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Utilizing Gastric Point-of-Care Ultrasound Assessment for Patients with Questionable NPO Status

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Executive Summary

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Introduction of the Problem

In the perioperative field of medicine, it is standard practice to require patients undergoing elective surgery to use standard nil per os (NPO) or fasting times to decrease the potential risk of aspiration while under the effects of anesthesia management. NPO guidelines are designed to eliminate, or at least mitigate, the risk of aspiration by presenting the patient for anesthesia with an empty stomach. However, these may not be effective with certain common patient comorbidities, such as obesity and diabetes mellitus, which can promote delayed gastric emptying despite following the NPO guidelines (Sharma, Deo, & Raman, 2018). Additionally, patients may complicate matters further by not following preoperative NPO instructions, the patient's fasting status may be unknown, or the timing of surgery may prevent adequate fasting times. In these situations, the anesthesia provider is faced with the difficult decision to alter, delay or potentially cancel the anesthetic and therefore the surgical procedure. This can be a costly choice for the operating room department in both money and efficiency. Gastric point-of-care ultrasound (POCUS) is emerging as a diagnostic tool in the practice of anesthesia in assessing the perioperative patient. Gastric POCUS can be used to assess the status of the patient's gastric contents to objectively decide how to manage an anesthetic. The difficulty in the implementation of this tool lies in the level of confidence and efficiency of the anesthesia provider's assessment to dictate decision-making.

Literature Review

Fourteen studies were reviewed for this project. Ultrasound has various advantages in that many anesthesia practices already own a portable ultrasound for other point-of-care

functions, and it is also easy to use, easy to access, low cost, portable, and able to provide an accurate assessment of gastric contents. The results of this literature review show that utilizing ultrasound for this purpose is becoming increasingly more popular as a tool in decision-making during the perioperative period.

The purpose of understanding how to use the POCUS assessment tool is ultimately to prevent pulmonary aspiration during the perioperative period. Perioperative aspiration is a rare but serious complication with high morbidity and mortality for patients in which this occurs. This event often occurs from anesthetic depression of protective airway reflexes. For this reason, the goal of a fasting period before anesthesia is to eliminate the presence of any gastric contents (El-Boghdadly et al., 2019).

Certain comorbidities and conditions increase the likelihood of the presence of gastric contents, despite the recommended fasting period. These are identified as pregnancy, obesity, chronic liver disease, chronic kidney disease (CKD), gastroesophageal reflux disease (GERD), diabetes mellitus (DM), neuromuscular disease, and patients undergoing emergency procedures (Sharma, Deo, & Raman, 2018). Benington & Severn (2007) further identified gastrointestinal obstruction, need for emergency surgery, previous esophageal surgery, lack of coordinated swallowing or respiration, esophageal cancer, hiatal hernia, and obesity as predisposing conditions for perioperative aspiration.

In a prospective observational study by Sharma, Deo, & Raman, (2018), gastric ultrasound assessment was conducted on 246 adult surgical patients with varying health and comorbidities. Both a qualitative and quantitative assessment were performed. Analysis of risk factors found that BMI and gastric contents correlated in a linear fashion. Obese patients were

1.07 times more at risk for aspiration. Patients with GERD were 2.3 times more at risk for aspiration. The other comorbidities did not show an association with the risk of aspiration in this study, though patients with chronic kidney disease (CKD) did have significant residual gastric volume. The authors suggested that fasting guidelines are adequate for healthy patients but obviously less successful for patients with risk factors. Therefore, the authors concluded that gastric ultrasound should become the standard of care with assessment of those with additional risk factors (Sharma, Deo, & Raman, 2018).

In a study by Johnson et al. (2021), gastric POCUS assessment was utilized using the direct visualization approach to differentiate qualitatively between empty, liquid, and solid gastric contents. The goal of this study was to calculate the diagnostic accuracy (sensitivity and specificity) of the assessment by performing the assessment of three groups after randomized consumption of food (1 donut), 360 mL of water, and a fasted patient. Results showed that sensitivity and specificity were high for liquids, with a sensitivity of 95% to, 100% and specificity of 87.5% to 90% for the identification of liquids. Sensitivity was low with the fasted group which was concluded to mean it was more difficult to accurately assess a fasted participant. Specificity was similar between liquid, solid, and fasted participants. When analyzing the data with respect to BMI, the accuracy of assessment was, not surprisingly, increased in the normal BMI group (Johnson et al., 2021).

