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 Committee on Standards and Practice Parameters

PRACTICE Guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints and are not intended to replace local institutional policies. In addition, Practice Guidelines developed by the American Society of Anesthesiologists (ASA) are not intended as standards or absolute requirements, and their use cannot guarantee any specific outcome. Practice Guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. They provide basic recommendations that are supported by a synthesis and analysis of the current literature, expert and practitioner opinion, open forum commentary, and clinical feasibility data.

This update includes data published since the Practice Guidelines for Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration were adopted by the ASA in 1998 and published in 1999.*

Methodology

Definition of Preoperative Fasting and Pulmonary Aspiration

For these Guidelines, preoperative fasting is defined as a prescribed period of time before a procedure when patients are not allowed the oral intake of liquids or solids. Perioperative pulmonary aspiration is defined as aspiration of gastric contents occurring after induction of anesthesia, during a procedure, or in the immediate period after surgery.

Purposes of the Guidelines

The purposes of these Guidelines are to (1) enhance the quality and efficiency of anesthesia care, (2) stimulate evaluation of clinical practices, and (3) reduce the severity of complications related to perioperative pulmonary aspiration of gastric contents.

Enhancements in the quality and efficiency of anesthesia care include, but are not limited to, the cost-effective use of perioperative preventive medication, increased patient satisfaction, avoidance of delays and cancellations, decreased risk

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* American Society of Anesthesiologists: 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–a report by the American Society of Anesthesiologists Task Force on Preoperative Fasting. ANESTHESIOLOGY 1999; 90:896–905

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of dehydration or hypoglycemia from prolonged fasting, and the minimization of perioperative morbidity.

Clinical practices include, but are not limited to, withholding solids and liquids for specified time periods before surgery, and prescribing pharmacologic agents to reduce gastric volume and acidity.

Complications of aspiration include, but are not limited to, aspiration pneumonia, respiratory disabilities, and related morbidities.

Focus

These Guidelines focus on preoperative fasting recommendations, as well as recommendations regarding the administration of pharmacologic agents to modify the volume and acidity of gastric contents during procedures in which upper airway protective reflexes may be impaired. Prevention of perioperative pulmonary aspiration is part of the larger process of preoperative evaluation and preparation of the patient.

Airway management techniques that are intended to reduce the occurrence of pulmonary aspiration are not the focus of these Guidelines. For example, a rapid-sequence induction/tracheal intubation technique or an awake tracheal intubation technique may be useful to prevent this problem during the delivery of anesthesia care. In addition, these Guidelines do not address the selection of anesthetic technique.

The intended patient population for these Guidelines is limited to healthy patients of all ages undergoing elective procedures. These Guidelines do not apply to patients who undergo procedures with no anesthesia or only local anesthesia when upper airway protective reflexes are not impaired, and when no risk factors for pulmonary aspiration are apparent. These Guidelines are also not intended for women in labor.

These Guidelines may not apply to, or may need to be modified for (1) patients with coexisting diseases or conditions that can affect gastric emptying or fluid volume (*e.g.*, pregnancy, obesity, diabetes, hiatal hernia, gastroesophageal reflux disease, ileus or bowel obstruction, emergency care, enteral tube feeding) and (2) patients in whom airway management might be difficult. Anesthesiologists and other anesthesia providers should recognize that these conditions can increase the likelihood of regurgitation and pulmonary aspiration. Additional or alternative preventive strategies may be appropriate for such patients.

Application

These Guidelines are intended for use by anesthesiologists and other anesthesia providers. They also may serve as a resource for other health care professionals who advise or care for patients who receive anesthesia care during procedures. Anesthesia care during procedures refers to general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care). Throughout these Guidelines, preoperative should be considered synonymous with preprocedural, as the latter term is often used to describe procedures that are not considered operations.

Task Force Members and Consultants

The original Guidelines were developed by a Task Force of 10 members, including anesthesiologists in both private and academic practice from various geographic areas of North America, and a consulting methodologist from the ASA Committee on Standards and Practice Parameters.

The Task Force developed the original Guidelines by means of a six-step process. First, they reached consensus on the criteria for evidence. Second, original published research studies from peer-reviewed journals relevant to preoperative fasting were reviewed and evaluated. Third, expert consultants were asked (1) to participate in opinion surveys on the effectiveness of various preoperative fasting management recommendations and (2) to review and comment on a draft of the Guidelines. Fourth, the Task Force held open forums at a national meeting† to solicit input on the draft recommendations. Fifth, expert consultants were surveyed to assess their opinions on the feasibility of implementing the Guidelines. Sixth, all available information was used to build consensus within the Task Force to finalize the Guideline recommendations (appendix 1).

In 2009, the ASA Committee on Standards and Practice Parameters requested that scientific evidence for these Guidelines be updated. This update consists of an evaluation of literature that includes new studies obtained after publication of the original Guidelines, new surveys of expert consultants, and a survey of a randomly selected sample of active ASA members.

Availability and Strength of Evidence

Preparation of this update used the same methodologic process as was used in the original Guidelines to obtain new evidence from two principal sources: scientific evidence and opinion-based evidence (appendix 2). The protocol for reporting each source of evidence is described below.

Scientific Evidence

Study findings from published scientific literature were aggregated and are reported in summary form by evidence category, as described below. All literature (*e.g.*, randomized controlled trials, observational studies, case reports) relevant to each topic was considered when evaluating the findings. However, for reporting purposes in this document, only the highest level of evidence (*i.e.*, level 1, 2, or 3 within category A, B, or C) is included in the summary.

Category A: Supportive Literature

Randomized controlled trials report statistically significant ($P < 0.01$) differences between clinical interventions for a specified clinical outcome.

