NPO?: WHAT IS REALLY IN THE STOMACH?

Linda Caccamo, CRNA, DNP, MBA[1], Robert D. Karpinos MD, MBA[2], Rene Bouquet CRNA, DNP[2], Stephen Songhurst, BS[1]

[1] Somnia Inc. 450 Mamaroneck Ave. Harrison, NY, USA

[2] St. Barnabas Health – Department of Anesthesiology, Bronx, NY, USA

AIM:

To improve patient safety and decrease expenses by enhancing NPO assessments via the addition of POCgUS to history-based evaluations.

Quality Improvement Background:

The impact of acute intraoperative pulmonary aspiration is one of the most significant complications in anesthesiology. The consequence of acid aspiration can be devastating, ranging from mild pneumonitis to fulminant respiratory failure and death. The risk of aspiration may be mitigated by antacid therapy, promotility agents, and rapid-sequence tracheal intubation, but mostly with strict adherence to preoperative fasting. Prolonged fasting may lead to unpleasant symptoms of thirst, hunger, anxiety, malaise, increased PONV, and metabolic derangements. Present ASA guidelines do not account for variability in gastric transit time seen in co-morbid conditions or urgent/emergent situations and may induce confirmational bias leading to a false risk assessment. Point-of-care gastric ultrasound (POCgUS) may be used to complement fasting guidelines by adding a visual assessment of gastric content which provides an individualized aspiration risk at the bed side, thus improving patient safety and hospital performance.

Quality Improvement Method:

The hypothesis for this study is that routine use of preoperative POCgUS will confirm that patients who are NPO have an empty stomach and can proceed to surgery rapidly without delay and without additional risk. Additionally, routine use of POCgUS will allow for identification of unanticipated residual gastric content and allow for timely modification of the anesthetic plan for those patients that remain at risk for pulmonary aspiration despite being NPO. Surgical patients at St. Barnabas Health System will be included in this study. POCgUS will be added to the routine assessment of NPO, especially during the implementation phase (acquisition via low frequency ultrasound probe at the epigastrium). Data will be collected as soon as each clinician has achieved competence (expected at 33 studies per clinician). Quarterly retrospective analysis and interim results will be tabulated to assess clinical impact, project safety, and NPO-status-induced-surgical-delays.

Empty stomach: low pulmonary aspiration risk

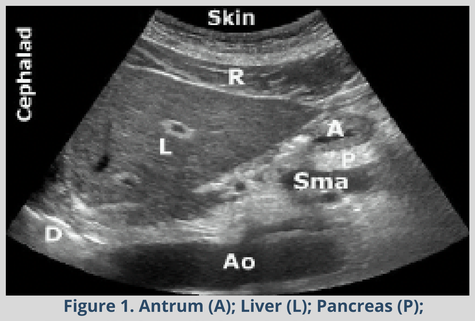


Figure 1. Antrum (A); Liver (L); Pancreas (P); Rectus (R); Spine (S); Superior Mesenteric Artery (SMA); Aorta (Ao); Diaphragm (D)

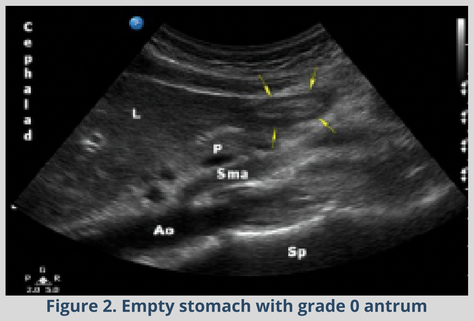


Figure 2. Empty stomach with grade 0 antrum and "bull's eye"/"target" appearance (arrows)

Clear fluid: hypoechoic/anechoic, thin and distended antrum

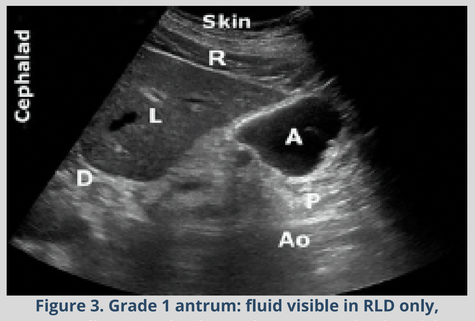


Figure 3. Grade 1 antrum: fluid visible in RLD only, generally <150 ml → low pulmonary aspiration risk

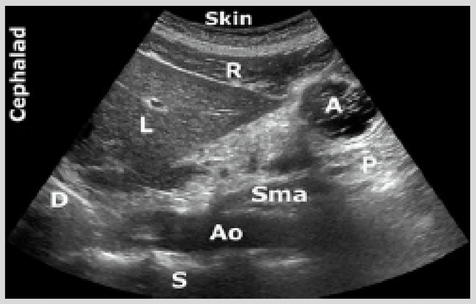


Figure 4. Grade 2 antrum: fluid visible in supine and RLD, "starry night" represents air-fluid mix, generally >150 ml → high pulmonary aspiration risk