In a study by Sharma, Deo, & Raman, (2018), a prospective observational correlation study examined adult patients preoperatively that had been NPO for at least 6 hours. In the supine position, 82% of patients had clear liquids and 3% had solid contents. Of those patients, 70% had gastric volume less than 40 mL and 22% had volumes between 40 ml and 80 ml. Of all patients, 16% had more than 1.5 mL/kg of clear liquids. The study identified that patients with

diabetes mellitus had a significant increase in CSA (Sharma, Deo, & Raman, 2018).

In a study by Joshi & Dhamija (2020), a simple randomized prospective interventional parallel group study assessed 60 healthy ASA grade 1 adult patients undergoing general anesthesia for non-abdominal surgery. The patients were divided into two groups consisting of a group adhering to the standard eight hour NPO fasting guidelines (the control group) and a group receiving 200 mL of clear apple juice two hours before surgery. Patients were assessed for the presence of gastric contents in the RLD position and CSA was measured. Using the CSA measurement, the gastric volume was calculated. Gastric contents were suctioned immediately following tracheal intubation, and the volume and pH were measured. The mean gastric volume was larger for the overnight fasting group than with the apple juice group. The pH was also lower in the fasting group compared to the apple juice group (Joshi & Dhamija, 2020).

Shorbagy et al (2021) conducted a prospective observational study on forty-five polytrauma patients undergoing emergency surgery. They were scanned in the supine position and RLD position with ultrasound before induction of anesthesia and quantitative and qualitative assessments were made, then confirmed with a nasogastric tube to suction contents. The results of their findings confirmed an empty stomach in 22.2% and a full stomach in 77.7%. Twenty-nine patients had solid contents and six had clear fluid in excess of 1.5 ml/kg. The greatest value in these findings was how the risk stratification changed after the ultrasound assessment. The high risk of aspiration designation changed from 25 to 35 patients after gastric ultrasound (Shorbagy et al., 2021).

Project Methods

This project provided structured educational content and guided practical experience

regarding the use and relevant application of gastric point of care ultrasound (POCUS) for the anesthesia staff at Gibson Area Hospital (GAH). This project aimed to improve the knowledge base for the team of anesthesia providers at GAH so that patient care and outcomes may be improved by decreasing aspiration events. GAH anesthesia providers were first provided with a consent to participate, a pre-test, and a personal survey about their opinion regarding the practicality of incorporating POCUS into regular practice. Following that, a lecture slideshow presenting the key background information, instructional POCUS process, and decision-making guidelines. Relevant diagrams and references were included to promote effective understanding. Following didactic training, a practice session was scheduled with each participant. Laminated reference cards were provided with the Ultrasound equipment. Participants were encouraged to perform as many scans as possible during their regular work schedule to achieve competency as quickly as possible. Participants logged their scans with basic indicators such as age, gender, body mass index (BMI), any relevant comorbidities, and results from their scan. Following this phase, participants were reevaluated with identical tests and surveys given before training.

Evaluation

At the time of this project, the GAH anesthesia department comprised of ten anesthesia providers: one full-time Physician Anesthesiologist, six full-time Nurse Anesthesiologists, and three part-time Nurse Anesthesiologists. Of the ten providers, nine consented to participation. Of the nine consented participants, five were able to complete the training and practicum requirements. The pre-test score average went from 50% to post-test score average of 87%. Overall, participants increased their likelihood to use gastric POCUS, confidence in using gastric POCUS, and desire to incorporate gastric POCUS in the future.

Impact on Practice

GAH providers overall displayed a desire and willingness to learn this new skill despite some skepticism in their ability to make clinical decisions from it. Since implementation, providers have continued to use gastric POCUS in situations to confirm or deny a lack of adequate NPO status. Implementation of gastric POCUS to risk stratify patients with high-risk comorbidities does not appear to have increased. Providers were encouraged to continue to practice scans in clinically unnecessary situations whenever time allows so that they can become more confident in identifying and confirming an empty stomach. It is hopeful that this added skillset to the department will prevent potential aspirations and decrease costs associated with delayed or canceled procedures. The incidence of perioperative pulmonary aspiration at our facility is not precisely known, however, generally it is estimated to occur between 0.1% and 19% of all surgical cases (Van de Putte & Perlas, 2014).

Conclusions

The research on POCUS is vast and well-established and supports the use of this tool as both a reliable and applicable resource in the preoperative setting. It is readily available and given the relevant training and practice, the anesthesia provider can utilize this tool to reduce the risk to surgical patients that have a greater risk of aspiration. Gastric POCUS can be done with minimal or no additional cost to the health care institution and patient given the readily available portable ultrasound. Using risk stratification, the anesthesia provider can implement this additional skill set to confidently proceed in the applicable scenarios discussed in this literature review.

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