† 12th Annual Meeting of the Society for Ambulatory Anesthesia, Orlando, Florida, May 2, 1997.

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Level 1. The literature contains multiple randomized controlled trials. Aggregated findings are supported by meta-analysis.‡

Level 2. The literature contains multiple randomized controlled trials, but there is an insufficient number of studies to conduct a viable meta-analysis for the purpose of these Guidelines.

Level 3. The literature contains a single randomized controlled trial.

Category B: Suggestive Literature

Information from observational studies permits inference of beneficial or harmful relationships among clinical interventions and clinical outcomes.

Level 1. The literature contains observational comparisons (*e.g.*, cohort, case-control research designs) of clinical interventions or conditions and indicates statistically significant differences between clinical interventions for a specified clinical outcome.

Level 2. The literature contains noncomparative observational studies with associative (*e.g.*, relative risk, correlation) or descriptive statistics.

Level 3. The literature contains case reports.

Category C: Equivocal Literature

The literature cannot determine whether there are beneficial or harmful relationships among clinical interventions and clinical outcomes.

Level 1. Meta-analysis did not find significant differences among groups or conditions.

Level 2. The number of studies is insufficient to conduct meta-analysis, and (1) randomized controlled trials have not found significant differences among groups or conditions, or (2) randomized controlled trials report inconsistent findings.

Level 3. Observational studies report inconsistent findings or do not permit inference of beneficial or harmful relationships.

Category D: Insufficient Evidence from Literature

The lack of scientific evidence in the literature is described using the terms defined below.

Silent. No identified studies address the specified relationships among interventions and outcomes.

Inadequate. The available literature cannot be used to assess relationships among clinical interventions and clinical outcomes. The literature either does not meet the criteria for content as defined in the "Focus" of the Guidelines or does not permit a clear interpretation of findings due to methodological concerns (*e.g.*, confounding in study design or implementation).

‡ All meta-analyses are conducted by the ASA methodology group. Meta-analyses from other sources are reviewed but not included as evidence in this document.

§ When an equal number of categorically distinct responses are obtained, the median value is determined by calculating the arithmetic mean of the two middle values. Ties are calculated by a predetermined formula.

Opinion-based Evidence

All opinion-based evidence relevant to each topic (*e.g.*, survey data, open-forum testimony, Internet-based comments, letters, editorials) was considered in the development of the original Guidelines. New opinion surveys were developed to address each clinical intervention identified in the document, and identical surveys were distributed to both expert consultants and a random sample of active ASA members.

Category A: Expert Opinion

Survey responses from Task Force–appointed expert consultants are reported in summary form in the text. A complete listing of consultant survey responses reported in a table in appendix 2.

Category B: Membership Opinion

Survey responses from active ASA members are reported in summary form in the text. A complete listing of ASA member survey responses reported in appendix 2.

Survey responses are recorded using a 5-point scale and summarized based on median values.§

Strongly Agree. Median score of 5 (at least 50% of responses are 5).

Agree. Median score of 4 (at least 50% of responses are 4 [or 4 and 5]).

Equivocal. Median score of 3 (at least 50% of responses are 3—or no other response category or combination of similar categories contain at least 50% of responses).

Disagree. Median score of 2 (at least 50% of responses are 2 [or 1 and 2]).

Strongly Disagree. Median score of 1 (at least 50% of responses are 1).

Category C: Informal Opinion

Open-forum testimony, Internet-based comments, letters, and editorials were all informally evaluated and discussed during the development of the original Guideline recommendations.

Guidelines

Preoperative Assessment

No controlled trials were found that address the impact of conducting a preoperative assessment (*e.g.*, history, physical examination, survey/interview) on the frequency or severity of pulmonary aspiration of gastric contents during the perioperative period (*Category D evidence*). Studies with observational findings suggest that certain predisposing conditions (*e.g.*, age, comorbid disease) may be associated with the risk of perioperative aspiration (*Category B2 evidence*).[1,2]

The consultants and ASA members strongly agree that a review of pertinent medical records, a physical examination, and patient survey or interview should be performed as part of preoperative evaluation. They also strongly agree that patients should be informed of fasting requirements, and the

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reasons for them, sufficiently in advance of their procedures. In addition, both the consultants and ASA members strongly agree that verification of patient compliance with fasting requirements should be assessed at the time of the procedure.

Recommendations for Preoperative Assessment. A review of pertinent medical records, a physical examination, and patient survey or interview should be performed as part of preoperative evaluation. The history, examination, and interview should include pertinent assessment of gastroesophageal reflux disease, dysphagia symptoms, or other gastrointestinal motility disorders, potential for difficult airway management, and metabolic disorders (*e.g.*, diabetes mellitus) that may increase the risk of regurgitation and pulmonary aspiration. Patients should be informed of fasting requirements, and the reasons for them, sufficiently in advance of their procedures. Verification of patient compliance with fasting requirements should be assessed at the time of the procedures. When the fasting recommendations in these Guidelines are not followed, the practitioner should compare the risks and benefits of proceeding, with consideration given to the amount and type of liquids or solids ingested.

