating room production pressure could have contributed to providers inability to complete all aspects of this QI project.

Project Team

The success of this project was dependent upon the collaboration of a team. The team consisted of a project chair, a team lead, Eric LaRoque, four Student Registered Nurse Anesthetist (SRNA), a facility CRNA contact, a program director, a course director, and a clinical instructor. There were team members that assumed multiple roles of this project. The development of a QRG along with pre-implementation and post-implementation surveys were of the combined efforts of the four SRNA students working collectively with similar topics. The team lead performed independent literature search, implementation of the QRG, data collection, and synthesis of results. The CRNA project chair aided in development of the outline along with the adaptation of the information into a QRG to be implemented in the clinical setting. The facility CRNA contact assisted in the implementation of the project at the partnering facility. This contact also connected the team lead to the participants. The course director guided the team lead throughout the project and their guidance was vital in the literature review, research design, review board approval, implementation, and throughout the writing process.

Methods and Measurement

This quality improvement project was developed and performed 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 project goal was to provide supplemental educational and useful resources in assisting CRNAs in the management of patients with aspiration pneumonitis. The project tool was a QRG designed to be utilized as educational reference materials for CRNAs. See Appendix E. In addition, there was a narrated PowerPoint presentation utilized to introduce the topic in a succinct way to provide the reference guide along with more detailed information. Data collection was performed by a pre-implementation and post-implementation survey through Qualtrics surveys. These were composed of multiple choice and Likert-style questions providing ordinal data with which analysis was performed. These surveys can be viewed in Appendix F and G.

The PDSA cycle was used as a guide throughout each step of this project. The *plan* phase consisted of literature review, project design, and review board approval. Throughout this phase the team met multiple times. The team developed problem and purpose statements. Further meetings were held to collaborate on project outlines, develop the tool, and develop the questionnaire. Prior to moving beyond the *plan* phase, approval was gained for the project by university and partnering facility review boards. See appendix D.

Once approval was received the project proceeded to the *do* phase. This phase was comprised of implementation of the QRG along with supplemental materials. Electronic mail was utilized to provide the developed materials to all potential participants. Included in the message was the pre-implementation survey in the form of a link to Qualtrics. The QRG was formatted to be viewed via mobile devices or printed if preferred. The presentation was provided as a narrated PowerPoint. The instructional materials provided additional information on management of aspiration pneumonitis.

The *study* phase was the third phase in the cycle. The focus of this phase was to note any changes in the pre- and post-implementation surveys regarding the perceptions of the CRNAs after utilization of the QRG. Trends were noted to provide support for the use of the QRG. This benefit was taken into consideration against the cost of time and resources utilized in the development of the tools.

The final phase in this cycle was the *act* phase. In this phase information obtained was shared in the form of a poster presentation. This was open to other students and faculty of ECU, including the participants and non-participants, from the partnering organization. Upon completion of this DNP project, this paper will be uploaded to The Scholarship, ECU's digital repository.

Section IV. Results and Findings

Results

Qualtrics pre- and post-implementation surveys were used to collect data on the participants perceptions of the adequacy of the QRG as an aid in the prompt identification of at-risk patients and provide prevention strategies and treatment options for perioperative aspiration pneumonitis. Once the data was collected via Qualtrics it was then analyzed using Microsoft Excel. Ten participants were provided with the surveys through individual email links. Participation in pre-implementation surveys included four individuals, and post-implementation surveys included three individuals. The participants were asked to complete both surveys within two weeks of receiving them.

The pre-implementation survey consisted of questions to assess the providers on the following: recognition of patients at high risk for pulmonary aspiration, confidence in recognizing risk factors for pulmonary aspiration, current NPO recommendations, current GLP-1 recommendations, management and treatment of pulmonary aspiration, POCUS training, confidence performing POCUS, and gastric volumes considered “full stomach.” The pre-implementation survey can be viewed in Appendix F. The post-implementation survey consisted of questions to assess the providers on the following: QRG accessibility, application, ease of use, helpfulness, number of times used, impact on time providing patient care; confidence recognizing risk factors of pulmonary aspiration, conditions with increased risk, NPO recommendations, GLP-1 recommendations, management and treatment of pulmonary aspiration, gastric volumes considered “full stomach,” confidence performing POCUS, interest in an in-service on POCUS, likelihood to continue QRG use, and an open ended feedback question. The post-implementation survey can be viewed in Appendix G.

