

Perioperative Pulmonary Aspiration and Point Of Care Ultrasound Testing

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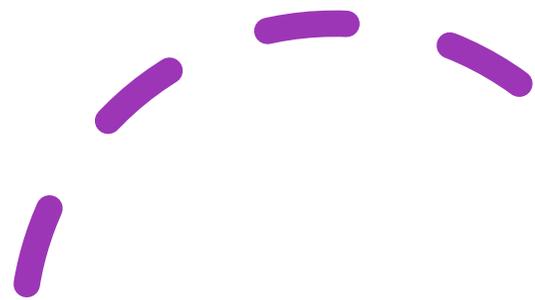
OBJECTIVES

At the end of the presentation the learner will be able to:

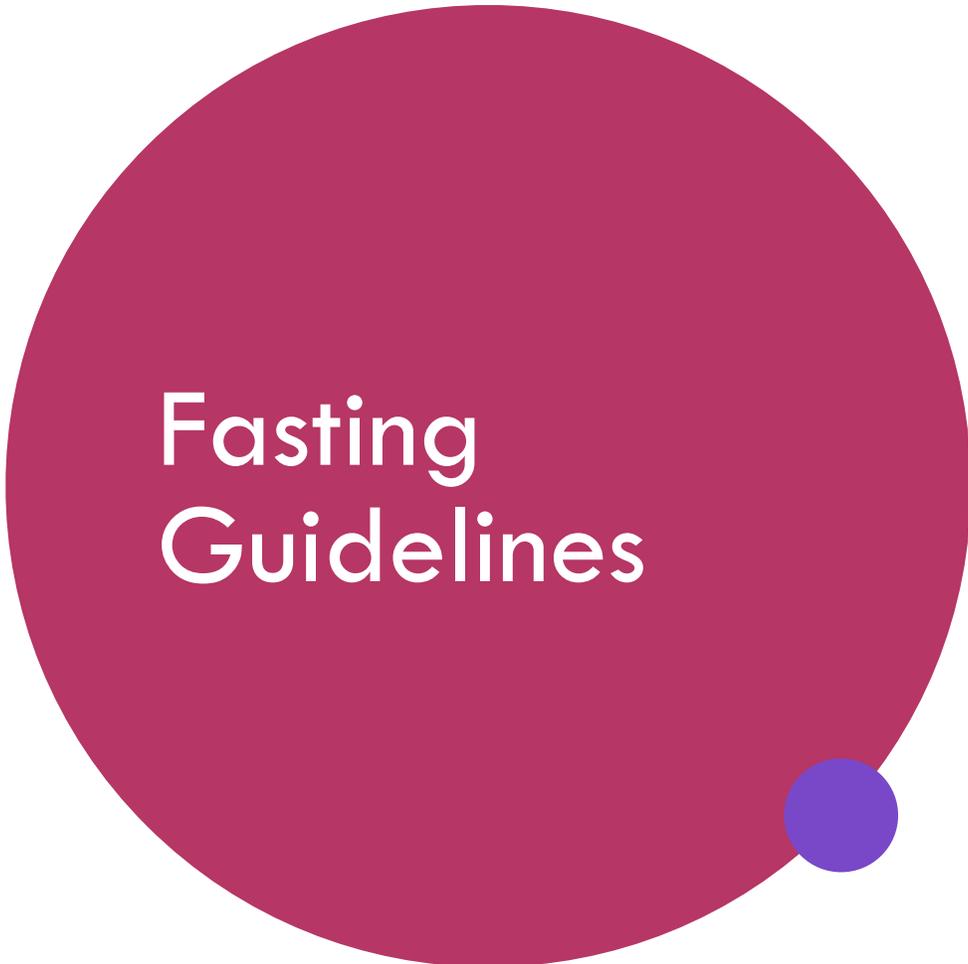
1. Identify factors that may increase the risk for aspiration