Preoperative Fasting Status: Clear Liquids

Meta-analysis of randomized controlled trials[3–10] comparing fasting times of 2–4 h *versus* more than 4 h report smaller gastric volumes and higher gastric pH values in adult patients given clear liquids 2–4 h before a procedure (*Category A1 evidence*); findings for gastric pH values more than 2.5 are equivocal (*Category C1 evidence*).[3–7,9] Meta-analysis of randomized controlled trials[11–19] report higher gastric pH values (*Category A1 evidence*) and equivocal findings regarding differences in gastric volume for children given clear liquids 2–4 h before a procedure *versus* fasting for more than 4 h before a procedure (*Category C1 evidence*).[11–19] Ingested volumes of clear liquids in the above studies range from 100 ml to unrestricted amounts for adults, and 2 ml/kg to unrestricted amounts for children. Published clinical evidence is insufficient to address the relationship between fasting times for clear liquids and the risk of emesis/reflux or pulmonary aspiration (*Category D evidence*).

Both the consultants and ASA members strongly agree that for otherwise healthy infants (younger than 2 yr), children (2–16 yr), and adults, fasting from the intake of clear liquids at least 2 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained.

Recommendations for Clear Liquids. It is appropriate to fast from intake of clear liquids at least 2 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care). Examples of clear liquids include, but are not limited to, water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee. These liquids should not include alcohol. The volume of liquid ingested is less important than the type of liquid ingested.

Preoperative Fasting Status: Breast Milk

Studies with observational findings are equivocal regarding the impact of ingesting breast milk 4 h before a procedure on the risk of higher volumes or lower pH levels of gastric contents during a procedure (*Category C3 evidence*).[20–22] The literature is insufficient to evaluate the effect of the timing of ingestion of breast milk and the perioperative incidence of emesis/reflux or pulmonary aspiration (*Category D evidence*).

The consultants agree and the ASA members strongly agree that for otherwise healthy neonates (younger than 44 gestational weeks) and infants, fasting from the intake of breast milk at least 4 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained.

Recommendations for Breast Milk. It is appropriate to fast from intake of breast milk at least 4 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care).

Preoperative Fasting Status: Infant Formula

A study with observational findings is equivocal regarding the impact of ingesting infant formula 4 h before a procedure on the risk of higher volumes or lower pH levels of gastric contents during a procedure (*Category C3 evidence*).[23] The literature is insufficient to evaluate the effect of the timing of ingestion of infant formula and the perioperative incidence of emesis/reflux or pulmonary aspiration (*Category D evidence*).

Both the consultants and ASA members agree that for neonates and infants, fasting from the intake of infant formula at least 6 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained. The consultants agree and the ASA members strongly agree that for children, fasting from the intake of infant formula at least 6 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained.

Recommendations for Infant Formula. It is appropriate to fast from intake of infant formula at least 6 h before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care).

Preoperative Fasting Status: Solids and Nonhuman Milk

A randomized controlled trial comparing a light breakfast consumed an average of less than 4 h before a procedure with overnight fasting reports equivocal findings regarding gastric volume and pH levels for adults (*Category C2 evidence*).[24] Studies with nonrandomized comparative findings for children given nonhuman milk 4 h or less before a procedure *versus* children who fasted for more than 4 h report higher gastric volumes (*Category B2 evidence*) and equivocal gastric pH (*Category C3 evi-*

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dence).[21,25,26] A study with observational findings suggests that fasting for more than 8 h may be associated with hypoglycemia in children (*Category B2 evidence*).[26] The literature is insufficient to evaluate the effect of the timing of ingestion of solids and nonhuman milk and the perioperative incidence of emesis/reflux or pulmonary aspiration (*Category D evidence*).

The consultants agree and the ASA members strongly agree that fasting from the intake of a light meal (*e.g.*, toast and a clear liquid) 6 h or more before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained. Both the consultants and ASA members strongly agree that fasting from the intake of a meal that includes fried or fatty foods 8 h or more before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained.

Both the consultants and ASA members agree that for infants, fasting from the intake of nonhuman milk 6 h or more before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained. The consultants agree and the ASA members strongly agree that for children and adults, fasting from the intake of nonhuman milk 6 h or more before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained.

Recommendations for Solids and Nonhuman Milk. It is appropriate to fast from intake of a light meal or nonhuman milk 6 h or more before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care). The Task Force notes that intake of fried or fatty foods or meat may prolong gastric emptying time. Additional fasting time (*e.g.,* 8 h or more) may be needed in these cases. Both the amount and type of food ingested must be considered when determining an appropriate fasting period. Because nonhuman milk is similar to solids in gastric emptying time, the amount ingested must be considered when determining an appropriate fasting period.

Preoperative Gastrointestinal Stimulants

Meta-analysis of randomized placebo-controlled trials[8–32] supports the efficacy of metoclopramide to reduce gastric volume (*Category A1 evidence*)[2] and is equivocal regarding the effect of metoclopramide on gastric acidity (*Category C1 evidence*)[28–32] during the perioperative period. The literature is insufficient to evaluate the effect of administering gastrointestinal stimulants on the perioperative incidence of emesis/reflux or pulmonary aspiration (*Category D evidence*).

Both the consultants and ASA members disagree that gastrointestinal stimulants should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have no apparent increased risk for pulmonary aspiration.

Recommendations for Gastrointestinal Stimulants. The routine preoperative use of gastrointestinal stimulants to decrease the risk of pulmonary aspiration in patients who have no apparent increased risk for pulmonary aspiration is not recommended.