Data Presentation

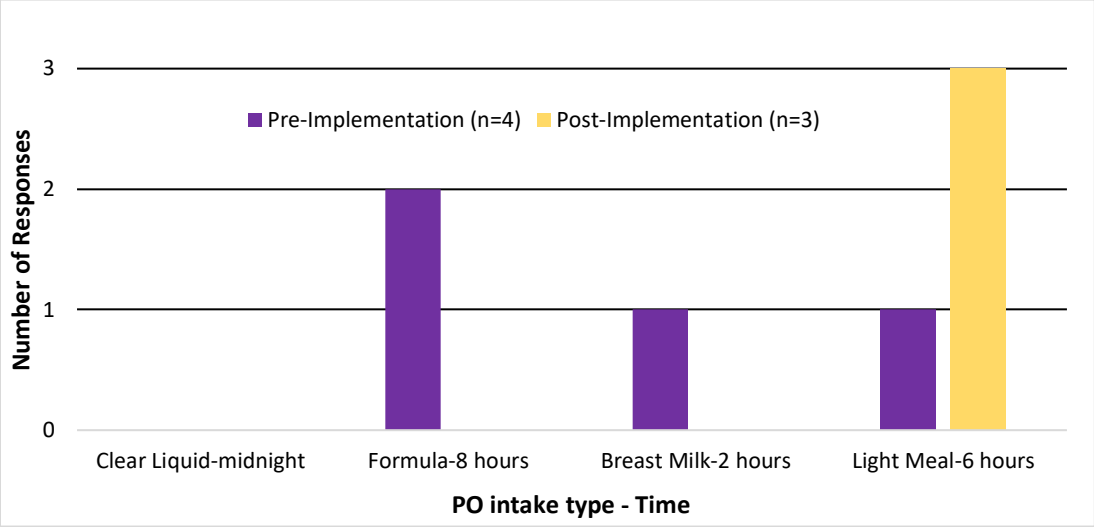
Individual links to the pre-implementation survey were emailed to ten CVOR CRNAs on June 7th, 2025. Four individuals participated, responses were received between June 8th and 14th, 2025. There were two questions on the pre-implementation survey that did not allow for comparison with the post-implementation survey. The first question focused on demographic data and the second focused on formal POCUS training. Six questions assessed demographic and background information along with usage of QRG. One question on pre-implementation survey assessed participants' experience level in years. For this question, one of four participants responded *3-6 years*, three responded *10 or more years.* One question on pre-implementation survey asked participants' if they had any formal training on POCUS; four of four participants responded *no*.

One question, containing four parts, on the post-implementation survey assessed perceptions of the QRG. Three of three participants responded *strongly agree* indicating that they found the QRG to be accessible and containing applicable content. One of three responded *somewhat agree* and two responded *strongly agree* indicating that they found it easy to read, understand, and have potential to improve care. One question on post-implementation survey assessed participants' use of the QRG. For this question, three of three participants responded *1-2 times*. One question on post-implementation survey assessed participants' time taken to reference the QRG per scenario. For this question, one of three participants responded *not applicable*, and two responded *<1 minute*. One question was an open-ended question allowing participants to share feedback on the QRG. None of the three participants responded.

The remaining questions allowed for comparison between pre- and post-implementation outcomes. One concept compared participants' confidence in recognizing aspiration pneumonitis risk factors. For the pre-implementation question, two of four participants responded *moderately confident*, and two responded *highly confident*. In the post implementation question two of three participants respond *moderately confident*, and one *highly confident*. One question on both pre- and post-implementation surveys assessed participants' knowledge of the risk factors of pulmonary aspiration. In the pre-implementation question, one of four participants responded *ASA Status of IV and V*, one responded *gastric pH<2.5 or gastric volume >25mL*, and two responded correctly *lower esophageal sphincter pressure exceeds intraabdominal pressure*. On post-implementation three of three participants respond with the correct answer of *lower esophageal sphincter pressure exceeds intraabdominal pressure*. One question on both pre- and post-implementation surveys assessed the participants' knowledge of the current ASA NPO recommendations for healthy patients undergoing elective surgery. In the pre-implementation question, two of four participants responded *formula should be held for 8 hours before the procedure*, one responded *breast milk should be held 2 hours before the procedure*, and one responded *light meals should be held 6 hours before the procedure*. The post-implementation question had three of three participants respond with the correct answer of *light meals should be held 6 hours before the procedure* (Figure 1).

