Evaluating the Effectiveness of Gastric Ultrasound Training for Practicing Certified Registered Nurse Anesthetists

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Abstract

Introduction/Purpose

The purpose of this project was to train Certified Registered Nurse Anesthetists (CRNAs) in the use of gastric ultrasound to evaluate stomach contents in patients at risk for aspiration prior to surgery. GLP-1 agonists delayed gastric emptying, which increased the risk for aspiration on induction of anesthesia, necessitating a reliable tool for preoperative assessment of gastric contents. The proposed solution was the implementation of gastric ultrasound, an inexpensive, non-invasive, simple skill, recognized for its accuracy in determining gastric contents.

Methods

The literature review underscored the rising use of GLP-1 agonists, their impact on gastric emptying, and the inadequacy of existing fasting guidelines. Gastric ultrasound, identified as a valuable point-of-care tool, lacked integration into anesthesia training. The study outlined a targeted intervention to educate practicing CRNAs, focusing on the Indication, Acquisition, Interpretation, and Medical-Decision Making (I-AIM) framework for gastric ultrasound interpretation.

The project design involved a pre– and post-intervention assessment using a questionnaire and the Ultrasound Competency Assessment Tool (UCAT). The educational intervention included a didactic presentation and hands-on training. CRNAs scanned a standardized volunteer model under various gastric states, and their competency was reevaluated two months later. The project’s setting was an anesthesia group in Boise, Idaho, serving a diverse patient population.

Results

Nine Certified Registered Nurse Anesthetists (CRNAs) participated in this study to evaluate their competency in performing gastric ultrasound after completing a structured training program. Before the training, participants completed a pre-questionnaire to assess their baseline knowledge and experience with ultrasound. None of the participants had received formal education in Point-of-Care Ultrasound (POCUS) or gastric ultrasound, though 78% reported using ultrasound in their clinical practice for nerve blocks and invasive line insertions. Their self-rated entrustment scores averaged 1.67 (SD = 0.50), indicating low confidence and competence.

Following the training intervention, the CRNAs were evaluated six weeks later using the UCAT. In preparation, all participants scored a 3. For image acquisition, the mean score was 2.56 (SD = 0.53), and for clinical integration, the mean score was 2.11 (SD = 0.60). Entrustment scores significantly improved, with a mean post-training score of 2.75 (SD = 0.46). A paired t-test confirmed the significance of this improvement, $t(8) = -5.50$, $p = 0.00057$.

Discussion

This study evaluated the effectiveness of a structured training program in enhancing CRNAs' competency in performing gastric ultrasound. The pre-educational questionnaire highlighted a gap in formal training, with most participants lacking experience in POCUS and gastric ultrasound. Post-training evaluations showed significant improvements in preparation, image acquisition, and clinical integration, demonstrating the program's effectiveness.

The significant increase in entrustment scores indicated that CRNAs gained confidence and competence in performing gastric ultrasound independently. The results suggest that a structured training program can effectively equip CRNAs with the skills needed to integrate gastric ultrasound into clinical practice, improving patient safety and clinical outcomes. To further enhance skill retention and autonomy, follow-up practice sessions are recommended, including refresher training, extended hands-on practice, simulation scenarios, and competency reassessment.

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Glucagon-Like Peptide-1 (GLP-1) agonists delay gastric emptying, patients prescribed these medications at higher risk for perioperative aspiration (American Society of Anesthesiology Task Force on Preoperative Fasting, 2017; Hulst et al., 2021). Gastric ultrasound has been identified as a clinically useful tool anesthetists can use before surgery to assess the stomach for gastric contents (Joshi et al., 2023; Tankul et al., 2022). The ability of the anesthetist to use point-of-care ultrasound to evaluate gastric contents immediately before surgery can improve patient safety by identifying the risk of aspiration, especially as the use of GLP-1 agonists is on the rise.

Background

Before the delivery of an anesthetic, a patient must have an empty stomach to decrease the risk of aspiration of gastric contents (Barash et al., 2017). Aspiration of gastric contents by patients having anesthesia has been associated with severe morbidity and mortality (Warner et al., 2021). In a recently published review of closed-claims cases in anesthesiology, the authors found 115 instances of perioperative aspiration resulting in patient claims; of these claims, 57%

resulted in death, and 14% resulted in severe permanent injury (Warner et al., 2021). The guidelines from the American Society of Anesthesiologists Task Force on Preoperative Fasting recommend preoperative fasting periods of two hours for clear liquids, six hours for non-human milk and light meals, and eight hours for fatty or fried foods (American Society of Anesthesiology Task Force on Preoperative Fasting, 2017). Many facilities advise patients not to eat or drink anything for at least eight hours before elective surgery to reduce the risk of preoperative aspiration.

GLP-1 receptor agonists are a class of medications used to treat type-II diabetes mellitus with a secondary effect of improving cardiovascular disease and obesity (Collins & Costello, 2023). This class of drugs has dramatically increased in use, with prescriptions from 2016 to 2022 increasing by 221% (Dzaye et al., 2022). One of this drug class's identified mechanisms of action is to delay gastric emptying time (Collins & Costello, 2023). This reduction in gastric emptying time results in the presence of gastric contents in the patient's stomach even after a typical eight-hour fasting time before surgery, putting them at increased risk for perioperative aspiration (Beam & Hunter Guevara, 2023; Hulst et al., 2021). Currently, there is not enough data to give an evidence-based recommendation of how long these medications should be held before surgery to reduce the effect of delayed gastric emptying time and confidently say the standard fasting guidelines will result in these patients arriving for surgery with an empty stomach (Joshi et al., 2023). The current recommendations by the American Society of Anesthesiology (ASA) are based on the known half-life of the medication, holding daily GLP-1 inhibitors for one day before surgery and holding once per week GLP-1 inhibitors one week before surgery (Joshi et al., 2023). In addition to guidelines for holding the medications, the recommendations also state the anesthesia provider should perform a gastric ultrasound for patients who are suspected to have gastric contents (Joshi et al., 2023).

Gastric ultrasound is a point-of-care ultrasound (POCUS) exam that can determine the presence of gastric contents and whether the contents are solids or liquid (Flynn et al., 2023). In assessing anesthesia providers' clinical use of gastric ultrasound, the exam was highly accurate for determining gastric volume contents and was easy to perform (Tankul et al., 2022). Given the reliable, objective data a gastric ultrasound can provide to an anesthesia provider to make a safe clinical decision for a patient on a GLP-1 inhibitor, CRNA must have the knowledge and skills to perform a gastric ultrasound.