Preoperative Pharmacologic Blockade of Gastric Acid Secretion

Histamine-2 receptor antagonists: Meta-analysis of double-blind randomized placebo-controlled trials support the efficacy of cimetidine to reduce gastric volume[31–36] and acidity[31–37] during the perioperative period (*Category A1 evidence*). Meta-analysis of double-blind randomized placebo-controlled trials[35,38–43] also supports the efficacy of ranitidine to reduce gastric volume and acidity during the perioperative period (*Category A1 evidence*). Randomized placebo-controlled trials indicate that famotidine is effective in reducing gastric volume and acidity (*Category A2 evidence*).[39,44,45]

Proton pump inhibitors: Randomized controlled trials support the efficacy of omeprazole in reducing gastric volume and acidity (*Category A2 evidence*),[41,46–48] with similar findings reported for lansoprazole (*Category A2 evidence*).[41,42,49,50]

The literature is insufficient to evaluate the effect of administering either histamine-2 receptor antagonists or proton pump inhibitors on the perioperative incidence of emesis/reflux or pulmonary aspiration (*Category D evidence*).

Both the consultants and ASA members disagree that histamine-2 receptor antagonists should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have no apparent increased risk for pulmonary aspiration. The ASA members disagree and the consultants strongly disagree that proton pump inhibitors should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have no apparent increased risk for pulmonary aspiration.

Recommendations for Preoperative Pharmacologic Blockade of Gastric Acid Secretion. The routine preoperative use of medications that block gastric acid secretion to decrease the risks of pulmonary aspiration in patients who have no apparent increased risk for pulmonary aspiration is not recommended.

Preoperative Antacids

Randomized controlled trials indicate that preoperative antacids (*e.g.*, sodium citrate, magnesium trisilicate) increase gastric pH during the perioperative period (*Category A2 evidence*),[29,51–54] with equivocal findings regarding gastric volume (*Category C2 evidence*). The literature does not sufficiently examine the relationship between reduced gastric acidity and the frequency of pulmonary aspiration or emesis in humans; nor does the literature sufficiently examine whether reduced gastric

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acidity or volume is associated with decreased morbidity or mortality in patients given preoperative antacids who have aspirated gastric contents (*Category D evidence*).

The consultants and ASA members both disagree that preoperative antacids should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have no apparent increased risk for pulmonary aspiration. The consultants and ASA members both strongly agree that only nonparticulate antacids should be used when antacids are indicated for selected patients.

Recommendations for Preoperative Antacids. The routine preoperative use of antacids to decrease the risks of pulmonary aspiration in patients who have no apparent increased risk for pulmonary aspiration is not recommended. Only nonparticulate antacids should be used when antacids are indicated for selected patients for purposes other than reducing the risk of pulmonary aspiration.

Preoperative Antiemetics

Randomized controlled trials indicate that the preoperative administration of droperidol[55–57] and ondansetron[58–60] are effective in reducing nausea and vomiting during the period after surgery (*Category A2 evidence*). The literature does not sufficiently examine the relationship between the preoperative use of antiemetics and the frequency of pulmonary aspiration (*Category D evidence*).

The consultants and ASA members both disagree that preoperative antiemetics should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have no apparent increased risk for pulmonary aspiration.

Recommendations for Preoperative Antiemetics.‖ The routine preoperative use of antiemetics to reduce the risks of pulmonary aspiration in patients who have no apparent increased risk for pulmonary aspiration is not recommended.

Preoperative Anticholinergics

Randomized placebo-controlled trials are equivocal regarding the efficacy of atropine[61] and glycopyrrolate[62–65] to reduce gastric volume or acidity (*Category C2 evidence*).

The ASA members disagree and the consultants strongly disagree that preoperative anticholinergics should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) to decrease the risk of pulmonary aspiration.

‖ These Guidelines do not address the use of antiemetics during the extended period after surgery when the upper airway protective reflexes are no longer impaired.

Recommendations for Preoperative Anticholinergics. The use of anticholinergics to decrease the risks of pulmonary aspiration is not recommended.

Preoperative Multiple Agents

Randomized controlled trials indicate that, when histamine-2 receptor antagonists (*i.e.*, cimetidine, ranitidine) are combined with gastrointestinal stimulants (*i.e.*, metoclopramide), the combined influence of the two drugs is effective in reducing both gastric volume and acidity (*Category A2 evidence*).[28,30–32,66–68] Therefore, when histamine-2 receptor antagonists combined with gastrointestinal stimulants are compared to histamine-2 receptor antagonists alone, comparable reductions in gastric acidity are reported. Similarly, when the combined drugs are compared to gastrointestinal stimulants alone as the single-drug comparison, equivocal findings for gastric volume are reported.[28,30–32,66–68] Randomized controlled trials comparing other drug combinations *versus* single drugs alone report inconsistent findings regarding gastric volume and pH outcomes (*Category C2 evidence*).[29,57,65,69–71]

The ASA members disagree and the consultants strongly disagree that preoperative multiple agents should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have no apparent risk for pulmonary aspiration.

Recommendations for Preoperative Multiple Agents. The routine preoperative use of multiple agents in patients who have no apparent increased risk for pulmonary aspiration is not recommended.

Appendix 1: Summary of Fasting and Pharmacologic Recommendations

Summary of Fasting Recommendations

Ingested Material	Minimum Fasting Period
Clear liquids	2 h
Breast milk	4 h
Infant formula	6 h
Nonhuman milk	6 h
Light meal	6 h

These recommendations apply to healthy patients who are undergoing elective procedures. They are not intended for women in labor. Following the Guidelines does not guarantee complete gastric emptying. The fasting periods noted above apply to patients of all ages.

Examples of clear liquids include water, fruit juices without pulp, carbonated beverages, clear tea, and black coffee. Because nonhuman milk is similar to solids in gastric emptying time, the amount ingested must be considered when determining an appropriate fasting period.

A light meal typically consists of toast and clear liquids. Meals that include fried or fatty foods or meat may prolong gastric emptying time. Additional fasting time (*e.g.*, 8 h or more) may be needed in these cases. Both the amount and

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type of food ingested must be considered when determining an appropriate fasting period.