Figure 1

Pre and Post evaluation on current ASA NPO elective surgery recommendations



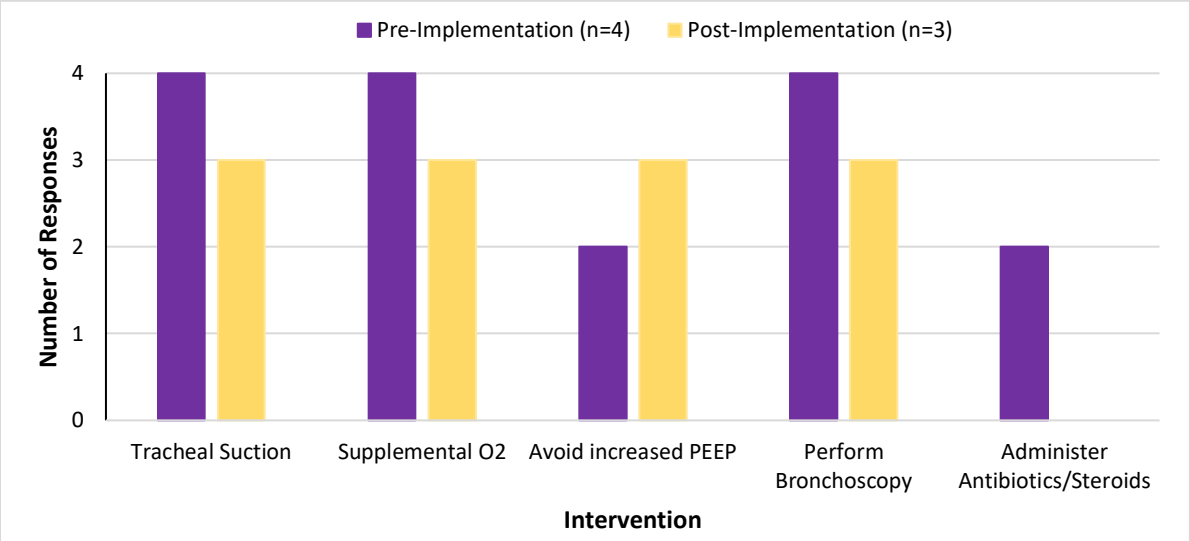
One questions on both pre- and post-implementation surveys assessed participants' knowledge of the guidelines regarding GLP-1 agonists. For the pre-implementation question, four of four participants responded with the desired answer of *weekly administered medications should be held one week prior to procedure*. The post-implementation question had one of three participants respond with the desired answer of *weekly administered medications should be held one week prior to procedure*, one of three responded *daily administered medications should be held the morning of the procedure*, and two of three responded with the desired answer of *daily administration should be held the day before the procedure*.

One question on both the pre- and post-implementation surveys assessed participants' knowledge of the evidence-based recommendations for management and treatment of pulmonary aspiration. For the pre-implementation question, two of four participants responded *avoid excess PEEP when possible*, and two responded with the desired answer of *administer antibiotics and steroids prophylactically*. The question on the post-implementation survey had three of three

participants respond with the desired answer *administer antibiotics and steroids prophylactically* (Figure 2).

Figure 2

Pre and Post evaluation of current evidence-based management of pulmonary aspiration



One question on both the pre- and post-implementation surveys assessed participants' knowledge of gastric volumes with potential aspiration risk. For the pre-implementation question, one of four participants responded *>0.5mL/kg*, one participant responded *>2mL/kg*, and two responded with the desired answer of *>1.5mL/kg*. The question on post-implementation had one out of three participants respond *>0.5mL/kg* and two out of the three participants respond with the desired answer of *>1.5mL/kg*. One question on pre- and post-implementation surveys assessed participants' confidence in identifying stomach contents using ultrasound. For the pre-implementation question, three of four participants responded *not confident at all*, and one responded *slightly confident*. The question on post-implementation had one of three participants respond *not confident at all*, and two responded *moderately confident*. One question on post-implementation survey assessed participants' interest in a POCUS in-service. For this

question, one out of three participants responded *yes*, and two responded *no*. One question on post-implementation survey assessed participants' likelihood to continue use of the QRG. For this question, one responded *not likely at all*, one responded *neutral*, and one out of three participants responded *moderately likely*.

Analysis

Upon review of the pre- and post-implementation survey results, several inferences could be drawn regarding perioperative care related to aspiration pneumonitis and the newly created QRG. The variation in results of pre- and post-implementation surveys may indicate the presence of gaps in awareness the latest evidence-based practice guidelines. After the review and use of the QRG, there was a shift in survey responses that were more aligned with current evidence-based recommendations related to NPO times, identification of high aspiration risk patients, gastric volumes consistent with “full stomach,” and pulmonary aspiration treatments. The shift supports the use of the QRG to improve patient care. The QRG reportedly took less than one minute on average to use. Two participants reported “strongly agree” that the QRG had potential to improve quality of care delivered to patients in their department. These reports and the survey results together would indicate that the quality of patient care could be improved with the use of the QRG without the excessive use of practitioner time.