Organizational "Gap Analysis" of Project Site

Over the past couple of years, new research has presented compelling evidence that gastric ultrasound is a useful clinical tool for the anesthesia provider (Flynn et al., 2023; Joshi et al., 2023; Tankul et al., 2022). Due to only recently emerging as a clinically useful tool for the anesthesia provider, it is not a specific skill that is part of the required education for CRNA (Council on Accreditation of Nurse Anesthesia Education Programs, 2022). As a result, many CRNAs have not received formal training to perform a gastric ultrasound during their education.

A survey of the CRNAs regarding gastric ultrasound was performed at the project site. Zero percent of the CRNAs reported being formally trained in using gastric ultrasound during their CRNA education. Zero percent of the CRNAs report receiving post-graduate training in gastric ultrasounds. Twenty percent of CRNAs reported being somewhat familiar with a gastric ultrasound. Zero percent of CRNAs said they are very familiar with gastric ultrasounds. Zero percent of CRNAs reported having performed a gastric ultrasound. Zero percent of CRNAs report feeling comfortable using a gastric ultrasound to make a clinical decision.

Based on the ""GAP"" analysis results, it is clear CRNAs at the project site are deficient in the skill and knowledge to perform a gastric ultrasound. The deficiency limits the CRNAs from fully applying the consensus guidelines issued by the ASA for patients taking GLP-1 medications.

Review of the Literature

A literature review was performed using the databases of PubMed, CINAHL, NIH, and the National Library of Medicine. Searches using the terms gastric ultrasound, anesthesiology, glucagon-like peptide 1, training, and point-of-care ultrasound (POCUS). The results of the searches were filtered for publications occurring in the last five years, which yielded 391 results. 45 of the 391 results were found to be scholarly articles on the topic. Articles were excluded if they did not directly address the topic or presented duplicate information. Of the articles reviewed, 17 articles were selected for this proposal.

Ultrasonography is a non-invasive imaging technique used across medicine for diagnostic and procedural interventions. POCUS is an emerging use of ultrasonography where the ultrasound is brought to the patient’s bedside or in the operating room (OR) to evaluate various organ systems of a patient directly by the provider (Li et al., 2020). Different POCUS techniques, including gastric ultrasound, are helpful to the anesthesia provider. A gastric ultrasound can be used to quickly assess a patient's stomach for gastric contents, assessing risk for perioperative aspiration (Gola et al., 2018; Kruisselbrink et al., 2019; Li et al., 2020; Segura-Grau et al., 2021). Performing the scan at the level of the gastric antrum has been found in the literature to be the most clinically accurate method for identifying the presence of gastric contents (Kaydu & Gokcek, 2018; Kruisselbrink et al., 2019; Rocha et al., 2020; Segura-Grau et al., 2021). The technique is not without limitations, as gastric resections, gastric banding, fundoplication, and hiatal hernias can alter the reliability of the exam (Gola et al., 2018). Nevertheless, a systematic review by Rocha et al. (2020) found that a gastric ultrasound performed at the gastric antrum is an effective method for assessing a patient's gastric contents, leading to improved patient safety in populations who have an increased risk for perioperative aspiration.

Many conditions are known to anesthesia providers to increase a patient's risk for a full stomach despite extended preoperative fasting (Barash et al., 2017). However, GLP-1 agonists, specifically semaglutide, have only recently been added to this list. A retrospective analysis by (Silveira et al., 2023) of patients on semaglutide undergoing esophagogastroduodenoscopy (EGD) found these patients had increased gastric contents. Several case studies in anesthesia have echoed the findings reported by Silveira et al., describing patients on GLP-1 agonists who still had full stomachs after normal, to extended, periods of preoperative fasting (Beam & Hunter Guevara, 2023; Gulak & Murphy, 2023; Klein & Hobai, 2023; Wilson et al., 2023). Sherwin et al., (2023) used gastric ultrasound to assess patients taking GLP-1 receptor agonists for increased gastric contents versus a control group after commonly prescribed preoperative fasting times. The authors found that participants in the GLP-1 receptor agonist group had a greater incidence of residual gastric contents than the control group when assessing solid food and water separately (Sherwin et al., 2023).

With the recent realization that GLP-1 receptor agonists may put patients at greater risk for perioperative aspiration, recommendations have been made for anesthesia providers to utilize the evidence-based tool of gastric ultrasound to assess these patients for increased gastric contents before surgery until proper fasting guidelines can be established for these patients (Fujino et al., 2023; Joshi et al., 2023). Unfortunately, POCUS, specifically gastric ultrasound, has not been a technique that has long been part of anesthesia training (Council on Accreditation, 2021; Naji et al., 2021). For this reason, many practicing providers are not familiar with POCUS, as pointed out in a national survey of anesthesia providers at Veterans Affairs Hospitals, which found 74% of respondents desired training in POCUS, and of those that currently performed POCUS, very little used it for diagnostic application (Remskar et al., 2023).

The current environment points to a need for POCUS training for current practicing anesthesia providers, and the literature shows it is a very teachable skill (Haskins et al., 2018; Kaydu & Gokcek, 2018; Ramsingh et al., 2014; Tankul et al., 2022). POCUS encompasses various exams that can differ in skill and knowledge; this project will focus on the literature of training for gastric ultrasound. Tankul et al. (2022) collected qualitative and quantitative data from a prospective cohort study on anesthesia providers' education on gastric ultrasound. The authors reported that after training, the anesthesia providers could identify liquid 100% of the time, while solid identification had a success rate of 89% with an overall success rate of 96% (Tankul et al., 2022). However, when the authors had the participants measure the actual volume of the gastric contents, there was less of a success rate, showing the ease of teaching identification of gastric contents is greater than that of quantifying the volume of gastric contents (Tankul et al., 2022). These findings build off earlier literature by Arzola et al., (2013) who explored the number of gastric ultrasounds that needed to be performed for a provider to be proficient. This study showed a 95% success rate of trainees after performing 33 gastric ultrasounds (Arzola et al., 2013).

GLP-1 receptor agonists cause patients to have increased gastric contents despite standard preoperative fasting guidelines. Until evidence-based guidelines for fasting for patients taking GLP-1 receptor agonists can be established, gastric ultrasounds are helpful for the anesthesia provider to provide safe anesthesia for patients. The literature has shown gastric ultrasounds performed at the gastric antrum reliably identify the presence of gastric contents (Kaydu & Gokcek, 2018; Kruisselbrink et al., 2019; Rocha et al., 2020; Segura-Grau et al., 2021). The knowledge and skill to complete this exam are lacking in current practicing anesthesia providers due to their absence from formal anesthesiology training. Research has shown, in general, that POCUS is an easy skill for trainees to learn (Haskins et al., 2021; Kaydu & Gokcek, 2018; Ramsingh et al., 2014; Tankul et al., 2022). While abundant research on training anesthesia providers in gastric ultrasound is lacking, research on acquiring general POCUS skills in untrained clinicians shows it can quickly be learned (Haskins et al., 2021; Kaydu & Gokcek, 2018; Ramsingh et al., 2014; Tankul et al., 2022). Given this evidence, a project to train current practicing CRNAs how to perform gastric ultrasounds to identify gastric contents for patients before surgery is of great benefit to the safety of patients and one the literature shows to be highly achievable (Haskins et al., 2021; Kaydu & Gokcek, 2018; Ramsingh et al., 2014; Rocha et al., 2020; Tankul et al., 2022).