Pharmacologic Recommendations

These recommendations are listed by medication type with common examples. In addition, combinations of the medications listed are not recommended for routine use.

Gastrointestinal Stimulants

Metoclopramide: No routine use

Gastric Acid Secretion Blockers

Cimetidine: No routine use
Famotidine: No routine use
Ranitidine: No routine use
Omeprazole: No routine use
Lansoprazole: No routine use

Antacids

Sodium citrate: No routine use
Sodium bicarbonate: No routine use
Magnesium trisilicate: No routine use

Antiemetics

Droperidol: No routine use
Ondansetron: No routine use

Anticholinergics

Atropine: No use
Scopolamine: No use
Glycopyrrolate: No use

Multiple Agents

No routine use

Appendix 2: Methods and Analyses

State of the Literature

For these Guidelines, a literature review is used in combination with opinions obtained from expert consultants and other sources (*e.g.*, American Society of Anesthesiologists members, open forums, Internet postings). Both the literature review and opinion data are based on evidence linkages, or statements regarding potential relationships between clinical interventions and outcomes. The interventions listed below were examined to assess their impact on pulmonary aspiration and other outcomes. Outcomes for the listed interventions include, but are not limited to, pulmonary aspiration, volume and acidity of gastric contents, adverse effects (*e.g.,* thirst, hunger, nausea, vomiting), adverse outcomes (*e.g.,* pneumonitis, mortality), and other outcomes (*e.g.,* length of stay in hospital, costs).

Preoperative Assessment

1. Medical record review or patient condition
2. Physical examination
3. Patient survey/questionnaire

Preoperative Fasting Status

1. Adults: Clear liquids between 2 and 4 h *versus* more than 4 h
2. Children: Clear liquids between 2 and 4 h *versus* more than 4 h
3. Breast milk between 2 and 4 h *versus* more than 4 h
4. Infant formula between 2 and 4 h *versus* more than 4 h
5. Solids or nonhuman milk less than 4 h *versus* more than 4 h
6. Solids or nonhuman milk between 4 and 8 h *versus* more than 8 h

Preoperative Pharmacologic Interventions

1. Gastrointestinal stimulants (*e.g.*, metoclopramide, cisapride)
2. Blockage of gastric acid secretion
   a. Histamine-2 receptor antagonists (*e.g.*, cimetidine, ranitidine, famotidine)
   b. Proton pump inhibitors (*e.g.*, omeprazole, lansoprazole)
3. Antacids (e.g., sodium citrate, magnesium trisilicate)
4. Antiemetics (e.g., ondansetron, droperidol)
5. Anticholinergics (*e.g.*, atropine, glycopyrrolate)
6. Multiple agents/drugs *versus* single agents/drugs

For the literature review, potentially relevant clinical studies were identified *via* electronic and manual searches of the literature. For the original Guidelines, electronic and manual searches covered a 57-yr period from 1940 through 1996. The literature search for this update covered the 15-yr period from 1996 through 2010 and included review of 1,223 nonoverlapping articles that addressed topics related to the evidence linkages. After review of the articles, 1,065 studies did not provide direct evidence and were subsequently eliminated. A total of 158 articles contained findings directly related to at least one of the evidence linkages listed above. No evidence linkage contained sufficient literature with well-defined experimental designs and statistical information to conduct an analysis of aggregated studies (*i.e.*, meta-analysis). A complete bibliography used to develop these updated Guidelines, organized by section, is available as Supplemental Digital Content 2, http://links.lww.com/ALN/A661.

The literature is categorized according to the proximity or directness of the outcome to the intervention. To appropriately evaluate an outcome, a study should either evaluate a direct comparison or institute methodological controls (*e.g.*, control for intervening variables). For these Guidelines, the primary outcomes of interest are pulmonary aspiration and its adverse consequences. Therefore, these Guidelines focus on assessing the causal relationship between a preoperative intervention and the frequency of pulmonary aspiration, and assessing the causal relationship between a preoperative intervention and the frequency or severity of an adverse consequence associated with aspiration (*e.g.*, pneumonitis). However, the literature is insufficient to evaluate such relationships. The literature reveals four types of analytic relationships between preoperative interventions and out-

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comes of interest. These types of relationships are referred to as first-, second-, third-, or fourth-order comparisons.

A first-order comparison represents a direct comparison either between an intervention (*e.g.*, antacid administration) and a clinical outcome, or between two outcomes (*e.g.*, gastric volume and emesis). In the studies reviewed with first-order comparisons, the relationship between one of the identified interventions in the Guidelines and the incidence of pulmonary aspiration was not assessed. Therefore, a cause-and-effect relationship between an intervention of interest and pulmonary aspiration cannot be shown. Although some outcomes (*e.g.*, gastric volume, pH) were considered by the authors to be representative of a predicted risk of pulmonary aspiration, results of such comparisons are not sufficient to provide methodologically acceptable evidence.

Levels 2 through 4 represent comparisons that must first control for an intermediate outcome. For example, to examine the effectiveness of a histamine-2 receptor antagonist on pulmonary aspiration, the effect of the histamine-2 receptor antagonist on gastric content as well as the occurrence of emesis must be methodologically controlled. Gastric content and emesis "outcomes" are intervening steps between the intervention and pulmonary aspiration. This example would be considered a third-order comparison.

Level 2 represents a comparison in which one step, or intermediate outcome, exists between the intervention and the outcome of interest. However, level 2 relationships do not examine the association between an intervention of interest and the occurrence of pulmonary aspiration.

