

PRACTICE GUIDELINES

# PREOPERATIVE FASTING

## IN PATIENTS UNDERGOING ELECTIVE SURGERY AND PROCEDURES

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## SUMMARY OF RECOMMENDATIONS

1. Patients undergoing elective surgery or procedures requiring anaesthesia should have the following minimum fasting time:

Ingested Material	Min Fasting
Clear liquids	2 hours
Breast Milk	4 hours
Infant Formula	4 – 6 hours
Non human milk	6 hours
Light meal	6 hours
Fried, fatty food, meats	8 hours

2. There is insufficient evidence to support the routine use of prokinetics, H<sub>2</sub> antagonists, antacids, antiemetics or anticholinergics for aspiration prevention in non-high risk patients.
3. Pregnant women not in labour, who are undergoing elective surgery, should follow normal fasting guidelines.
4. Pregnant women in labour should not have any solid foods but can have clear fluids as desired. They can continue to drink clear fluids until up to 2 hours prior to elective surgery under regional or general anaesthesia. If they require surgery, a H<sub>2</sub> antagonist and a non particulate antacid should be given.
5. Obese patient should also follow this normal fasting guidelines.
6. Patients with diabetes (likely to have delayed gastric emptying) may benefit from a longer fast.
7. Currently, there is no evidence to support the withholding of fluids after elective procedures.

## A. PURPOSE AND DEVELOPMENT OF THE GUIDELINES

Perioperative pulmonary aspiration can occur after induction of anaesthesia, during surgery or in the immediate period after surgery. The purpose of preoperative fasting is to prevent perioperative pulmonary aspiration of gastric contents and its potential complications related to it. Currently in Singapore, there are no consensus guidelines on preoperative fasting for adults and children undergoing elective surgery and procedures under general anaesthesia and moderate sedation. The fasting guidelines in the individual restructured hospitals differ as they have been adopted from other organisations like the American Society of Anesthesiologists or the European Society of Anaesthesiology.

Many anaesthesiologists, being concerned about risk of aspiration, have chosen to adopt a more conservative preoperative fasting guidelines of 6 hours for both solids and liquids. This has led to the reluctance to do away with unnecessary restrictive fasting regimens in otherwise healthy, elective patients. Guidelines for fasting from fluids and solids are not new. Lister in 1883 recommended a 2 hours fast from fluids while the stomach should be empty of solid food.<sup>1</sup> The practice of a 6 hours fast from both fluids and solids before procedures started from the 1960's. They were derived mainly from textbooks and were made without strong scientific evidence.<sup>2,3</sup>

It has been appreciated that prolonged fasting is detrimental to patient. Fasting does not ensure an empty stomach as gastric acid production continues to be produced during fasting. Fasted patients often arrive for their surgery dehydrated with its associated decrease in oxygen delivery.<sup>4</sup> They could even be in a catabolic state with deranged glucose control. Furthermore, children who are fasted for prolonged periods are often hypoglycemic, ketotic, have increased incidence of nausea and vomiting and need for analgesics.<sup>5</sup>

The aims of these guidelines are to enhance the quality and efficiency of anaesthesia care based on current scientific evidence while ensuring maximum patient comfort.

## B. GATHERING THE EVIDENCE AND CURRENT PRACTICES

Guidelines published from Association of Anesthetists of Great Britain and Ireland, American Society of Anesthesiologists, European Society of Anesthesiologist and Australian, New Zealand College of Anesthetists were reviewed. We also used Pubmed, Ovid and Medical search engines like Google, Google Scholar to search for the terms like fasting guidelines, fasting and anaesthesia, anaesthesia and aspiration. We included studies published in English over the last 10 years.

A draft was produced by the task force with inputs from anaesthesia departments in all our public hospitals and anaesthesiologists practicing in the private hospitals in

Singapore. This draft was presented at the Singapore Society of Anaesthesiologist 20<sup>th</sup> General Scientific Meeting on 27<sup>th</sup> June 2017. The feedback and opinions of the attending delegates were considered. The final guidelines was then tabled and approved by the College of Anaesthesiologist, Academy of Medicine Singapore during their Annual General Meeting on 23<sup>rd</sup> May 2018.