2. Identify conditions that increase the risk for aspiration

3. Have a greater understanding of point-of-care gastric ultrasound specific to patient assessment

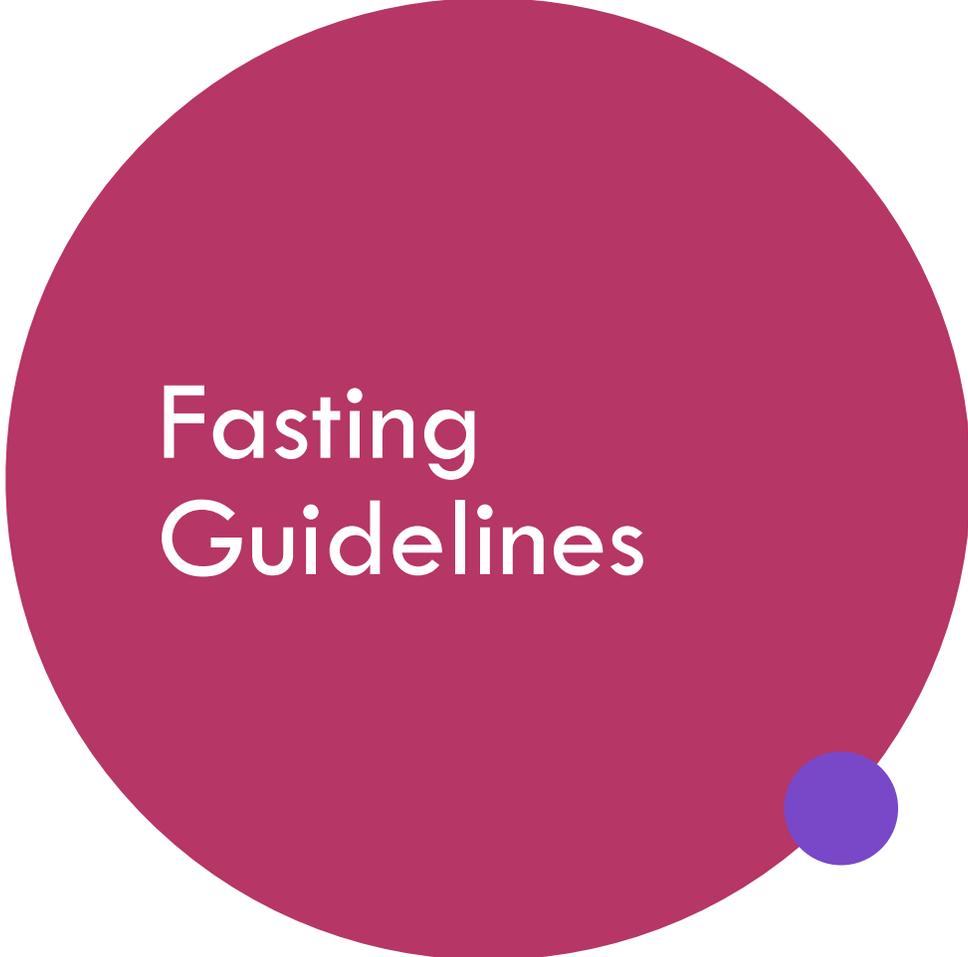


- ASA guidelines recommend recommend fasting times before anesthesia: 2h for clear liquids, 4h for breast milk, 6h for solids, nonhuman milk and infant formula, and 8 h for fried/fatty food and meat