The limited timeframe of this project combined with the small numbers of participants in both the pre- and post-implementation surveys limited the strength of conclusion. Implementation occurred concurrently with multiple providers’ vacation time which may have lowered participation. This also indirectly lowered participation as selected providers were relocated to assignments outside of the area of implementation to cover for other providers time off. The noted potential for improved quality of care would support the need for further study

with greater numbers and longevity to obtain more robust data. Any interpretation of these results can be applied only to this setting. This project shows clinical meaningfulness of the QRG only within the CVOR at the partnering facility. This project can be viewed as a pilot project supporting the need for future projects.

Section V. Implications

Financial and Nonfinancial Analysis

The financial costs of this project include the printing cost of the physical QRGs, the supplies used to perform POCUS, including ultrasound gel and sterilization products. The cost of time would be spent maintaining best practice recommendations on the QRGs as new research shifts guidelines. Kozlow et al. (2003) found that aspiration events independently were found to increase total hospital charges by a mean of twenty two thousand dollars. The costs of the QRG implementation are minimal in comparison to the added costs to facilities and patients if additional operative time, treatment, or hospitalization is indicated related to an aspiration event.

Implications of Project

As noted previously, aspiration during the perioperative period can result in adverse outcomes, longer hospital stays, and higher costs for both patients and healthcare facilities. The incidence of aspiration events have the potential to be reduced when a QRG is utilized. QRGs allow providers to identify risk factors and remain updated on practice guidelines allowing for efficient and safe care to be provided to patients. The use of the QRG would have the potential to improve patient outcomes, decrease patient harm, decrease costs, and improve providers time efficiency. This could concurrently cause an increase in patient satisfaction scores.

Sustainability

Considering the minimal cost incurred to implement this project and the increasing cost to treat patients with negative outcomes associated with aspiration pneumonitis, the partnering organization should find that implementation of this QRG to be cost-effective for further use. To maintain use of this QRG the organization would need to maintain physical handouts accessible to providers and/or provide digital copies. They would need to update it as any new studies are

published and take time to educate new staff and re-educate current staff on its use. Educational staff or CRNAs could assume this responsibility as a part of their professional responsibilities for continued education and new hire onboarding education.

Dissemination Plan

A poster with associated presentation illustrating the results of this quality improvement project were shared with project participants, SRNAs, project team members, and anesthesia department members and college of nursing facuilty. Project participants were invited to attend the presentation, but attendance was not required. This paper along with the poster were uploaded to the digital archive of East Carolina University, The Scholarship, allows continued access to these materials to the public.

Section VI. Conclusion

Limitations

A limitation of this QI project was the sample size in comparison to the total number of anesthesia providers at the partnering organization. Another limitation was the timeframe of the project, had implementation lasted longer there could be greater number of participants. Giving additional time would allow providers increased opportunity to participate. Additional responses would have added rigor to the data collected.

Recommendations for Future Implementation and/or Additional Study

Recommendation for future study would include addressing the noted limitations of this study as noted previously. One additional recommendation would include allowing locum or travel employees to participate. Allowing the QRG and other materials to be added digitally to the workstation computer desktop could also increase access to the tool and decrease burden. Addressing these recommendations would allow for greater participation and more supported conclusions.

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Appendix A:

Concept Chart

	Concept 1 Aspiration Pneumonitis	Concept 2 treatment	Concept 3 anesthesia
Keywords	“Aspiration pneumonitis” “Mendelson syndrome”	“treatment”	"anesthesia"
PubMed MeSH	"pneumonia, aspiration"[MeSH Terms]	"therapeutics"[MeSH Terms]	"anesthesia"[MeSH Terms]
CINAHL Subject Headings	(MH “Aspiration pneumonia”)	MH Therapeutics	MH "Anesthesia" OR MH "Anesthesia, General"
Google Scholar	"pneumonia, aspiration"[MeSH Terms]	"therapeutics"[MeSH Terms]	"anesthesia"[MeSH Terms]