### C. IDENTIFICATION OF RISKS FROM ASPIRATION

Death from aspiration of gastric content is of great concern to anaesthesiologists. The mortality from aspiration is usually quoted to be between 1:22 008 to 1: 46 340.<sup>6,7</sup> More recently, in the NAP 4 study, the risk of anaesthesia related mortality from aspiration was estimated to be approximately 1: 350 000. While aspiration was the commonest cause of death from complication of airway management, poor judgement was the more likely root cause. This was due to poor assessment of risk of aspiration and failure to use the appropriate airway device or technique.<sup>8</sup> Lack of pre procedural fasting is one of the many factors which can contribute to aspiration.

The risks of pulmonary aspiration usually include:

1. Full stomach due to inadequate fasting time
2. Emergency surgery
3. Acute or chronic, upper or lower gastrointestinal pathology e.g. hiatus hernia, gastrointestinal reflux
4. Delayed gastric emptying
5. Incompetent lower esophageal sphincter or esophageal diseases
6. Lithotomy position
7. Anaesthesia related factors like light anaesthesia, difficult airway, use of first generation supraglottic devices
8. Opioid medication

A preoperative anaesthesia assessment should be done to identify patients who are at possible risk of regurgitation and aspiration of gastric contents by thoroughly reviewing the patient's medical record, obtaining a medical history, conducting a focused physical examination and reviewing of relevant ordered investigations.

Gastric antral ultra sound has been suggested as a means of estimating residual gastric volume during fasting. A gastric volume of 0.8 – 1.5 ml/kg has been considered an increased risk of aspiration.<sup>9,10,11</sup>

## D. RESTRICTIONS OF DRINKS AND SOLID FOOD IN ADULTS

### (1) Fluids

Adults and children should be encouraged to drink clear fluids up to 2 hours before elective procedures requiring general anaesthesia, regional anaesthesia or procedural sedation. Clear fluids would include water, pulp free juice, plain tea or coffee but exclude alcohol.

Oral intake of clear fluids up to 2 hours prior to elective procedures appears to be safe and do not increase the gastric fluid content as compared to a longer fast.<sup>12,13,14,15,16,17,18,19,20</sup> Unnecessary fluid abstinence can be detrimental for patients particularly in the elderly and young children.<sup>21</sup> It may add unnecessary stress and discomfort to the patient.

### (2) Milk

Coffee or tea with milk is allowed up to 2 hours prior to an elective procedure. The amount of milk added should not exceed 20% of the total volume (not more than 50 mls or more than 220 calories).

The rate of gastric emptying is affected by the caloric content of the ingested fluid rather than its type. Adding milk to tea up to 20% of the volume and coffee up to 50%, has not been shown to affect gastric emptying in normal volunteers.<sup>22,23,24</sup>

### (3) Solid Food

A light meal (e.g. toast and clear fluids) is allowed for up to 6 hours prior to elective procedures requiring general anaesthesia, regional anaesthesia or sedation. The fasting time should be increased following a larger meal and fried or a fatty food intake. For a large oily meal, an 8 hours fast is recommended.

It is common practice to avoid solid food for at least 6 hours prior to elective procedures. Previous studies have shown no increase in gastric content after a light breakfast of tea and buttered toast consumed 2-4 hours prior to elective surgery compared to an overnight fast.<sup>25</sup> There has been no other recent studies to define the minimal safe time for pre procedure fasting for solid food.

As gastric emptying time is related to calorie content (approximately 200 cal/hour)<sup>26</sup> it will be prudent to fast for a longer period after an oily meal or one filled with calories, based on ASA member consensus and expert opinion.<sup>12</sup> When determining an appropriate fasting period, both the amount and type of food ingested should be considered.