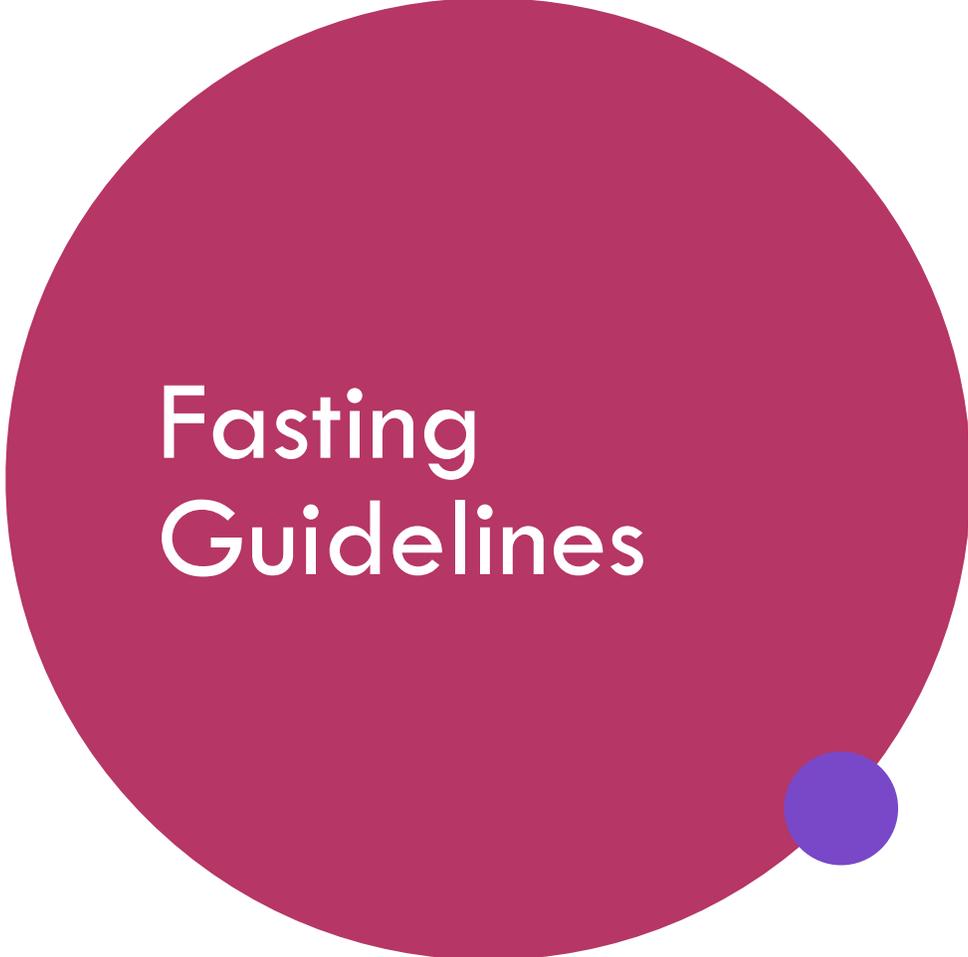
Fasting Guidelines

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- Adherence to ASA fasting guidelines has not been shown to be effective for reducing gastric contents in patients with comorbidities that delay gastric emptying, including increased intracranial pressure, hiatal hernia, renal failure, obesity, gastrointestinal tract obstruction, gastroesophageal reflux disease and diabetes mellitus



Fasting Guidelines

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- It is also unknown whether compliance with fasting guidelines ensures that gastric residual volumes (GRVs) are safe in patients with known risk factors (e.g. factors known to delay gastric emptying or to increase GRV, such as trauma, opioid use, obesity and renal impairment)



Fasting Guidelines

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- The rationale for fasting is that minimization of GRV's will reduce the risk of aspiration
 - There is no consensus as to what GRV is to be expected in a population of fasted adults
 - Values between 0.4 and 1.2 ml/kg have been reported in a number of previous studies, using different measurement techniques



Fasting Guidelines

A decorative graphic featuring a large maroon circle on the left containing the text 'Gastric Contents'. To the right of this circle is a list of three bullet points. The background is white with various purple and blue geometric shapes, including circles, triangles, and lines, scattered around the main content.

Gastric Contents

- A recent study showed that 6.2% of elective adult patients who followed current fasting guidelines had a full stomach when presenting for induction of general anesthesia
- 2.9% of those even presented with solid gastric contents
- The cut off volume to avoid increased risk of aspiration is still unclear



Gastric Contents

- The literature has also shown that fasted patients without aspiration under induction of general anesthesia often have residual gastric volumes up to 1.5ml/kg
- Fasting guidelines will most certainly be a topic for future research

Risk Factors

- A full stomach at the time of induction is a major risk factor for pulmonary aspiration during induction of general anesthesia
- Is associated with high morbidity and mortality
- 50% of airway related deaths in anesthesia are a direct result of aspiration



Risk Factors



Some patients simply do not abide by preoperative fasting instructions



Anesthesia providers base aspiration risk primarily on the presence of patient risk factors