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	(pneumonia, aspiration) AND (anesthesia) AND (therapeutics) **PubMed interpretation:** (("pneumonia, aspiration"[MeSH Terms] OR ("pneumonia"[All Fields] AND "aspiration"[All Fields]) OR "aspiration pneumonia"[All Fields] OR "pneumonia aspiration"[All Fields]) AND ("anaesthesia"[All Fields] OR "anesthesia"[MeSH Terms] OR "anesthesia"[All Fields] OR "anaesthesias"[All Fields] OR "anesthesias"[All Fields]) AND ("therapeutical"[All Fields] OR "therapeutically"[All Fields] OR "therapeuticals"[All Fields] OR "therapeutics"[MeSH Terms] OR "therapeutics"[All Fields] OR "therapeutic"[All Fields])) AND (2020:2024[pdat])	2021-2024 English Full text Humans	28/3	25 articles were excluded due to: not being anesthesia related, not being about aspiration of gastric contents, full article not available to this university, not being relevant to this project

09/12/2024	CINAHL	"Aspiration pneumonia" AND "Anesthesia, General" AND "Therapeutics" CINAHL interpretation: (aspiration pneumonia) AND (General anesthesia) AND (Therapeutics)	2021-2024 English Full text	28/0	All articles were excluded due to: not being anesthesia related, not being about aspiration of gastric contents
09/12/2024	Google Scholar	pneumonia, aspiration) AND (anesthesia) AND (therapeutics)	"Since 2023"	3850/1 10 pages reviewed	Exclusion criteria: not about humans, not about aspiration pneumonia, not related to anesthesia, not related to gastric contents

Appendix C:

Literature Matrix

Year	APA Citation	Purpose & Conceptual Framework or Model	Design and Level of Evidence	Setting	Sample	Tools and/or Interventions	Conclusions
2024	Perlas, A., Arzola, C., Portela, N., Mitsakakis, N., Hayawi, L., & Van de Putte, P. (2024, May 1). *Gastric volume and antral area in the fasting state: A meta-analysis of individual patient data*. American Society of Anesthesiologists. https://doi.org/10.1097/ALN.0000000000004914	ASA on ultrasound techniques for gastric volumes	Level VII – expert group opinions	n/a	n/a	n/a	ASA guidelines on use of ultrasound to measure gastric volumes and therefore predicting need for RSI or standard intubation to prevent aspiration.
2023	American Society of Anesthesiologists. (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. ASA Newsroom. https://www.asahq.org/about-asa/newsroom/news-releases/2023/06/american-society-of-anesthesiologists-consensus-based-guidance-on-preoperative	ASA guidelines for GLP-1	Level VII – expert group opinions	n/a	n/a	n/a	ASA guidelines on fasting for patients taking GLP-1 receptor agonists.

2022	Apfelbaum, J. L., Hagberg, C. A., Connis, R. T., Abdelmalak, B. B., Agarkar, M., Dutton, R. P., Fiadjoe, J. E., Greif, R., Klock, P. A., Mercier, D., Myatra, S. N., O'Sullivan, E. P., Rosenblatt, W. H., Sorbello, M., & Tung, A. (2021). 2022 American Society of Anesthesiologists Practice Guidelines for management of the difficult airway. *Anesthesiology*, *136*(1), 31–81. https://doi.org/10.1097/aln.0000000000004002	ASA guidelines on airway management	Level VII – expert group opinions	n/a	n/a	n/a	ASA guidelines on management of airway
2022	Rubinelli, S., Purnat, T. D., Wilhelm, E., Traicoff, D., Namageyo-Funa, A., Thomson, A., Wardle, C., Lamichhane, J., Briand, S., & Nguyen, T. (2022). Who competency framework for health authorities and institutions to manage infodemics: Its development and features. *Human Resources for Health*, *20*(1). https://doi.org/10.1186/s12960-022-00733-0	Guidelines developed by the World Health Organization for infodemic management in healthcare	Level VII: group expert opinion	Healthcare overall	n/a	n/a	The use of reference tools is helpful in the healthcare setting to provide the most up to date care in the setting of ever-changing recommendations.