Evidence-Based Practice: Verification of Chosen Options

This project was designed to train CRNAs to perform gastric ultrasounds on patients taking GLP-1 medication and to interpret the exam findings correctly. Six weeks after training, CRNAs were assessed for their ability to perform and correctly interpret a gastric ultrasound independently.

Theoretical Framework Model

The theoretical framework guiding this project is George Miller's framework for assessing clinical competence, commonly known as Miller's Pyramid. Miller first described this framework in 1990 when he presented his four-tier pyramid that illustrated how learners moved through four stages when learning a clinical skill in medical education (Miller, 1990). The literature has used this framework to review POCUS assessment methods (DeBiasio et al., 2023).

The theory states learners begin at the base of the pyramid, as shown in Figure 1, by forming a knowledge base; they then proceed to the competence of knowing how, then to the performance tier of showing how, and finally to the top of the pyramid which Miller calls doing (Miller, 1990). Miller describes the knowledge base as the point in learning in which the learner understands what is required to carry out the skill and why the skill is performed (Miller, 1990). Participants will enter the project with some of this base knowledge and will have the base fully formed through the educational presentation. The next pyramid tier is the competence stage or the ""know-how"" stage. This stage is described as when learners understand how to use the knowledge they have and apply it to a clinical skill (Miller, 1990). The second half of the educational presentation and the demonstration of gastric ultrasound by the project director is where participants will move into this second tier of Miller's Pyramid. During these parts of the education, participants will be presented with the techniques for gastric ultrasound performance, how to interpret images, and how to clinically apply the findings.

When learners complete the second tier, they move into the third tier of the pyramid, which is the performance stage named the " shows how" tier by Miller (Miller, 1990). At this tier, learners now use their base knowledge, and their understanding of how-to, and perform the clinical skill under the guidance and observation of an instructor (Miller, 1990). The project will move to this tier after gastric ultrasound has been demonstrated to the participants. The participants will then be shown how to perform gastric ultrasounds with the project director guiding them through the technique and interpretation. Learners reach the fourth and final tier of the pyramid when performing the clinical skill independently in clinical practice (Miller, 1990). The goal of the project is to get participants to this tier essentially. Following the educational intervention, participants will be encouraged to perform gastric ultrasounds in practice. A formal evaluation of participants' gastric ultrasound performance will determine if they have moved into the top tier of Miller's Pyramid.

Goals, Objectives, and Expected Outcomes

The goal of this project was for CRNAs, with no formal training in performing gastric ultrasounds, to be able to independently perform the skill and correctly interpret the scan's findings, two months after receiving education.

Several objectives had been identified that would help to achieve this goal.

Objectives:

1) The Project Director provided a twenty to thirty-minute education presentation to participating CRNAs on performing a gastric ultrasound at four separate opportunities in March and April of 2024. This presentation was be based on formal education on gastric

ultrasound from gastricultrasound.org, an evidence-based free educational resource for gastric ultrasound (Van de Putte & Bouvet, n.d.).

2) The Project Director performed hands-on instruction with each CRNA, assisting them with techniques for image acquisition of the gastric ultrasound using the Indication, Acquisition, Interpretation, & Medical Decision Making (I-AIM) framework. This included time scanning the model patient in the supine and lateral decubitus positions, helping them to identify an empty stomach, a stomach with solid contents, and a stomach with fluids.
3) Six weeks after education in April and May of 2024, the Project Director assessed each CRNA's ability to perform and interpret a gastric ultrasound using the Ultrasound Competency Assessment Tool (UCAT).

The project's expected outcome was that six months after education, 90% of CRNA participants would be able to perform and correctly interpret a gastric ultrasound with an entrustment score of three or greater, as assessed by the UCAT.

Methods

The project began with educating nine CRNAs on the use and interpretation of gastric ultrasound using the I-AIM framework. Participants' performance was reevaluated two months after their initial training. The project's educational component was divided into a presentation and hands-on training. Six weeks after the education, the project director assessed each participant's ability to perform a gastric ultrasound accurately and appropriately interpret the findings using the UCAT.

Project Design

The project was an educational intervention that used a presentation and hands-on training to educate CRNAs, with no formal training in gastric ultrasound, on performing and interpreting a gastric ultrasound. Participants were recruited on a volunteer basis using the project site's roster of CRNAs. Before the education, participants completed a pre-educational questionnaire to determine their qualification to participate. Questions related to years of practice, the clinical use of ultrasound, formal ultrasound training, and if they had ever received any formal training in gastric ultrasound were asked. CRNAs who were not currently practicing, were not board certified, and had had previous formal training on performing gastric ultrasounds were all excluded from participating in this project.

Participants then received a twenty-to-thirty-minute presentation on all aspects of gastric ultrasound. This presentation reviewed the relevant anatomy and then introduced the gastric ultrasound based on the I-AIM framework, as shown in Figure 2. I-AIM is a framework for protocol-guided ultrasonography that has been utilized for many different POCUS exams. There are four general steps in an I-AIM protocol: indication for the procedure, acquisition of the image, interpretation of the scan, and decision made from the exam interpretation (Perlas et al., 2016). Perlas and colleagues used the I-AIM framework to create a gastric ultrasound protocol (Perlas et al., 2016). This specific protocol by Perlas et al. (2016) was used as the framework for the instruction of performing gastric ultrasound in the project.

After the presentation, participants scanned a volunteer model, who was under a body mass index (BMI) of 40 at three different gastric states (empty, clear fluid, and solid). All participants scanned the same volunteer model. The project director first demonstrated the scan reinforcing use of the I-AIM framework as structure to conducting the scan. Then participants each performed the scan under the guidance of the project director. The first round of scanning the volunteer model had an empty stomach. The second round of scanning the volunteer model ingested eight ounces of water to simulate a stomach containing clear liquids. The third round of scanning the volunteer model ingest a protein bar to simulate a stomach with solid contents. All participants scanned the volunteer at each post prandial state.