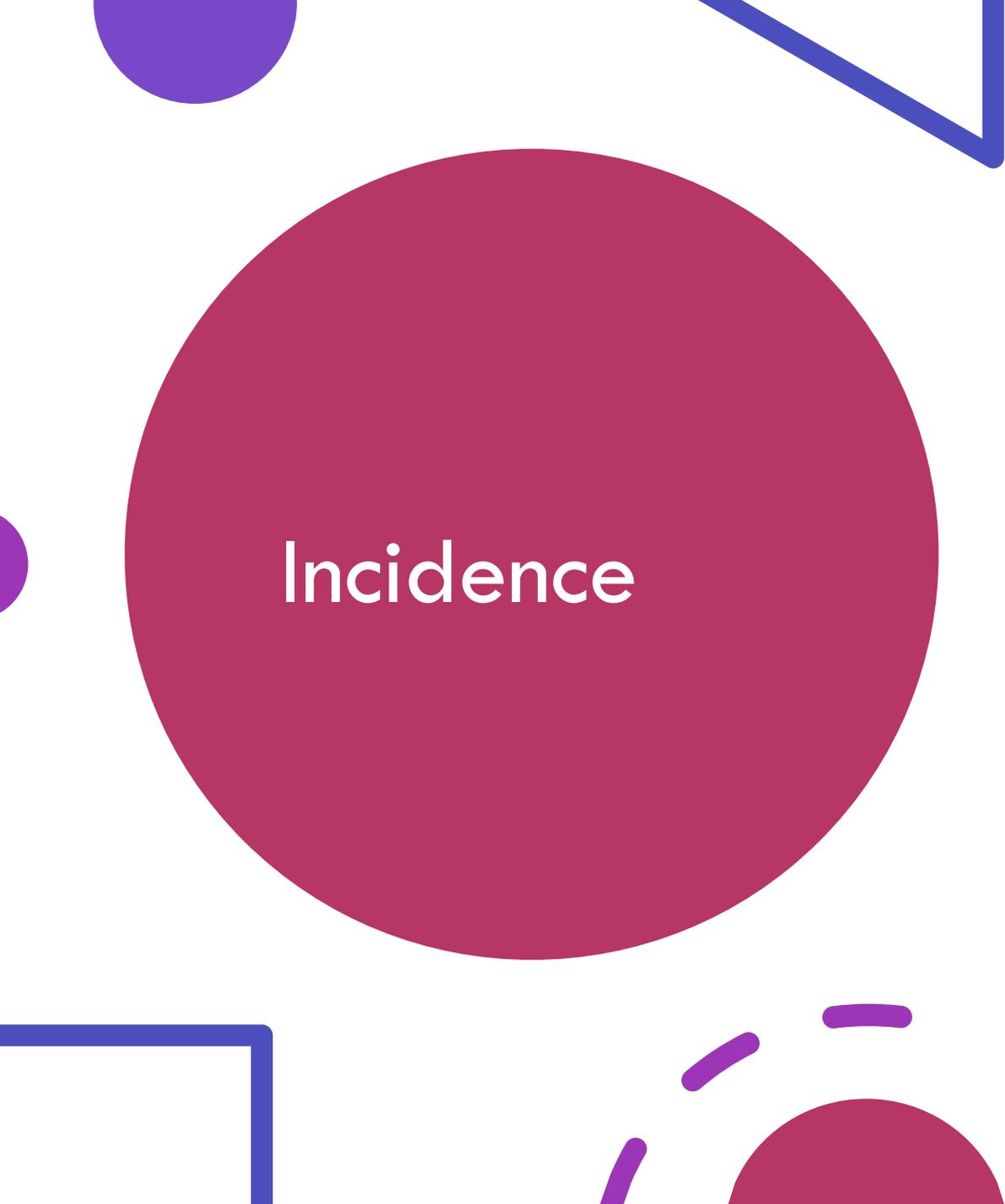
Risk Factors

Once the subjective relative risk of aspiration is determined, the anesthesia provider selects a plan for airway management that is appropriate for the estimated level of risk. There is a great deal of variability among anesthesia providers regarding the use of aspiration risk factors, particularly gastric content, to inform decisions about the method of airway

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- The overall incidence of aspiration is estimated to be 1:2,000 to 1:3000 anesthetics, when it occurs, the results are often clinically and economically catastrophic
 - Sources report that the frequency of aspiration during GA is likely higher due to underreporting



Incidence



Incidence

- Of patients that aspirate, 47% experience aspiration pneumonia and 17% require mechanical ventilation
- Aspiration incidents have large financial implications for hospitals because the average overall cost for any patient requiring mechanical ventilation in an ICU is \$47,158

Complications

Unless identified before anesthesia induction, it is often an unknown volume of residual stomach contents

It is unknown how many patients have gastric volumes that place them at increased risk of aspiration despite adequate testing

Complications

Complications can occur in patients with risk factors, which include anesthesia induction and airway instrumentation

Another risk factor of note is the existence of gastric contents, making aspiration an even higher risk

Complications

Since aspiration is rare, it is possible that some patients have sizeable gastric volumes, but do not suffer an aspiration event

Recent consensus-based guidelines have been adjusted to permit drinking clear fluids up to two hours prior to surgery, as this has been shown not to increase the gastric contents nor the risk of

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- Patients admitted for emergency surgery/procedures with comorbidities that have an impact on normal gastric emptying are at risk of delayed gastric emptying and at higher risk for aspiration
 - More than 50% of emergency patients present with a full stomach at the time of induction of anesthesia as do almost the same amount- 48% of patients with type 2 diabetes