#### (4) Gums, Sweets and Smoking

Chewing gum or sweets is allowed for up to 2 hours before general anaesthesia, regional anaesthesia or moderate sedation. Elective surgery need not be postponed or canceled in patients who chew gum, suck on sweets or smoke up to the time of the surgery. They have little or no effect on gastric volume and pH.<sup>27,28,29</sup>

### E. ROLE OF PROKINETIC AND ANTIEMETICS IN ADULTS AND CHILDREN

After analysis of international guidelines and existing evidence, there is insufficient evidence in recommending the routine administration of prokinetics, or acid suppression drugs for patients other than in obstetrics.<sup>30</sup>

There are several randomized controlled trials (RCT) on the use of metoclopramide in reducing gastric fluid volume with some studies showing reduction in gastric volumes but no studies on the impact on aspiration or reducing severity of aspiration.<sup>31,32</sup> As such, routine use of metoclopramide is not recommended for aspiration prophylaxis in the non-high risk patient.

A meta-analysis has shown the superiority of premedication with ranitidine over proton pump inhibitors (PPIs) in suppressing gastric acid pH and reducing gastric volume.<sup>33</sup> However, there is no conclusive evidence that routine acid suppression in non-high risk patients improve aspiration outcomes.<sup>34</sup> Therefore, it is not recommended to routinely suppress gastric acid production in the non-obstetric group.

### F. RESTRICTIONS OF DRINKS AND SOLID FOOD IN PREGNANT WOMEN

#### (1) Fasting of Food and Drinks in Pregnant Women

Women in labour should be allowed clear fluids as they wish but solid food should be avoided.

Pregnant women can continue to drink clear fluids until up to 2 hours prior to elective surgery under regional or general anaesthesia.

A light meal or nonhuman milk may be ingested for up to 6 hours before elective procedures requiring general anaesthesia, regional anaesthesia, or moderate sedation. Additional fasting time (e.g. 8 or more hours) may be needed in cases of patient intake of fried foods, fatty foods, or meat.

## (2) Prophylaxis Against Pulmonary Aspiration

A H<sub>2</sub>-receptor antagonist should be given the night before, as well as on the morning of an elective caesarean section.

Intravenous H<sub>2</sub>-receptor antagonist should be given prior to emergency caesarean section. If general anaesthesia is planned 30 ml of 0.3 mol l<sup>-1</sup> sodium citrate should also be given.

The risk of failed intubation can be as high as 11 times greater in pregnant patients compared to non-pregnant patients.<sup>35</sup> Aspiration pneumonitis can occur when there is a difficult or failed intubation during the induction of general anaesthesia. Although pregnant women do not have increase gastric secretions or delayed gastric emptying time throughout pregnancy, the higher incidence of oesophageal gastric reflux and difficult or failed intubation would warrant antacid prophylaxis for the obstetric patient coming for any form of surgery.

Intravenous H<sub>2</sub>-receptor antagonists when administered to fasting patients, decrease gastric acid production resulting in a small reduction in gastric volume. The onset time can be as short as 30 min with peak effect at 60-90 min. The gastric pH is greater than 2.5 within 1 hour of administration of ranitidine.<sup>36,37</sup> When used prior to emergency caesarean section intravenous H<sub>2</sub>-receptor antagonists and proton pump inhibitors are equally effective when given together with sodium citrate.<sup>38</sup>

Pregnant women at term are at higher risk of aspiration due to an incompetent lower oesophageal sphincter. This results from the alteration in the anatomical relationship of the oesophagus to the diaphragm and stomach, relaxation of the sphincter smooth muscle due to progesterone and an increase in intra gastric pressure from the enlarged uterus.<sup>39</sup> Gastric acid secretion is essentially unchanged during pregnancy.<sup>40</sup>

The rate of gastric emptying does not change much during pregnancy. It is normal in early labour but prolongs as labour progresses.<sup>41</sup> This could be further delayed by opioid boluses given in parenteral, epidural or intrathecal route especially if the epidural dose of fentanyl exceeds 100 mcg.<sup>42,43,44,45</sup>

## (3) Eating and drinking after caesarean section

There is no evidence to support the restriction of oral fluids or food following uncomplicated caesarean section.<sup>46</sup> Clear fluids can be commenced as early as 30 min after caesarean section under regional anaesthesia. Fluids are well tolerated and have allowed earlier ambulation and breast feeding. However early solid intake is associated with higher incidence of nausea although this was self-limiting.<sup>47</sup> Early

oral hydration should be encouraged while solid food should be introduced with more caution.