2021	Megahed, M., El-Menshawy, A., & Ibrahim, A. (2021). Use of early bronchoscopy in mechanically ventilated patients with aspiration pneumonitis. Indian Journal of Critical Care Medicine, 25(2), 146-152. https://doi.org/10.5005/jp-journals-10071-23718	to determine the impact of early bronchoscopy in mechanically ventilated patients with aspiration pneumonitis	level II - Randomized control trial	Hospital	18 or older, intubated and ventilated, presenting with acute aspiration of gastric contents Sample size : 76	patients were grouped in two categories, Bronchoscopy within 24 hours of aspiration and the control group (no bronchoscopy) that received only chest PT and blind suctioning. Kolmogorov-Smirnov test for normality and distribution, t-test for normally distributed continuous variables, Mann-Whitney U-test for non-normal continuous variables, Chi-square test for categorial variables, analysis of variance and Friedman test for repeated measures within groups	Bronchoscopy is indicated only if solid particles are aspirated. Radiography would be needed to indicate this treatment. Upper airway suctioning and airway management are the only indicated treatment.
2018	Beckford, L., Holly, C., & Kirkley, R. (2018). Systematic review and meta-analysis of Cricoid pressure training and education efficacy. *AORN Journal*, *107*(6), 716–725. https://doi.org/10.1002/aorn.12150	To determine the effectiveness of education on proper use of cricoid pressure with intraoperative providers	Level I- meta-analysis	Operating room	494 healthcare providers	Meta-analysis of 8 different studies. X squared, Egger's test, Fisher's procedure	Education on proper technique of applying cricoid pressure during induction and intubation is needed for most providers. This study focused on cricoid pressure during resuscitation as well as during RSI to protect the airway from aspiration.

2018	Dragan, V., Wei, Y., Elligsen, M., Kiss, A., Walker, S. A. N., & Leis, J. A. (2018). Prophylactic antimicrobial therapy for acute aspiration pneumonitis. Clinical Infectious Diseases, 67(4), 513-518. https://doi.org/10.1093/cid/ciy120	to determine the benefit of prophylactic antimicrobial therapy to prevent aspiration pneumonia in the incidence of aspiration pneumonitis.	Level IV- retrospective cohort study	Hospital	18 or older, admitted to acute care bed at time of aspiration, nonmechanically ventilated, documentation of aspiration event, chest x-ray showing new radiologic infiltrate Sample size: 275	prophylactic antimicrobial therapy group and nonprophylactic antimicrobial therapy group. Odds Ratios were utilized for CIs. Multivariable logistic regression models to assess impact of antimicrobial prophylaxis on primary outcome.	The use of prophylactic antimicrobial therapy was not associated with a reduction in mortality or transfer to critical care compared with patients managed with supportive care and airway management only.
2017	Pytka, S., & Crosby, E. (2017). Aspiration: Risks and prevention. In O. R. Hung & M. F. Murphy(Ed.), Hung's Difficult and Failed Airway Management (3rd ed.) McGraw-Hill Education. https://accessanesthesiology.mhmedical.com/content.aspx?bookid=2206&sectionid=171075369	Gastric aspiration risks and prevention	Level VII: group expert opinion	n/a	n/a	n/a	Textbook chapter on gastric aspiration risks and prevention strategies

2011	Poulton, T. J. (2011). Gum chewing during pre-anesthetic fasting. *Pediatric Anesthesia*, *22*(3), 288–296. https://doi.org/10.1111/j.1460-9592.2011.03751.x	Assessment of if gum chewing prior to surgery will increase risk of aspiration	Level 1, Systematic review of literature	n/a	n/a	Analysis of different studies on gum related aspiration risks.	Study that shows that chewing gum pre-operatively does not increase gastric contents and can be allowed for patients without increasing aspiration risks.
2001	Marik, P. (2001). Aspiration pneumonitis and aspiration pneumonia. The New England Journal of Medicine, 344(9), 665-671. https://doi.org/10.1056/NEJM200103013440908	aspiration pneumonia treatment vs aspiration pneumonitis treatment	Level III-literature review	n/a	n/a	n/a	Aspiration syndromes may present similarly, but the treatment plan is dependent upon if it is aspiration pneumonitis or aspiration pneumonia.

Appendix D

Approval Process

College of Nursing/Institutional Review Board Project Review Process

Quality Improvement/Program Evaluation Self-Certification Tool

Purpose:
Projects that do not meet the federal definition of human research pursuant to 45 CFR 46 do not require IRB review. This tool was developed to assist in the determination of when a project falls outside of the IRB's purview.

Instructions:
Please complete the requested project information, as this document may be used for documentation that IRB review is not required. Select the appropriate answers to each question in the order they appear below. Additional questions may appear based on your answers. If you do not receive a STOP HERE message, the form may be printed as certification that the project is "not research", and does not require IRB review. The IRB will not review your responses as part of the self-certification process. For projects being done at Vidant Health, site support will be required. Please email crg.quality@vidanthealth.com to obtain site support from Vidant Health.