Emergency
Procedures

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- Other comorbidities that impact gastric emptying are obesity, advanced renal or hepatic dysfunction, multiple sclerosis, critical illness, Parkinson's disease, substance abuse, preoperative opioid administration and labor
 - As the status of gastric contents can rapidly change, the main evaluation should be complete prior to induction by an anesthesia provider proficient in ultrasound assessment



Emergency
Procedures

Point-Of-Care-Testing

- Point of care testing (POCT) is an analytical test performed outside the lab, normally at or near the site of patient care
- Primary users are often non-laboratory healthcare workers
- The use of POCT has been around for over 50 years, but use has increased recently

Point-Of-Care-Testing

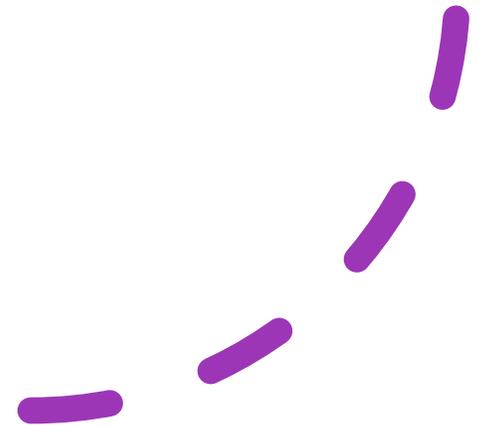
- The main advantage of point of care testing is to generate results sooner and therefore initiating treatment earlier
- This can lead to improved to patient care, earlier discharge from the hospital and contribute towards reducing government waiting time targets
- The primary outcome should therefore be improved clinical and economic results
- Examples: TEG, Glucose, HGB, ACT, ABG

Point-Of-Care Testing

- While prevalent in multiple testing facilities, Point-of-Care ultrasound can inform aspiration assessment by providing bedside information on the type and the volume of gastric contents
- Examination at the bedside is helpful when providers are unsure of the patient's gastric contents
- The exam can identify whether the patient has an empty stomach versus one that has a clear fluid, thick fluid, or solid particulate based on qualitative findings

Point-Of-Care-Testing

- Findings based on both qualitative and quantitative information can change how the anesthesia team cares for their patients



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- While a full stomach is a major risk factor for aspiration under anesthesia, the lack of an objective tool to assess gastric content at the bedside limits risk assessment, and patient management is usually based on patient history alone
 - The risk of aspiration is greatest is highest in emergency situations, it occasionally occurs in patients who have followed fasting guidelines and are considered at low risk



Rationale for
Use

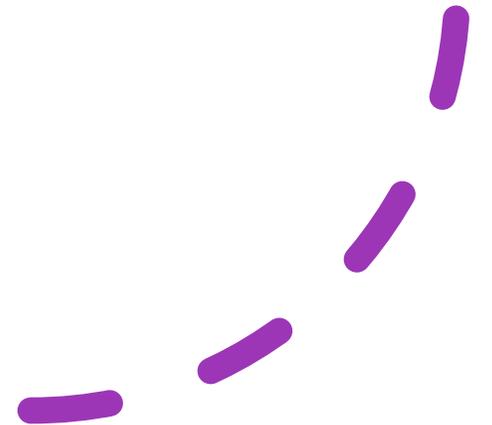
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- Pulmonary aspiration of gastric contents carries significant morbidity and mortality
 - Major morbidity includes pneumonitis, acute respiratory distress syndrome, multiple organ dysfunction, and brain damage
 - Inaccurate risk assessment is often a root cause of aspiration events



Rationale for
Use

Rationale for Use

- Gastric ultrasound is an emerging POCT that provides bedside information on gastric content and volume



Rationale for Use

This testing method is used to answer a well-defined clinical question in a short period of time in order to guide patient management to improve patient outcomes

Several recent editorials in major anesthesia journals have called for greater adoption and teaching of gastric POCUS in anesthesia practice

Rationale for Use

POCUS applications are diagnostic tests.