Level 3 contains one relationship of interest to the Guidelines (*i.e.*, intervention/pulmonary aspiration). Level 4 contains the other relationship of interest to the Guidelines (*i.e.*, association between an intervention and clinical consequences from pulmonary aspiration).

Table 1 indicates that outcomes related to preoperative fasting and the administration of pharmacologic agents were insufficient to evaluate cause-and-effect relationships that link the interventions of interest in these Guidelines with the occurrence of pulmonary aspiration or the clinical consequences from pulmonary aspiration.

Although the literature was not sufficient for causal assessment related to pulmonary aspiration, findings for each intervention of interest regarding intermediate outcomes is reported. Initially, each pertinent outcome reported in a study is classified as supporting an evidence linkage, refuting a linkage, or equivocal. These results are then summarized to obtain a directional assessment for each evidence linkage before conducting a formal meta-analysis. The literature relating to five evidence linkages contained enough studies with well-defined experimental designs and statistical information to conduct formal meta-analyses. These five evidence linkages are: (1) preoperative fasting status of liquids between 2 and 4 h for adults, (2) preoperative fasting status of liquids between 2 and 4 h for children, (3) preoperative metoclopramide, (4) preoperative cimetidine, and (5) preoperative ranitidine. Meta-analysis was limited to gastric volume and acidity outcomes (table 2).

General variance-based effect-size estimates or combined probability tests are obtained for continuous outcome measures. Mantel-Haenszel odds ratios are obtained for dichotomous outcome measures. Two combined probability tests are used as follows: (1) the Fisher combined test, producing chi-square values based on logarithmic transformations of the reported P values from the independent studies, and (2) the Stouffer combined test, providing weighted representations of the studies by weighting each of the standard normal deviates by the size of the sample. An odds-ratio procedure based on the Mantel-Haenszel method for combining study results using 2×2 tables is used with outcome frequency information. An acceptable significance level is set at a P value of less than 0.01 (one-tailed). Tests for heterogeneity of the independent studies are conducted to ensure consistency among study results. DerSimonian-Laird random-effects odds ratios are obtained when significant heterogeneity is found ($P < 0.01$). To control for potential publishing bias, a "fail-safe n value" is calculated. No search for unpublished studies was conducted; no reliability tests for locating research results were done. To be accepted as significant findings, Mantel-Haenszel odds ratios must agree with combined test results whenever both types of data are assessed. In the absence of Mantel-Haenszel odds ratios, findings from the Fisher and weighted Stouffer combined tests must agree with each other to be considered statistically significant.

For the original Guidelines, interobserver agreement among Task Force members and two methodologists was established by interrater reliability testing. Agreement levels using a κ statistic for two-rater agreement pairs are as follows: (1) type of study design, $\kappa = 0.75–0.95$; (2) type of analysis, $\kappa = 0.54–0.85$; (3) evidence linkage assignment, $\kappa = 0.68–0.82$; and (4) literature inclusion for database, $\kappa = 0.64–0.78$. Three-rater chance-corrected agreement values are: (1) design, Sav = 0.81, Var (Sav) = 0.006; (2) analysis, Sav = 0.66, Var (Sav) = 0.014; (3) linkage identification, Sav = 0.75, Var (Sav) = 0.005; (4) literature database inclusion, Sav = 0.67, Var (Sav) = 0.050. These values represent moderate to high levels of agreement.

Consensus-based Evidence

Consensus was obtained from multiple sources, including: (1) survey opinion from consultants who were selected based on their knowledge or expertise in preoperative fasting and prevention of pulmonary aspiration, (2) survey opinions solicited from active members of the American Society of Anesthesiologists, (3) testimony from attendees of a publicly held open forum for the original Guidelines held at a national anesthesia meeting, (4) Internet commentary, and (5) Task Force opinion and interpretation. The survey rate of return was 59.7% (37 of 62) for the

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consultants (table 3); 471 responses were received from active American Society of Anesthesiologists members (table 4).

For the original Guidelines, an additional survey was sent to the consultants asking them to indicate which, if any, of the evidence linkages would change their clinical practices if the Guidelines were instituted. The percent of consultants expecting no change associated with each linkage were as follows: preoperative assessment, 95%; preoperative fasting of solids, 75%; preoperative fasting of liquids, 67%; preoperative fasting of breast milk, 78%; gastrointestinal stimulants, 95%; pharmacologic blockage of gastric secretion, 91%; antacids, 100%; antiemetics, 98%, anticholinergics, 100%, and multiple agents, 98%. Ninety-six percent of respondents indicated that the Guidelines would have no effect on the amount of time spent on a typical case. For all respondents, the mean increase in the amount of time spent on a typical case was 2.4 min. Two respondents reported that the Guidelines would increase the amount of time spent per case. The anticipated time increase for these two respondents was 5 and 120 min, respectively.

Table 1. Summary of First-, Second-, Third-, and Fourth-order Comparisons of Outcomes Related to Fasting and Pharmaceutical Interventions

Fasting or Pharmaceutical Intervention	Studies, No.
First-order comparisons	
Intervention - gastric outcomes	132
Gastric volume or pH - emesis/reflux	1
Emesis/reflux - pulmonary aspiration	0
Pulmonary aspiration - adverse outcomes	3
Second-order comparisons	
Intervention - emesis/reflux	15
Gastric volume or pH - pulmonary aspiration	1
Emesis/reflux - adverse outcomes	0
Third-order comparisons	
Intervention - pulmonary aspiration	3
Gastric volume or pH - adverse outcomes	0
Fourth-order Comparisons	
Intervention - adverse outcomes	0