Name of Project Leader:

Eric LaRoque

Project Title:

DNP Project on Aspiration Pneumonitis in Perioperative Patients

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 for aspiration pneumonitis. The guide is designed to aid in the swift identification of at-risk populations and provide appropriate prevention strategies and treatment options for managing perioperative aspiration pneumonitis. 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 in their current practice. A newly developed quick reference guide 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 aspiration pneumonitis quick reference guide and 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.

Will the project involve testing an experimental drug, device (including medical software or assays), or biologic?

- ○ Yes
- ● No

Has the project received funding (e.g. federal, industry) to be conducted as a human subject research study?

- ○ Yes
- ● No

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)?

- ○ Yes
- ● No

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)?

- ○ Yes
- ● No

Will the results of the project be published, presented or disseminated outside of the institution or program conducting it?

- ○ Yes
- ● No

Based on your responses, the project appears to constitute QI and/or Program Evaluation and IRB review is not required because, in accordance with federal regulations, your project does not constitute research as defined under 45 CFR 46.102(d). If the project results are disseminated, they should be characterized as QI and/or Program Evaluation findings. Finally, if the project changes in any way that might affect the intent or design, please complete this self-certification again to ensure that IRB review is still not required. Click the button below to view a printable version of this form to save with your files, as it serves as documentation that IRB review is not required for this project. 11/14/2024

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 medicatio s should be held the day before surgery.

Weekly dosed medicatio s should be held one week before surgery.

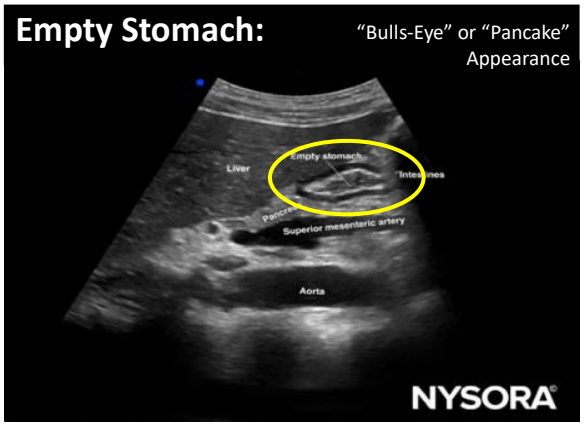
	GLP-1 Agonists	Clinical Dosing	Pharmacokinetics HALF-LIFE	Pharmacokinetics ELIMINATION	Special Considerations
1st Generation	Exanetide (Byetta®, Bydureon®)	SQ, twice daily (IR), weekly (ER), uptitrated	3 hours	Renal	Associated with immune-mediated thrombocytopenia
1st Generation	Lixisenatide (Adlyxin®)	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

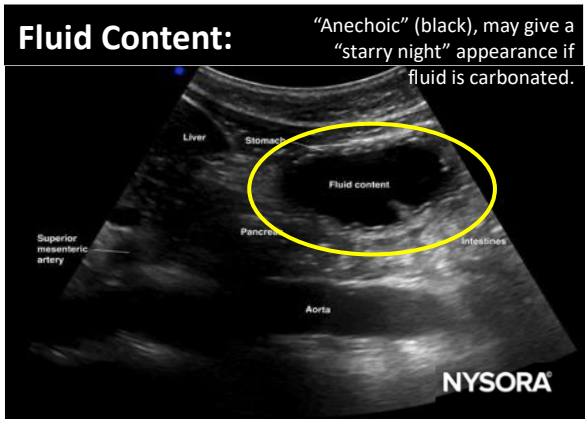
Grade 0	**Empty stomach**: No content is visualized in the supine and RLD position
Grade 1	**Low risk**: Fluid content is visualized and calculated to be **less than 1.5 mL/kg**
Grade 2	**High risk**: Fluid content is visualized and exceeds **1.5 mL/kg**



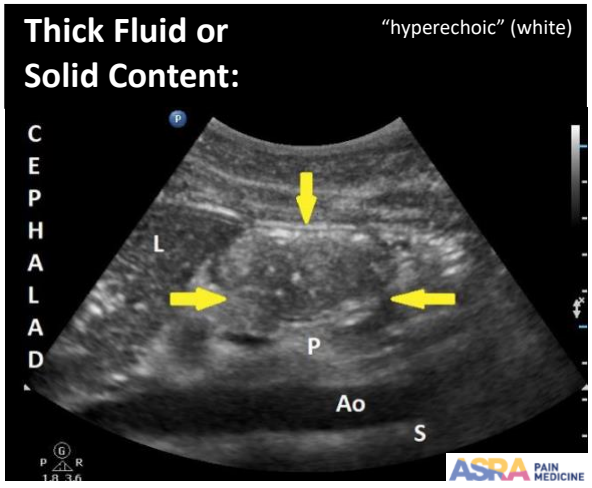
Patients are scanned in 2 positions: supine and right lateral decubitus