Although brief and focused, each needs to be studied from multiple angles

It is essential to determine their diagnostic validity

Diagnostic accuracy refers to the global accuracy (% of exams with a correct diagnosis) as well as the sensitivity, specificity, and positive and negative predictive values

Rationale for Use

The importance of R/O a full stomach to prevent aspiration, the negative predictive value of the test is arguably of outmost importance

Other aspects of relevance that need further study include the clinical applicability, educational aspects, and cost-effectiveness of POCUS

This testing method has identified the need for development and change

Rationale for Use

- For patients with abnormal anatomy, usually as a result of previous gastric surgery or large hiatus hernia, the use of this technique may be limited, especially since the stomach is only examined in one ultrasound plane in the supposed gastric antrum

Limitations

It is important to consider the technical limitations of this testing method as well as the conceptual framework within which it is used

From a technical perspective, gastric ultrasound has been validated in patients with normal anatomy and may not be reliable or accurate in patients

with previous gastric surgery
Information on the nature of gastric content (fluid, solid) could still be useful in these settings, but volume estimation would be inaccurate

Limitations

This testing method evaluates only one of the determinants of aspiration risk i.e. gastric content

The risk of clinically important aspiration is partly determined by the presence of gastric content at the time of induction

Is also influenced by other independent factors such as co-existing diseases of the upper GI tract, anesthetic technique, events related to airway

Limitations

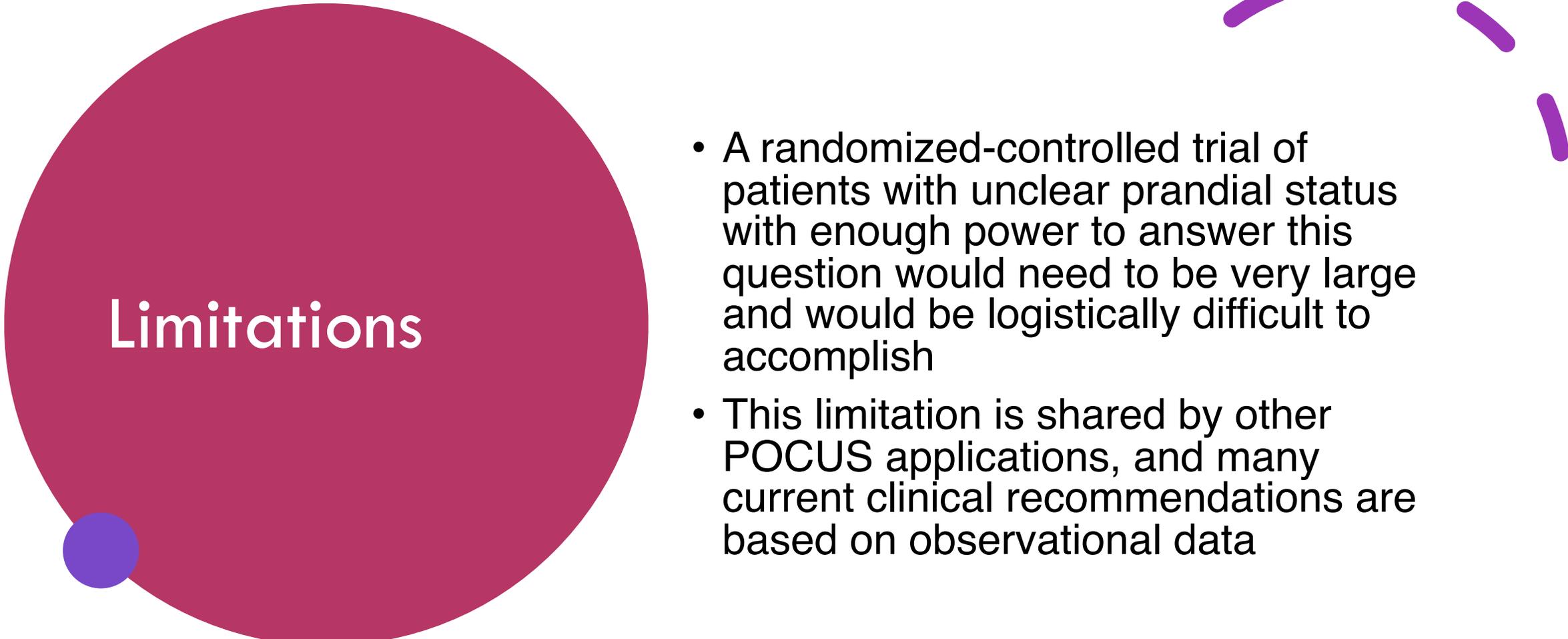
3-5% of all exams may be inconclusive, and the diagnostic accuracy of full stomach detection remains to be studied