## **G. RESTRICTIONS OF DRINKS AND SOLID FOOD IN INFANTS AND CHILDREN**

Preoperative fasting is important in children to minimise the risk of pulmonary aspiration. In young children especially in the infant and neonate, excessive fasting can result in dehydration, hypoglycaemia, distress and discomfort. As in adults, more stringent guidelines may be required when there is trauma, gastro-oesophageal reflux, airway intervention or other factors increasing the risk of pulmonary aspiration.<sup>48, 49</sup>

### **(1) Clear Fluids**

Children should be encouraged to drink clear fluids (e.g. water, glucose or pulp free juice) up to 2 hours prior to elective surgery.<sup>50,51</sup>

### **(2) Milk**

Infants can be fed breast milk up to 4 hours, prior to elective surgery.

Some local institutions vary their policy for non-human milk. It can be completed up to 4 h before anaesthesia in infants under 4 months old and up to 6 hours for those who are older.

### **(3) Clear Fluids**

Fasting induces catabolism and increases the risk of dehydration hypoglycemia. Children who have prolonged fast experience thirst, hunger, anxiety and may be less well behaved prior to surgery.

Pulmonary aspiration is rare in children. A recent observational study of severe critical events in paediatric anaesthesia found an incidence of only 0.09%.<sup>52</sup> This study included both unfasted emergency and elective procedures in children. The traditional 2 hours clear fluid fasting rule was based on historical data in adults and may not be applicable to children.

With a regime which allow children to have unrestricted clear fluids prior to being called to the operating theatre for elective procedures, the incidence was reported to be 3 in 10 000.<sup>53</sup> In the 3 cases of aspiration, none needed to be cancelled, admitted to intensive care or died. The children on this unrestricted regime were fasted for an average of 1.7 hours before induction of anaesthesia and none were anaesthetized within 30 min of their last drink.

A recent consensus statement issued by The Association of Paediatric Anaesthetists of Great Britain and Ireland, the European Society for Paediatric Anaesthesiology, and The L'Association Des Anesthesistes-Reanimateurs Pediatriques d'Expression Francaise recommended that all children should be encouraged to take clear fluids up to 1 hour prior to elective surgery.<sup>54</sup> They could be allowed to drink 3 ml/kg of clear fluid according to their predicted weight.

#### **(4) Formula and Breast Milk**

There is insufficient evidence to correlate the incidence of pulmonary aspiration to the timing of ingestion of breast milk. The evidence with respect to gastric volume and pH is inconclusive.<sup>55</sup>

Infant formula milk and cow's milk empty less rapidly than breast milk, with cow's milk being the slowest as they separate into solid when in contact with an acid environment.<sup>56</sup> The constituents of infant formula feed (casein or whey predominant feed) affect emptying rates and there may be variability in the composition of different formula preparations.

Recommendations for preoperative fasting of infant formula milk and non-human milk vary widely with respect to the child's age, duration of fasting and practice guidelines. There is insufficient literature to determine gastric volume, gastric pH and incidence of pulmonary aspiration to the timing of ingestion of non-human milk. The recommendations for 4 or 6 hour duration of fasting differ between institutions and for infants of varying age. Scandinavian guidelines recommended a 4 hour fast for breast milk and formula milk for infants less than 6 months old.<sup>57</sup> Both the European and ASA guidelines recommend a 4 hour fast for breast milk and 6 hours for infant formulas. Some local institutions have made a variation of this guideline. Formula milk can be completed up to 4 hours before anaesthesia in infants under 4 months old and up to 6 hours for those older.