Six weeks after the educational intervention, participants were assessed for their ability to perform a gastric ultrasound and correctly interpret the findings. Participants were individually assessed by the project director. The volunteer model for the assessment was randomly assigned to have either an empty stomach, drink 8 ounces of water immediately before the scan, or eat a protein bar immediately before the scan. The participant was then asked to perform a gastric ultrasound on the volunteer and provide an interpretation. Qualitative data was collected on the participants' performance using the UCAT at this two-month assessment.

Project Site and Population

The project site is an anesthesia group providing inpatient and outpatient anesthesia services to the community. The group is owned by two practicing CRNAs and has 13 other partner CRNAs in the practice. The group provides anesthesia services in an independent practice model, meaning there is no supervision from a physician anesthesiologist. The group serves a patient population of all ages and co-morbidities, with most patients being middle-aged to elderly.

The group is located in greater Boise, Idaho. Idaho is a Medicare opt-out state for CRNAs, which allows for billing of anesthesia services from independent practicing CRNAs, which then translates to the ability for CRNAs to practice independently (AANA State Government Affairs Division, 2023). The group covers facilities in Ada, Canyon, and Gem counties, providing anesthesia services to patients of all income levels. The three counties have a total population of 774,838 people, with 17.4% of the population over 65 years of age (County Health Rankings & Roadmaps, 2023). The median household income for the counties is $67,400, with a medically uninsured rate of 13.6% (County Health Rankings & Roadmaps, 2023). All counties have designations as medically underserved areas (MUA) and have medically underserved populations (MUP) with low income (Health Resources & Services Administration, n.d.).

In planning for the educational intervention, some resources were identified that the Project Director needed to ensure were available for the proper intervention delivery. For the presentation, a room with a projector and adequate seating needed to be identified. There were multiple facilities the group had access to that had such a room. For the hands-on training, an ultrasound machine with a curvilinear probe and ultrasound gel was needed. Multiple ultrasounds with this probe were available to the group. A long table or gurney for the human model to lie on during scanning was required. Finally, a volunteer human model needed to be identified. Once identified, the model was given clear instructions for the day of the training for the scans to be successful. The model was advised to avoid any food six hours before the exercise and avoid any clear beverages two hours before the activity. Additionally, the model was told to wear a loose-fitting shirt to expose the abdomen easily.

The project's target population was CRNAs who did not have previous formal training in performing gastric ultrasounds. This included any CRNA who was currently practicing and was board-certified. CRNAs who were not currently practicing, were not board-certified, or had had previous formal training on performing gastric ultrasounds were excluded from participating in this project.

Measurement Instruments

Two instruments were used to measure data. The initial tool was a questionnaire of the participants before the educational intervention, as shown in Figure 3. This was a brief questionnaire that gathered demographic data about the participants' general professional experience and their ultrasound experience, including how long they had been practicing. Questions related to the clinical use of ultrasound were also asked, including if the participant currently used ultrasound in any form in their current practice, if they performed POCUS assessments, if they had ever received any formal training in using an ultrasound, and if they had ever received any formal training in gastric ultrasound. Participants were also asked to self-rate their entrustment score for performing a gastric ultrasound.

The second instrument used was the UCAT, as seen in Figure 4. This instrument was used to assess the participants' competency in performing a gastric ultrasound. The UCAT is an objective assessment for measuring the performance of an individual performing POCUS during direct observation (Bell et al., 2020). The tool was developed with the goal of creating a simple assessment that could be used to assess a wide variety of POCUS examinations (Bell et al., 2020). Bell and colleagues developed the UCAT by establishing anchors from a three-step Delphi design survey (Bell et al., 2020). The tool was then validated with trainees learning Focused Assessment with Sonography in Trauma (FAST) and cardiac POCUS, with both studies showing a Cronbach's alpha score of 0.9 or greater for inter-rater reliability (Bell et al., 2020; Bell et al., 2021). The tool has five assessment categories: preparation, image and acquisition, image optimization, clinical integration, and entrustment (Bell et al., 2020).

Data Collection Procedures

Pre-Intervention

Using the CRNA roster of the project site, CRNAs were formally invited to participate in the project. In the formal invitation, CRNAs were informed that participation was entirely voluntary, and they could stop participating at any time. CRNAs who agreed to participate were given the pre-questionnaire before the course. Not only was this valuable demographic data to supplement the project's data, but it was also used to rule out participants. Any CRNA that indicated they had received formal training in gastric ultrasound and currently performed gastric ultrasounds in their practice was ruled out from proceeding in the study. A total of nine CRNAs were recruited.

The design of the intervention started with the creation of the didactic presentation. The Project Director designed a twenty-to-thirty-minute presentation using Microsoft PowerPoint. The presentation design began with an introduction to what gastric ultrasound is and when it is used. A discussion of the anatomy of the stomach and surrounding structures followed this. The presentation was then designed to discuss sonoanatomy in relation to the reviewed anatomy to orient participants. These sections were developed from educational materials from gastricultrasound.org (Van de Putte & Bouvet, n.d.). From there, the presentation was designed to introduce the scanning protocol based on the I-AIM framework. This part of the presentation design reviewed indications for performing a gastric ultrasound. The presentation then explained how to acquire an image properly, discussing patient position, type of probe, scanning technique, and capturing the proper image. Following image acquisition, the presentation instructed the participants on interpreting the images, including correctly measuring the stomach contents. These slides showed the participants the appearance of an empty stomach, a stomach with liquid, and a stomach with solids. Finally, participants were educated on how to use these interpretations to inform clinical decisions. Participants were offered time to ask any questions.

The second part of the educational intervention was designed around hands-on training in the gastric ultrasound technique. The Project Director organized this part of the education by planning a framework for the demonstration of the technique based on the I-AIM framework. The intention was at this point, participants would enter the second tier of Miller's Pyramid (Miller, 1990). It was planned that each participant would then scan a volunteer model under the guidance of the Project Director in supine and right lateral decubitus positions with an empty stomach, a stomach containing liquid, and a stomach containing solid food.

The course would be offered on four separate days to improve participation. Before the intervention, the Project Director contacted all identified participants with class dates and times. Participants were asked to sign up for a date and time that worked best for them. Scheduling of participants was difficult due to personal and professional scheduling conflicts that participants had.