Diagnostic accuracy will be related to the experience of the sonographer

Limitations

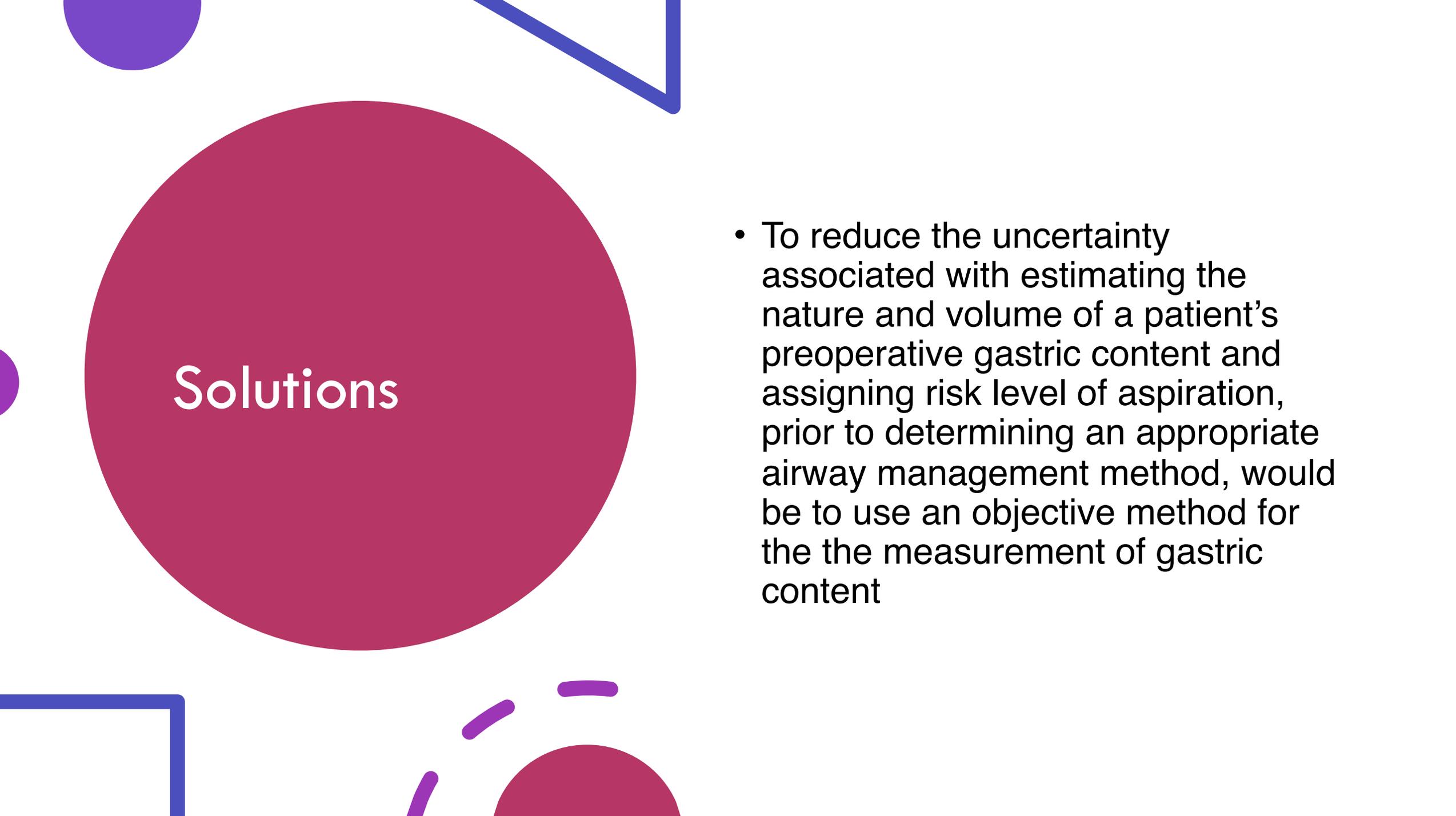
It has been established that, on average, approximately 33 practice examinations followed by expert feedback are needed for anesthesia fellows

learning to perform gastric ultrasounds to obtain an accurate diagnosis in 95% of cases. Important limitation is difficulty to prove conclusively that the introduction of this test will lead to a reduction in episodes of clinically important aspiration and tangible improvements in patient outcomes.