Thick fluid/solid: hyperechoic and distended antrum → high aspiration risk

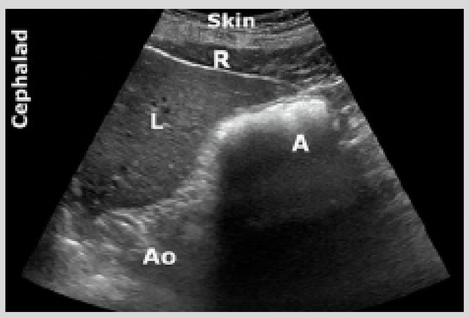


Figure 5. early stage solid with "frosted glass" appearance superiorly and shadowing inferiorly

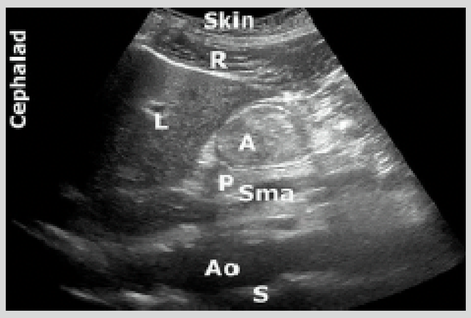
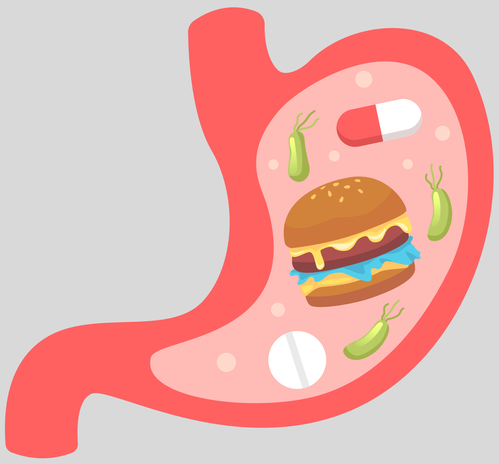


Figure 6. late stage associated with hyperechoic, heterogenous bolus-like consistency



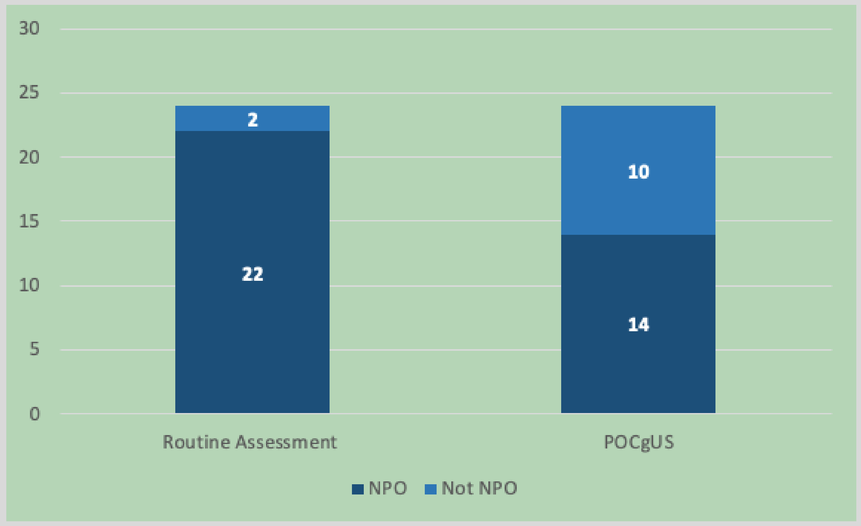


Figure 7. Evaluation of NPO status as per routine history vs. augmentation with POCgUS

Quality Improvement Results:

A total of 24 patients were evaluated in this study. Of that group, 22 patients were reported as NPO while 2 reported as Not NPO. Of the 22 patients reported as NPO, 14 were confirmed by POCgUS. Of the 2 patients that reported as Not NPO, both were confirmed by POCgUS. Total positive POCgUS resulted in 10 patients. Of the 10 positive POCgUS, 3 had late phase solid content, 6 had fluid greater than 150 ml, and 1 had supine fluid less than 150 ml. Of the positive findings that were NPO by history, 4 had suspected delayed emptying based on comorbid conditions. No cases were delayed by the new POCgUS augmented routine.

Quality Improvements Discussion:

Early results from the implementation phase of this project support several concepts. First, the POCgUS modality is easy to use with a sharp learning curve. Second, patients appreciate the use of simple, non-invasive technology. Third, patients appreciate the apparent increased vigilance and concern for safety. At present, all patients with unreliable or unknown history of NPO status will continue to be managed with full aspiration precautions even if POCgUS shows an empty stomach. Patients that have not met NPO status will continue being managed individually depending on case urgency. Elective/low acuity cases may be delayed or postponed while emergent/urgent conditions may proceed with procedure with full aspiration precautions. Patients that have met NPO status and have negative findings on POCgUS can proceed with procedure. Patients that have met NPO status but have positive findings on POCgUS may be reassessed, and care is individualized with an increased level of precaution (i.e., intubation instead of LMA). We expect this to be an area of development. Through improvement of assessment, we positively impacted the incidence and expense of additional morbidity and length of stay due to avoidable complications. Improving the ability of the anesthetists to accurately assess NPO will improve patient safety, decrease expenses, increase efficiency, and improve satisfaction.

Resources:

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