Intervention

The educational intervention was delivered on days and times identified when the CRNAs could participate. The Project Director delivered the PowerPoint presentation, introducing the CRNAs to gastric ultrasound. The presentation was no more than twenty to thirty minutes long to hold the participants' attention. The presentation began with an introduction to gastric ultrasound, highlighting the utility of the skill for anesthesia providers. The presentation then explored the applied anatomy related to gastric ultrasound. The anatomical sections of the stomach were identified with emphasis on the gastric antrum. The three muscular layers that form the stomach were presented to help participants understand the three-layer appearance of the gastric antrum on ultrasound. Other anatomical structures in a typical gastric ultrasound were also presented. The location of the left lobe of the liver, superior mesenteric artery, and aorta as they relate to the stomach was explored. The presentation then explored these structures as they appeared on ultrasound by presenting ultrasound images beside anatomic illustrations so that participants could connect what they would see during the gastric scans with the anatomy they had learned.

The presentation then moved to the gastric ultrasound scanning protocol based on the I-AIM framework. Indications for the scan were presented, including the ASA recommendations for patients taking GLP-1 agonists (Joshi et al., 2023). The acquisition of a gastric ultrasound image was then explained. This started with needing patients to be scanned in supine and right lateral decubitus positions. The curvilinear probe was identified as the probe of choice for gastric ultrasound. Probe positioning on the patient was then discussed, with details on performing fine adjustments to enhance the image. Sonoanatomy was identified, along with anatomical landmarks that helped the CRNA to orient themselves. Views of the gastric antrum and different states were presented, including empty, fluid, and solid contents. Interpretation of findings was then discussed (Table 1). An empty stomach was presented with ultrasound images and an explanation of the keys to interpreting the images.

Table 1

Ultrasound Findings & Aspiration Risk

Gastric Ultrasound Findings	Aspiration Risk
Empty Stomach (Grade 0)	Low Risk
Clear Fluid (Vol < 1.5 ml/kg) (Grade 1)	Low Risk (Suggests Empty Stomach)
Clear Fluid (Vol > 1.5 ml/kg) (Grade 2)	High Risk (Suggests Full Stomach)
Solid Contents	High Risk

(Van de Putte & Bouvet, n.d.)

Clear fluid ultrasound images were then discussed. Grading of clear fluid as either grade 1 or grade 2 was discussed, and the change in patient positioning from supine to right lateral decubitus that was required to differentiate between the two grades was discussed. Finally, gastric ultrasound findings of thick fluid/solid were discussed with ultrasound images as examples. Once the three states of the antrum had been presented, the process of volume estimation was discussed. CRNAs were shown how to measure the cross-section of the antrum (CSA) and then calculate the volume of fluid in the antrum based on the CSA. Clinical decision-making was then discussed, relating the measurements to risk for aspiration. The different states of the antrum discussed in the lectures and volumes measured were associated with risk for aspiration. At the end of the presentation, the participants had the opportunity to ask questions. This formed the first tier of Miller's Pyramid.

After the presentation, the participants received hands-on training on performing a gastric ultrasound. This training was done with ultrasound using a curvilinear probe and a volunteer model under a BMI of 40. While gastric ultrasound in patients over a BMI of 40 have been shown in the literature to be feasible and accurate, it can be more difficult for even an experienced provider (Mohammad Khalil et al., 2021; Van de Putte & Perlas, 2014). All participants scanned the same volunteer model. Before participants performed scans, the Project Director demonstrated a gastric ultrasound using the I-AIM framework. The demonstration included verbalization of an indication for the exam. Proper scanning techniques were then presented in both supine and lateral decubitus positions. Sonoanatomy was reviewed as the image was obtained. The Project Director interpreted the findings of the volunteer model's antrum, which was empty. At this point, participants had the knowledge of how to perform a gastric ultrasound, completing the second tier of Miller's Pyramid. Participants then scanned the volunteer model in both the supine and lateral decubitus positions under the guidance of the Project Director.

Once all participants had completed the scanning, the volunteer model consumed eight ounces of water. Participants were not aware of the volume of liquid the volunteer had consumed. The Project Director then demonstrated how to measure the CSA and calculate fluid volume using the calculation volume = 27 + 14.6 x right lateral CSA - 1.28 x age (Perlas et al., 2016). Participants then practiced scanning the volunteer model with clear liquid in the stomach in both the supine and lateral decubitus positions.

After completion of this round of scanning, the volunteer model consumed a protein bar. Participants did not know the volume of food consumed. Participants then scanned the volunteer model in supine and lateral decubitus positions, identifying the antrum with solid food content. In total, each participant performed a gastric ultrasound a minimum of six times under the guidance and direction of the Project Director. After this, the participants had shown they could perform a gastric ultrasound with guidance, completing the third stage of Miller's Pyramid.

Post-Intervention

The Project Director met with each participant individually six weeks after the educational intervention to assess their ability to perform a gastric ultrasound independently. Participants scanned a volunteer model who was under a BMI of 40 to improve ease of scanning success. The volunteer model was randomly assigned to either not consume anything for at least six hours, consume only eight ounces of water, or consume a protein bar immediately before each participant assessment. The CRNA was asked to perform a gastric ultrasound using the I-

AIM framework. The Project Director assessed the participant's ability to perform a gastric ultrasound and correctly interpret the scan results using the UCAT. During the scan, the Project Director scored the CRNA on three sections of the UCAT: preparation, image acquisition, and clinical integration. At the end of the scan, the Project Director graded the CRNA with an entrustment score. The results of each participant were recorded as qualitative data. The primary outcome was whether participants could independently perform a gastric ultrasound and successfully interpret the exam, resulting in an entrustment score of three or greater, which would result in the participant entering the fourth tier of Miller's Pyramid.

Entrustment scales were developed in medical education and come from the concept of entrustable professional activities (EPA) (Holzhausen et al., 2019). EPAs are activities that a clinical supervisor trusts a trainee to perform (Holzhausen et al., 2019). The need for a more objective way to define when one might judge a trainee ready for EPA resulted in entrustment scales (Holzhausen et al., 2019). One scale that was developed is the Ottawa Surgical Competency Operating-Room (O-SCOR) Scale: An Entrustability-Aligned Anchor Scale (Rekman et al., 2016). The scale has five levels that a trainee can be graded on as shown in Figure 3. The O-SCOR was adopted for use in the UCAT, providing an objective way to assess the overall ability of the trainee to perform the ultrasound skill (Bell et al., 2020).

Data Analysis

Data was collected from the pre-education questionnaire and in-person evaluation of participants' performance and interpretation of gastric ultrasound using the UCAT. All collected data was kept private and entered on a password-protected personal computer and kept in the cloud-based software University of Alabama (UA) Box. No personal information or personally identifying information was collected. The results of the pre-education questionnaire provided demographic information related only to ultrasound experience and training. Specifically, this information included the number of years of practice, whether the CRNA used ultrasound in their current practice, what application of ultrasound they used, whether they received formal ultrasound training in their CRNA education, whether they had ever performed POCUS, whether they had ever performed a gastric ultrasound, and how they would rate their ability to perform a gastric ultrasound based on the entrustment score scale. This data was entered into a Microsoft Excel spreadsheet. This data was then imported into IBM SPSS Statistics software version 29 and evaluated using descriptive statistics.