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	125	111	98	85
12	177	164	151	138	125	113	100
13	191	178	165	153	140	127	114
14	206	195	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

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2. American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration. (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 aspiration. *Anesthesiology, 126*(3), 376–393. https://doi.org/10.1097/ALN.0000000000001452
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Appendix F

Pre Questions

1. **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

2. **Which condition is NOT considered high risk for pulmonary aspiration?**
   a. Delayed gastric emptying

   b. ASA Status of IV and V

   c. Emergency surgical status

   d. Lower esophageal sphincter pressure exceeds intraabdominal pressure

   e. Gastric pH <2.5 or gastric volume >25mL

3. **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

4. **Which of the following NPO recommendations from the ASA for healthy patients undergoing elective surgery is correct? (choose one)**
   a. Clear liquids should be held at midnight before the procedure.

   b. Formula should be held for 8 hours before the procedure.

   c. Breast milk should be held 2 hours before the procedure.

   d. Light meals should be held 6 hours before the procedure.

5. **Which of the following guidelines regarding GLP-1 agonists are correct? (Select all that apply)**
   a. Weekly administered medications should be held <u>one week</u> prior to procedure.

   b. Daily administered medications should be held the <u>morning of</u> the procedure.

   c. Weekly administered medications should be held <u>one month</u> prior to the procedure.

   d. Daily administration should be held the <u>day before</u> the procedure.

6. **Which is NOT a current <u>evidence-based recommendation</u> for the management and treatment of pulmonary aspiration?**
   a. Aggressive tracheal suction.

   b. Administer supplemental oxygen.

   c. Avoid excess PEEP when possible.

   d. Perform a bronchoscopy for large particulate matter or significant volume of aspirated contents

   e. Administer antibiotics and steroids prophylactically

7. **Have you received any formal training on point-of-care gastric ultrasound (POCUS)?**
   Yes No

8. **How confident do you feel identifying stomach contents on ultrasound?**
   Not confident at all Slightly confident Moderately Confident Highly Confident Completely Confident

9. **Which gastric volume is considered to be significant content (i.e. a "full stomach") with potential aspiration risk?**
   a. >0.5 mL/kg

   b. >1 mL/kg

   c. >1.5 mL/kg

   d. >2 mL/kg

Appendix G

Post Questions

1. **When answering the next four questions, think about your use of the QRG over the previous two weeks.**

   The QRG:

   a. **Was easily accessible.**
      1 2 3 4 5

   b. **Included applicable content.**
      1 2 3 4 5

   c. **Was easy to read and understand.**
      1 2 3 4 5

   d. **Has the potential to improve the quality of care delivered to patients in the anesthesia department.**
      1 2 3 4 5

   Over the past two weeks:

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

   0 1-2 3-4 5-6 >6

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

   <30 seconds 31 - 60 seconds 1-2 minutes 2-5 minutes
   > 5 minutes

4. **After reviewing this reference material, 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

5. **Which condition is NOT considered high risk for pulmonary aspiration?**
   a. Delayed gastric emptying

   b. ASA Status of IV and V

   c. Emergency surgical status

   d. Lower esophageal sphincter pressure exceeds intraabdominal pressure

   e. Gastric pH <2.5 or gastric volume >25mL

6. **Which of the following NPO recommendations from the ASA for healthy patients undergoing elective surgery is correct? (choose one)**
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   c. Breast milk should be held 2 hours before the procedure.

   d. Light meals should be held 6 hours before the procedure.

7. **Which of the following guidelines regarding GLP-1 agonists are correct? (Select all that apply)**
   a. Weekly administered medications should be held one week prior to the procedure.

   b. Daily administered medications should be held the morning of the procedure.

   c. Weekly administered medications should be held one month prior to the procedure.

   d. 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?**
   a. Aggressive tracheal suction.

   b. Administer supplemental oxygen.

   c. Avoid excess PEEP when possible.

d. Perform a bronchoscopy for large particulate matter or significant volume of aspirated contents

e. Administer antibiotics and steroids prophylactically

9. **Which gastric volume is considered to be significant content (i.e. a "full stomach") with potential aspiration risk?**
   a. >0.5 mL/kg
   b. >1 mL/kg
   c. >1.5 mL/kg
   d. >2 mL/kg

10. **After reviewing this reference material, 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

11. **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

12. **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.**

(open-ended question box)