Table 2. Meta-analysis Summary

Evidence Linkages	No.	Fisher χ^2	*P* Value	Z Score	*P* Value	Effect Size	OR	CI	Significance	Effect Size
Preoperative fasting: clear liquids										
Adults, 2–4 *vs.* > 4 h										
Gastric volume	8	39.80	0.001	−2.44	0.007	−0.11	—	—	ns	ns
Gastric volume, < 25 ml	6	—	—	—	—	—	1.68	1.00–2.80	—	ns
Gastric pH	8	36.26	0.005	2.69	0.004	0.12	—	—	ns	ns
Gastric pH, > 2.5	6	—	—	—	—	—	1.83	0.91–3.69	—	ns
Low risk	6	—	—	—	—	—	1.86*	1.10–3.14	—	ns
Children, 2–4 *vs.* > 4 h										
Gastric volume	9	39.07	0.005	−1.37	0.085	−0.05	—	—	ns	ns
Gastric volume, < 0.04 ml/kg	7	—	—	—	—	—	1.30	0.81–2.10	—	ns
Gastric pH	9	35.88	0.006	2.89	0.002	0.10	—	—	ns	ns
Gastric pH, > 2.5	5	—	—	—	—	—	0.81	0.37–1.74	—	ns
Low risk	8	—	—	—	—	—	1.06	0.71–1.57	—	ns
Metoclopramide *vs.* placebo										
Gastric volume	6	49.61	0.001	−5.06	0.001	−0.34	—	—	ns	ns
Gastric pH	5	37.06	0.001	3.56	0.001	0.28	—	—	ns	ns

(*continued*)

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Table 2. Continued

Evidence Linkages	No.	Fisher χ^2	*P* Value	Z Score	*P* Value	Effect Size	OR	CI	Significance	Effect Size
Cimetidine *vs.* placebo										
Gastric volume	6	54.24	0.001	−5.50	0.001	−0.39	—	—	ns	ns
Gastric volume, < 25 ml	8	—	—	—	—	—	4.38*	2.41–7.96	—	ns
Gastric pH	7	93.37	0.001	11.73	0.001	0.78	—	—	0.005	0.001
Gastric pH, > 2.5	11	—	—	—	—	—	12.60*	8.02–19.78	—	ns
Low risk	5	—	—	—	—	—	5.69	2.63–12.35	—	ns
Ranitidine *vs.* placebo										
Gastric volume	7	78.73	0.001	−9.46	0.001	−0.55	—	—	0.001	0.001
Gastric volume, < 25 ml	14	—	—	—	—	—	4.83*	3.21–7.27	—	ns
Gastric pH	7	106.41	0.001	14.05	0.001	0.85	—	—	ns	0.001
Gastric pH, > 2.5	6	—	—	—	—	—	16.61*	9.12–30.26	—	ns
Low risk	6	—	—	—	—	—	9.31*	5.97–14.51	—	ns

* Odds ratios from double-blind studies.

CI = confidence interval; low risk = patients with gastric volume <25 ml and pH >2.5; ns = nonsignificant ($P > 0.01$); OR = odds ratio; χ^2 = chi-square test.

Table 3. Consultant Responses per Survey Item (N = 37)

	Response, No.	Response, %				
		Strongly Agree	Agree	Equivocal	Disagree	Strongly Disagree
Preoperative Assessment						
1. A review of pertinent records, a physical examination, and patient survey or interview should be performed as part of the preoperative evaluation	37	86.5*	13.5	0	0	0
2. Patients should be informed of fasting requirements and the reasons for them sufficiently in advance of their procedures	37	97.3*	2.7	0	0	0
3. Verification of patient compliance with the fasting requirements should be assessed immediately prior to the time of the procedure	36	94.4*	5.6	0	0	0
Preoperative NPO Status						
Clear liquids						
4a. For otherwise healthy *infants* (<2 yr of age), fasting from the intake of clear liquids for *2 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	59.5*	27.0	10.8	0	2.7
4b. For otherwise healthy *children* (2 to 16 yr of age), fasting from the intake of clear liquids for *2 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	54.1*	32.4	10.8	2.7	0
4c. For otherwise healthy *adults*, fasting from the intake of clear liquids for *2 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	56.8*	40.5	2.7	0	0

(*continued*)

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Table 3. Continued

	Response, No.	Response, %				
		Strongly Agree	Agree	Equivocal	Disagree	Strongly Disagree
Breast milk						
5a. For otherwise healthy *neonates* (<44 gestational weeks), fasting from the intake of breast milk for *4 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	37.8	35.1*	18.9	8.1	0
5b. For otherwise healthy *infants*, fasting from the intake of breast milk for *4 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	43.2	37.8*	18.9	0	0
Infant formula						
6a. For *neonates*, fasting from the intake of infant formula for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	27.0	32.4*	24.3	13.5	2.7
6b. For infants, fasting from the intake of infant formula for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	36	36.1	30.6*	16.7	13.9	2.8
6c. For children, fasting from the intake of infant formula for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	32.4	40.5*	21.6	5.4	0
Nonhuman milk						
7a. For infants, fasting from the intake of non-human milk for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	35	31.4	34.3*	22.9	11.4	0
7b. For children, fasting from the intake of non-human milk for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	29.7	46.0*	18.9	5.4	0
7c. For adults, fasting from the intake of non-human milk for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	37	43.2	46.0*	5.4	5.4	0
Solids						
8. Fasting from the intake of a *light meal* (*e.g.*, toast and a clear liquid) for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	36	41.7	44.4*	0	13.9	0
9. Fasting from the intake of a meal that includes *fried or fatty foods* for *8 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	36	63.9*	27.8	2.8	2.8	2.8

(*continued*)