The primary outcome was measured by the entrustment score from the UCAT. This data along with the other qualitative data from the UCAT was input into a Microsoft Excel spreadsheet. The spreadsheet was then imported into IBM SPSS Statistics software version 29. The UCAT data from the preparation, image acquisition, and clinical integration sections were analyzed by the software using descriptive statistics. The entrustment score was analyzed by the software using a paired t-test.

Cost-Benefit Analysis/Budget

The cost of this project was covered by the Project Director and was minimal, as shown in Figure 5. The project site provided the facility and equipment needed. This did not incur a cost as the CRNAs' education benefited the project site. Participants' time was voluntary outside of the standard paid work. Participants benefited from the free education that enhanced their clinical practice. The volunteer model for the education intervention needed to consume a beverage and food at a specific point in the education. The cost of the food and drink was forty dollars. In total, it was estimated that the project would cost forty dollars, which was funded by the Project Director.

Timeline

The scholarly project began in September 2023 and ended in July 2024, as shown in Figure 6. The project started with the creation of a proposal in September 2023. The formation of the proposal took several months and included the submission of the project to the UA Institutional Review Board (IRB). Approval of the proposal was in December of 2023. In the second week of January 2024, the Project Director created the educational presentation based on resources from gastricultrasound.org and the I-AIM framework. Additionally, the Project Director determined dates in March and April for the intervention to occur at the site facility. In February 2024 the project received IRB approval from the University of Alabama. The Project Director then began recruiting participants. During the fourth week of February 2024, the Project Director recruited a model volunteer for the hands-on portion of the education.

In late March 2024 to early April 2024, the educational intervention of the project was delivered. Due to differences in participant availability this occurred four times. In late April of 2024, the Project Director evaluated the data from the pre-educational questionnaires, excluding any participants who did not meet the qualifications of the project, and then entered the data in Microsoft Excel. Additionally in late April, the Project Director began contacting all participants to schedule individual times in May 2024 to assess participants' performance of gastric ultrasound based on the project's identified outcomes. In May 2024, the Project Director met with each participant individually for a gastric ultrasound assessment and collected data from the sessions. In June 2024, the data collected from the participants' performance was entered into

Microsoft Excel and then analyzed in IBM SPSS. In late June of 2024, the Project Director wrote a project manuscript for dissemination. The writing focused on updating any sections from the initial proposal and adding the results, the data analysis, the interpretation, and the recommendation for further research.

Ethical Considerations/Protection of Human Subjects

The UA IRB approval was obtained before initiating the project. The project was an educational intervention for providers and did not include patients in the research. The privacy of all participants was maintained in the collection of data. All participants were assigned a code number throughout the project to minimize personal identifying information. Participants' phone numbers were collected so that follow-up evaluation could be scheduled with the participant. The phone numbers of the participants were associated with the identifying code numbers. This information was kept in the secure cloud storage system UA Box and in a locked file cabinet in the project directors office that had a locked door. All pre-educational questionnaires were anonymous, and data was held in the UA Box. Evaluation of each participant was done in a private setting without other participants present. UCAT data collected from each assessment was associated with the participant assigned identifying number. This data was also kept in the UA Box.

Results

Nine CRNAs participated in this study to evaluate their competency in performing gastric ultrasound after completing a structured training program. Before the training, participants completed a pre-questionnaire to assess their baseline knowledge and experience with ultrasound.

Before the training intervention, none of the participants had received formal education in POCUS or gastric ultrasound. Despite this, seven of the nine participants (78%) reported using ultrasound in their clinical practice, primarily for nerve blocks and invasive line insertions. The self-rated entrustment scores of 1 to 5, which reflected their confidence and perceived ability to perform gastric ultrasound, averaged 1.67 (SD = 0.50), with scores ranging from 1 to 2. These scores highlighted a generally low level of confidence and competence in performing gastric ultrasound amongst the CRNAs before the training.

The qualitative data from the pre-questionnaire provided insights into the baseline training and usage of ultrasound among the CRNAs. The majority (66.67%) had not received ultrasound training during CRNA education, and none had received POCUS training or formal training in POCUS or gastric ultrasound. Despite this lack of formal training, 77.78% of the participants reported using ultrasound in their practice, primarily for nerve blocks and inserting invasive lines. All participants (100%) had not performed a gastric ultrasound before the training (see Table 1).

Following the training intervention, which included hands-on education and practice, the CRNAs were evaluated six weeks later for their ability to perform gastric ultrasound independently. The evaluation was conducted using the UCAT, which measured key performance in preparation for the scan, image acquisition, and clinical integration. The participants were then scored with an overall entrustment score (see Table 2).

In terms of preparation, all participants scored a 3. For image acquisition, the mean score was 2.56 (SD = 0.53), with scores ranging from 2 to 3. Clinical integration scores averaged 2.11 (SD = 0.60), ranging from 1 to 3. The entrustment scores, which were central to this study, showed a significant improvement, with a mean post-training score of 2.75 (SD = 0.46) and individual scores ranging from 2 to 3.

To determine the statistical significance of the improvement in entrustment scores, a paired t-test was conducted comparing the pre-training and post-training scores. The results indicated a significant increase in entrustment scores following the training intervention, $t(8) = -5.50$, $p = 0.00057$ (see Table 3).

Discussion

This study aimed to evaluate the effectiveness of a structured training program designed to enhance the competency of CRNAs in performing gastric ultrasound. The results offer significant insights into the impact of targeted educational interventions on clinical practice.

The pre-educational questionnaire highlighted a gap in formal training among the participants. While seven out of nine CRNAs (78%) had experience using ultrasound primarily for nerve blocks and invasive line insertions, none had formal training in POCUS or gastric ultrasound. This lack of formal training was evident in their self-rated entrustment scores, which averaged 1.67 (SD = 0.50), indicating low confidence and competency in performing gastric ultrasound.

Six weeks after the educational intervention, the CRNAs were assessed using the UCAT. The evaluation focused on three key domains: preparation, image acquisition, and clinical integration.

All participants scored a perfect three in the preparation domain, reflecting their adeptness in essential tasks such as patient and sonographer positioning, probe selection, and initial equipment settings. These high scores can be attributed to their familiarity with ultrasound procedures, which provided a solid foundation for mastering the basics of gastric ultrasound.