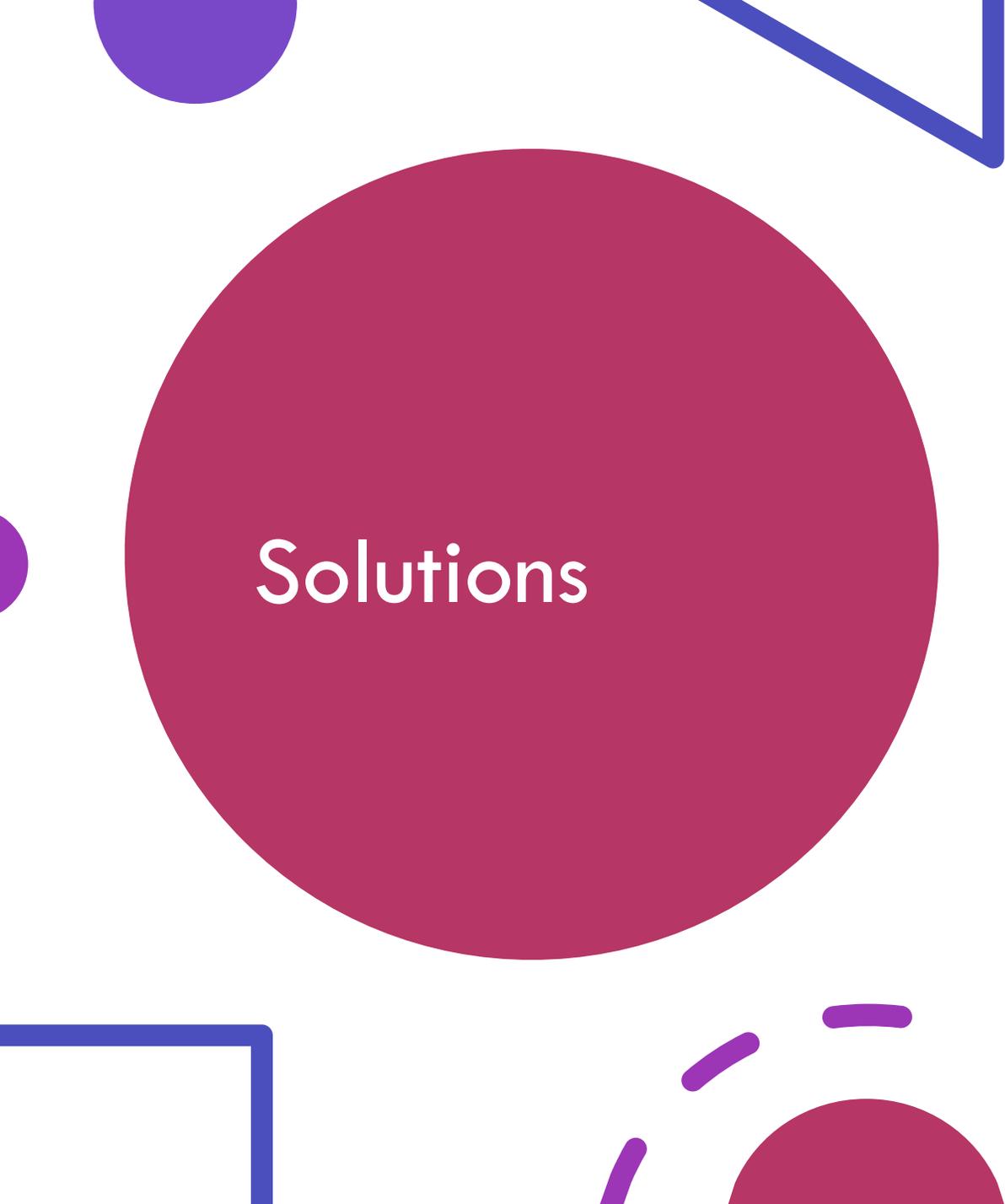
Limitations

- A randomized-controlled trial of patients with unclear prandial status with enough power to answer this question would need to be very large and would be logistically difficult to accomplish
- This limitation is shared by other POCUS applications, and many current clinical recommendations are based on observational data

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Solutions

- To reduce the uncertainty associated with estimating the nature and volume of a patient's preoperative gastric content and assigning risk level of aspiration, prior to determining an appropriate airway management method, would be to use an objective method for the the measurement of gastric content



Solutions

- Bedside ultrasonography has been established as a valid and reliable objective method for the measurement of gastric content
- The application of gastric ultrasonography as an objective, quantitative method to assess gastric content preoperatively could be a valuable method to better define a patient's actual aspiration risk and most appropriate method of airway management

The background features several abstract geometric elements: a large purple circle in the upper left, a blue square outline on the left, a blue triangle outline at the top, and a large red circle on the right. There are also several purple dashed lines scattered across the left side.

QUESTIONS ????????

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