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Table 3. Continued

	Response, No.	Response, %				
		Strongly Agree	Agree	Equivocal	Disagree	Strongly Disagree
Preoperative Gastrointestinal Stimulants						
10. Gastrointestinal stimulants should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	36	0	0	5.6	47.2*	47.2
Preoperative Pharmacologic Blockade of Gastric Acid Secretion						
11. Histamine-2 receptor antagonists should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	36	0	2.8	5.6	44.4*	47.2
12. Proton pump inhibitors should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	37	0	2.7	8.1	37.8	51.4*
Preoperative Antacids						
13a. Preoperative antacids should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	36	0	2.8	2.8	47.2*	47.2
13b. When antacids are indicated for selected patients, only non-particulate antacids should be used	36	55.6*	27.8	11.1	0	5.6
Preoperative Antiemetics						
14. Preoperative antiemetics should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	37	0	5.4	0	51.4*	43.2
Preoperative Anticholinergics						
15. Preoperative anticholinergics should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) to decrease the risk of pulmonary aspiration	37	0	2.7	2.7	40.5	54.1*
Preoperative Multiple Agents						
16. Preoperative multiple agents should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	37	0	2.7	0	43.2	54.1*

Survey rate of return was 59.7% (37 of 62) for consultants.

* Median response.

NPO = Nil Per Os (nothing by mouth).

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Table 4. American Society of Anesthesiologists Members Responses per Survey Item (N = 471)

	Response, No.	Response, %				
		Strongly Agree	Agree	Equivocal	Disagree	Strongly Disagree
Preoperative Assessment						
1. A review of pertinent records, a physical examination, and patient survey or interview should be performed as part of the preoperative evaluation	470	93.2*	6.0	0.4	0.2	0.2
2. Patients should be informed of fasting requirements and the reasons for them sufficiently in advance of their procedures	470	93.4*	6.4	0	0	0.2
3. Verification of patient compliance with the fasting requirements should be assessed immediately prior to the time of the procedure	468	88.5*	9.6	1.3	0.2	0.4
Preoperative NPO Status						
Clear liquids						
4a. For otherwise healthy *infants* (<2 yr of age), fasting from the intake of clear liquids for *2 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	471	66.9*	25.1	5.7	2.1	0.2
4b. For otherwise healthy *children* (2 to 16 yr of age), fasting from the intake of clear liquids for *2 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	467	67.0*	23.3	5.6	3.6	0.4
4c. For otherwise healthy *adults*, fasting from the intake of clear liquids for *2 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	465	64.5*	21.5	6.0	6.5	1.5
Breast milk						
5a. For otherwise healthy *neonates* (<44 gestational weeks), fasting from the intake of breast milk for *4 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	465	53.6*	29.5	13.1	3.0	0.9
5b. For otherwise healthy *infants*, fasting from the intake of breast milk for *4 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	466	55.6*	32.4	8.6	2.8	0.6
Infant formula						
6a. For *neonates*, fasting from the intake of infant formula for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	455	45.7	30.1*	16.9	5.9	1.3
6b. For infants, fasting from the intake of infant formula for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	459	47.9	33.8*	12.4	4.8	1.1

(*continued*)

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Table 4. Continued

	Response, No.	Response, %				
		Strongly Agree	Agree	Equivocal	Disagree	Strongly Disagree
6c. For children, fasting from the intake of infant formula for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	456	52.6*	32.5	10.5	3.3	1.1
Nonhuman milk						
7a. For infants, fasting from the intake of non-human milk for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	458	47.6	33.4*	12.5	5.0	1.5
7b. For children, fasting from the intake of non-human milk for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	460	51.1*	34.4	8.4	4.8	1.3
7c. For adults, fasting from the intake of non-human milk for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	462	55.6*	33.3	5.0	4.8	1.3
Solids						
8. Fasting from the intake of a *light meal* (*e.g.*, toast and a clear liquid) for *6 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	468	59.0*	29.7	4.1	6.2	1.1
9. Fasting from the intake of a meal that includes *fried or fatty foods* for *8 or more hours* before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) should be maintained	470	68.5*	22.6	4.7	3.6	0.6
Preoperative Gastrointestinal Stimulants						
10. Gastrointestinal stimulants should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	468	1.9	4.5	8.3	48.8*	36.5
Preoperative Pharmacologic Blockade of Gastric Acid Secretion						
11. Histamine-2 receptor antagonists should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	470	4.0	7.9	9.2	44.7*	34.2
12. Proton pump inhibitors should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	470	1.3	3.6	11.9	46.8*	36.4

(*continued*)

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Table 4. Continued

	Response, No.	Response, %				
		Strongly Agree	Agree	Equivocal	Disagree	Strongly Disagree
Preoperative Antacids						
13a. Preoperative antacids should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	467	0.6	2.8	6.6	52.0*	37.9
13b. When antacids are indicated for selected patients, only non-particulate antacids should be used	466	65.2*	28.5	4.5	1.5	0.2
Preoperative Antiemetics						
14. Preoperative antiemetics should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	461	4.3	11.9	8.5	49.9*	25.4
Preoperative Anticholinergics						
15. Preoperative anticholinergics should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) to decrease the risk of pulmonary aspiration	466	1.3	1.7	7.6	53.4*	36.1
Preoperative Multiple Agents						
16. Preoperative multiple agents should be routinely administered before elective procedures requiring general anesthesia, regional anesthesia, or sedation/analgesia (*i.e.*, monitored anesthesia care) in patients who have *no apparent* increased risk for pulmonary aspiration	470	2.3	4.7	7.9	44.3*	40.9

* Median response.

NPO = Nil Per Os (nothing by mouth).

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