The image acquisition domain, with a mean score of 2.56 (SD = 0.53), revealed that while participants initially struggled with identifying specific gastric ultrasound anatomy, they quickly adapted. Their prior ultrasound experience facilitated their learning, allowing them to differentiate between an empty stomach and one containing fluids or solids effectively. However, measuring the area of the gastric antrum posed a challenge, likely due to their lack of experience with the specific measurement tools used in gastric ultrasound.

Clinical integration, averaging a score of 2.11 (SD = 0.60), showed that participants could appropriately interpret ultrasound findings and incorporate them into clinical decision-making. Despite some variability, they effectively identified postprandial states and utilized the information in patient management. The challenge in measuring the antral area underscores the need for continued practice to achieve consistent proficiency.

The entrustment scores significantly improved, rising from a pre-training mean of 1.67 to a post-training mean of 2.75 ($t(8) = -5.50$, $p = 0.00057$). This statistically significant increase underscores the training program's success in boosting participants' confidence and competence in performing gastric ultrasound independently.

The findings from this project indicate that CRNAs can attain the ability to perform gastric ultrasound with minimal prompting after a single educational intervention. This suggests that a structured training program can effectively equip CRNAs with the necessary skills to integrate gastric ultrasound into their clinical practice. The ability to perform gastric ultrasound is crucial for making informed decisions regarding patient management, particularly in assessing gastric contents to prevent perioperative complications such as aspiration.

Integrating gastric ultrasound training into CRNA education and ongoing professional development can significantly enhance patient safety and clinical outcomes. This project demonstrates the feasibility and effectiveness of such training, advocating for its wider adoption to standardize and elevate CRNA practice.

Although the results showed that participants could perform gastric ultrasound with minimal prompting following the training, this level of support is impractical in a clinical setting. CRNAs must be able to perform these procedures independently, without immediate assistance from colleagues. To enhance this project's educational intervention, it may be beneficial for anesthesia groups to incorporate a follow-up practice session. This session should be scheduled later after the initial training to reinforce skills and provide opportunities for independent practice.

The follow-up session could include:

1. Refresher Training: A brief review of key concepts and techniques from the initial session.
2. Hands-On Practice: Extended practice with a provider who is experienced in gastric ultrasound that focuses on identifying gastric ultrasound anatomy and accurately measuring the antral area.
3. Simulation Scenarios: Clinical simulations where CRNAs perform gastric ultrasounds independently, followed by feedback and debriefing.

4. Competency Assessment: Re-assessment using the UCAT to evaluate improvements and identify areas needing further practice.

By incorporating these additional elements, the intervention can better prepare CRNAs to perform gastric ultrasounds autonomously in clinical settings. This approach enhances skill retention, builds confidence, and ensures that CRNAs are competent in their abilities, ultimately improving patient care and safety.

Conclusion

The emerging evidence that the popular drug class of GLP-1 agonists can result in a full stomach before surgery, even after standard fasting guidelines are followed, has led to the ASA recommendation of the use of point-of-care gastric ultrasound in these patients before anesthesia (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.2017; American Society of Anesthesiology Task Force on Preoperative Fasting, 2017; Gulak & Murphy, 2023; Klein & Hobai, 2023; Sherwin et al., 2023b; Silveira et al., 2023). In response to the lack of requirement for training in gastric ultrasound in formal CRNA education, an educational project was developed to determine if current practicing CRNAs could be trained to perform gastric ultrasound and interpret the findings after a single training (Council on Accreditation of Nurse Anesthesia Education Programs, 2022). This project intends to validate the intervention so that it may serve as a model for other CRNA groups around the country to assist in training providers to correctly perform and interpret gastric ultrasounds to increase safety for patients taking GLP-1 agonists.

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Tables

Table 1

Participant Ultrasound Experience Demographics (N=9)

Characteristic	Sample	
	Participant	%
Ultrasound Training During CRNA Education		
Yes	3	33.33%
No	6	66.67%
POCUS Training During CRNA Education		
Yes	0	0%
No	9	100%
Use of Ultrasound in current practice		
Nerve Blocks	7	77.78%
Insertion of Invasive Lines	6	66.67%
Insertion of PIV	9	100%
POCUS	0	0%
Received Formal Training in POCUS As a CRNA		
Yes	0	0%
No	9	100%
Received Formal Training in Gastric Ultrasound as a CRNA		
Yes	0	0%
No	9	100%
Performed a Gastric Ultrasound As a CRNA		
Yes	0	0%
No	9	100%

Note N = 9

Table 2

Post-Training Competency Scores

Metric	Mean	SD	Min	Max
Preparation (1-3)	3.00	0.00	3	3
Image Acquisition (1-3)	2.56	0.53	2	3
Clinical Integration (1-3)	2.11	0.60	1	3
Entrustment Score (1-5)	2.75	0.46	2	3

Note N= 9

Table 3

Paired T-Test Results

Statistic	Value	p-value
t(8)	-5.50	0.00057

*Note *P < .05 -statistically significant*

Appendix

Figure 1

Miller's Pyramid

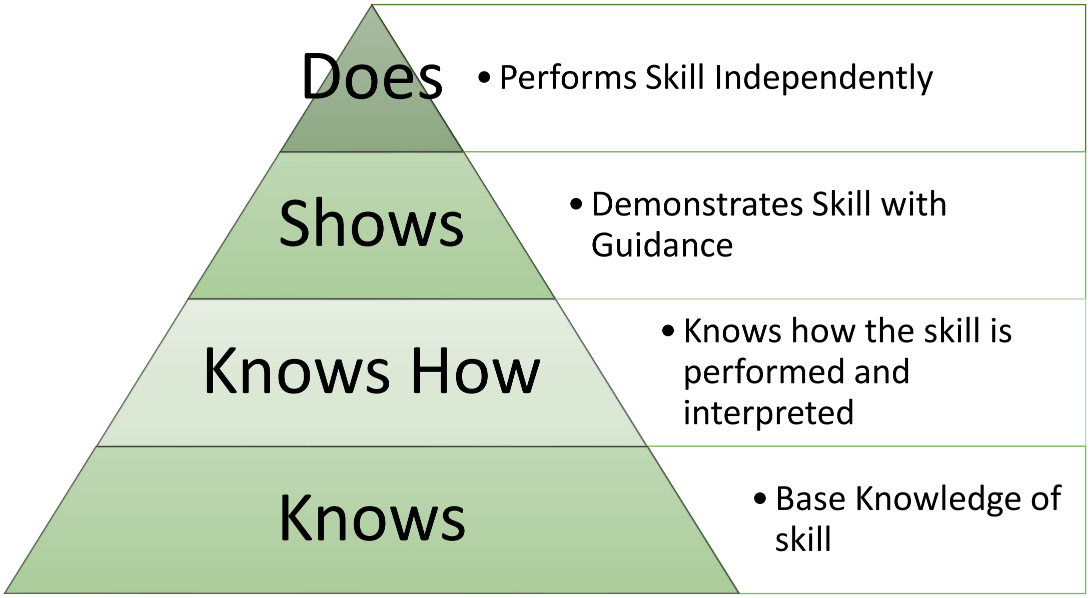

Figure 2

I-AIM (Indication, Acquisition, Interpretation, Medical Decision Making)