## **H. SPECIAL GROUPS**

### **(1) Enhanced Recovery after Surgery (ERAS) and Carbohydrate Drinks**

Patients enrolled into ERAS programs can be allowed to ingest oral carbohydrate pre-load (mainly maltodextrins), up to 2 hours before elective surgery.

Current ERAS regimens vary. Commonly, patient are given 800 ml of carbohydrate drink containing 100g carbohydrate, the night before or 12 hours before surgery. The next drink is 400ml containing 50g carbohydrate, 2 hours before surgery.<sup>58</sup> This will prevent dehydration from fasting and also provide the calories to reduce the catabolic state and hyperglycemia after surgery.<sup>59</sup>

Major surgery tends to disrupt metabolic homeostasis and causes insulin resistance. Patients will benefit from administration of oral carbohydrate solutions as they raises insulin sensitivity by 50%. This effect is carried through to the postoperative period.<sup>60</sup>

Oral carbohydrate preload should not be administered to patients with delayed gastric emptying or GI motility disorders. Although gastric emptying has been previously reported to be normal in obese patients and diabetics, these studies were too small and incomplete to allow routine recommendation of this intervention. No recommendations can be given for the use of oral carbohydrate preload in diabetic patients at this point in time.<sup>61</sup>

## **(2) Diabetics**

Delayed gastric emptying is common among patients with diabetes due to autonomic neuropathy. Patients with gastroparesis may benefit from a longer fasting period.

## **(3) Trauma and Emergency Surgery**

Patients with trauma usually have delayed gastric emptying. In these patients, fasting cannot reliably prevent aspiration of gastric contents. The volume of the gastric content is dependent on the nature of the trauma and the interval between the last meal and the time of trauma.<sup>62</sup> Ultrasound evidence demonstrated that 56% of adult emergency cases have full stomach despite fasting (median 18 hours; interquartile range 11-24).<sup>63</sup>

Prokinetics have not been recommended for use in trauma or emergency situation. However, there is some evidence that erythromycin could increase the proportion of a clear stomach among patients undergoing general anaesthesia for emergency surgery.<sup>64</sup> Gastric tubes have been used to drain the stomach but does not ensure that it will be empty. Preoperative insertion of a gastric tube can be associated with complications and is recommended only for patients with bowel obstruction.<sup>65</sup>

## **I. RESUMPTION OF FEEDING AFTER ELECTIVE SURGERY**

After elective surgery, adults and children should be allowed to resume drinking as soon as they desire. Ambulatory or day surgery centres need not insist on prerequisite fluid intake before allowing discharge.

The benefits of early postoperative feeding have been clearly demonstrated in colorectal surgery. Oral nutritional intake can be continued after surgery without interruption in most patients. Patients who are awake and not nauseous postop can usually have an oral diet within 4 hours after surgery.<sup>61</sup> Early oral feeding reduces

ileus.<sup>66</sup> The oral intake can be adapted according to individual tolerance and to the type of surgery carried out.<sup>67</sup>

A Cochrane review also found no evidence to justify a policy of withholding oral fluids or food after uncomplicated caesarean section.<sup>68</sup> Early diet resumption proved beneficial even after complicated caesarean delivery, where ileus was not increased in patients with previous abdominal operations with moderate adhesions.<sup>69</sup>

## **J. CAUTION**

These guidelines provide recommendation for fasting times only in healthy patients going for elective procedures requiring general anaesthesia or moderate sedation. They have not addressed other risk factors. The anaesthesiologist must consider the risk of aspiration in each patient when deciding the appropriate anaesthetic technique. They may not be appropriate for every clinical situation and deviations can be expected based on the physician's assessment of the patient (e.g. patients with delayed gastric emptying or patients with known or suspected difficult airway). It is hoped that these guidelines will also be useful to hospital administrators and clinical leaders in determining policies relating to peri-operative fasting and its medico legal implications.

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