Indication

A pre-anesthetic aspiration risk exists

- Patient takes a GLP-1 agonist and
    - Has not held it
    - Feels bloated or nauseated
- Patient has not followed NPO guidelines for elective surgery
- Urgent or Emergent case where NPO status is unknown

Acquisition

Patient

- Scanned in Supine and in Right Lateral Decubitus Position
- Expose upper abdomen

Probe

- Curvilinear ultrasound probe
- Ultrasound gel to act as an acoustic medium

Picture

Scan

- Sweep widely from left to right subcostal margin to systematically identify the stomach as a hollow viscus located superficially between the left lobe of the liver and the pancreas with a prominent muscularis layer within its wall.
- Rock and slide the probe to positively identify the antrum and the level of the aorta
- Rotate to obtain a true cross section of the antrum, avoiding oblique views
- Heel to Toe movements to optimize acoustic reflections

Knobology

- First: Adjust depth as needed.
- Second: Adjust gain as needed.
- Third: Use color flow doppler to recognize aorta if needed

Capture

- If clear fluid is recognized, then the antrum needs to be measured
- With patient in right lateral decubitus position freeze the image the gastric antrum in between peristalsis. Measure the cross section of the antrum (CSA)
- Calculate volume with CSA measurement as follows
  Volume = 27+14.6 x Right lateral CSA – 1.28 x age

Interpretation

Gastric Content Recognition

Empty Stomach

- Grade 0 = Minimal clear fluid/air content, flat antrum, or ""bulls-eye"" pattern in both supine and right lateral decubitus

Clear Fluid

- Distended antrum with hypoechoic content
  - Grade 1 = Fluid is only visible in right lateral decubitus
  - Grade 2 = Fluid is visible in both supine and right lateral decubitus indicating high gastric volume

Thick Fluid/Solid

- Distended antrum with hyperechoic or heterogenous content

Volume Estimation

- Differentiate clinically insignificant volume versus clinically significant volume

- o Insignificant = < 1.5 ml/kg of clear fluid volume
- o Significant = > 1.5 ml/kg of clear fluid volume or thick fluid/solid of any volume

Medical Decision Making

Interpretation of findings and decision making

Findings

- Empty stomach or insignificant clear fluid volume = low risk for aspiration
- Clear Fluid volume > 1.5 ml/kg = high risk for aspiration
- Thick fluid or Solid content = high risk for aspiration

Figure 3

Pre-Education Questionnaire

1. How long have you been a practicing CRNA? ____________ year(s)

2. As a student did you receive any ultrasound education from your CRNA program?

   Yes **No**

3. As a student did you receive any education on point-of-care ultrasound from your CRNA program?

   Yes **No**

4. As a student did you receive any education on performing a point-of-care gastric ultrasound from your CRNA program?

   Yes **No**

5. As a practicing CRNA do you use ultrasound in some form in your practice?

   Yes **No**

6. If you do use ultrasound in your practice, please circle all aspects in which you have used ultrasound in your practice.

   a. Peripheral Nerve Blocks
   b. Point-of-care Ultrasound
   c. Insertion of Invasive Lines
   d. Insertion of Peripheral IVs

7. As a practicing CRNA have you received formal training or education in performing any type of point-of-care ultrasound?

   Yes **No**

8. As a practicing CRNA have you received formal training or education specifically in point-of-care gastric ultrasound?

   Yes **No**

9. As a practicing CRNA have you ever performed a point-of-care gastric ultrasound on a patient?

   Yes **No**

10. Please rate your Entrustment Score based on your current ability to perform a gastric ultrasound.

I do not have the knowledge or skillset to do one	If I was talked through it, I could do one based on my current knowledge and skillset	I could do one, but may have to be prompted from time to time	I could do one on my own without prompting, but would need a provider experienced in the skill standing by	I could do one completely on my own with no
1	2	3	4	5

Figure 4

Ultrasound Competency Assessment Tool (UCAT)

Domain	Performance Rating				
	Competent performance of SOME criteria	Competent performance of MOST criteria	Competent performance of ALL criteria		
Preparation -Patient & Sonographer -Positioning -Probe selection -Appropriate clinical indication -Initial settings (depth, pre-sets) -Ensures clean transducer	**1**	**2**	**3**		
Image Acquisition -Hand & probe position -Identify appropriate landmarks -Thorough visualization of target -Efficiency of probe motion -Appropriate measurements -Troubleshoots technical limitations	**1**	**2**	**3**		
Image Optimization -Centers area of interest -Overall image quality for interpretation -Troubleshoots patient obstacles -Optimizes machine settings (gain, focal zone, depth, frequency)	**1**	**2**	**3**		
Clinical Integration -Appropriate interpretation -Understands limitations of US scan -Utilizes information from PoCUS to appropriately inform management decisions -Performs multiple PoCUS exams when appropriate - Communicates findings to care team and documents appropriately -Considers false positives/negatives as cause of findings	**1**	**2**	**3**		
Entrustment	I had to do	I had to talk them through	I had to prompt from time to time	I needed to be there just in case	I did not need to be there
	1	**2**	**3**	***4***	***5***

Figure 5

Cost Benefit Analysis

Benefit	
Education for Providers (Benefit Participant & Project Site)	
Continuing Education Credit for Providers	

Cost	
Food & Beverage for Gastric Ultrasound Education	$20
Gift Card for Volunteer	$50
Total expenses	**$70**

Figure 6

Project Timeline

Date	Description
9/2023 -11/2023	Development of Proposal
12/2023	Proposal Approval
Week of 1/8/24	Development of Educational Presentation & Dates Project Facility Available for Educational Intervention
Week of 1/15/24	Schedule participants for Educational Intervention
Week of 1/22/24	Recruit Volunteer Model
2/10/23 – 3/10/23	Perform Educational Intervention of Project
Week of 3/18/23	Analyze Data from Pre-Educational Questionnaire
Week of 4/1/23	Schedule with Participants date for Gastric Ultrasound Performance Evaluation
5/2024	Evaluate Participants Gastric Ultrasound Performance & Collect Data
Week of 6/3/24	Analyze data form Gastric Ultrasound Evaluation
6/17/24 – 7/2024	Write Scholarly Manuscript for Dissemination