GUIDELINES ON PREOPERATIVE FASTING

Revised 2008

COLLEGE OF ANAESTHESIOLOGISTS
ACADEMY OF MEDICINE OF MALAYSIA

In collaboration with

MALAYSIAN SOCIETY OF ANAESTHESIOLOGISTS

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1. Introduction and History

On a landmark paper in 1946, Mendelson[1] described 66 cases of aspiration of stomach contents into the lungs. In 45 cases, the aspirated materials were recorded: 40 were liquid resulting in chest radiograph changes but no deaths; 5 inhaled solid material and died. He then injected human acid vomitus into rabbit trachea and caused the same radiograph changes. However, when the vomitus was neutralized, the radiograph changes did not occur. Solids caused obstruction with atelectasis or suffocation. As a result Mendelson offered the following advice: "No oral feeding during labour – i.v. fluids should be given; wider use of regional anesthesia; alkalinisation and emptying of stomach before general anesthesia; competent administration of general anesthesia with full appreciation of the danger of aspiration during induction and recovery; and the use of tracheal intubation."

In 1993, Warner et al[2] reviewed 67 cases of aspiration that occurred in 172,334 consecutive adult patients receiving general anaesthesia between 1985-1991. Poor physiological states and emergency surgery were associated with a greater risk of aspiration. The majority occurred during direct laryngoscopy and tracheal intubation.

Mortality after aspiration of gastric contents ranges from 3-70%[1,3,4,5]. Morbidity includes bronchospasm, hypoxia, pneumonitis and lung abscess.

Patients have been defined as at risk if they have a residual gastric fluid volume which exceeds 0.4 *mL/kg with a pH below 2.5 units* at the time of the aspiration. These risk factors were extrapolated from unpublished data obtained in a study of rhesus monkeys where an aliquot of acidic fluid was instilled directly into the right bronchus of the subject[6]. A subsequent study in the same model showed that a minimum of 0.8 *mL/kg of acidified gastric fluid was required to produce pneumonia resulting in mortality*[7]. Both volumes represent the amount of fluid instilled into the lung, and not the fluid contained in the stomach.

In order to prevent these possible complications, patients are usually fasted prior to anaesthesia to allow sufficient time for gastric emptying of ingested food and fluid.

2. Patients at Risk of Aspiration

From the preceding comments, we can conclude that patients with significant amounts of solid food present in the stomach are at risk of morbidity and mortality from aspiration.

How about the patient with gastric acid? Even adequately fasted patients can have residual gastric acid volume of more than 0.4 mL/kg of pH<2.5[8]. So even adequately fasted patients are not without risk if we do not manage the airway properly Adequate fasting, will however reduce the risk.

Patients who have delayed gastric emptying may have increased gastric contents even after 'adequate' periods of fasting, e.g., trauma patients[9], ingestion of fatty food[10], certain medications[9].

Other patients at increased risk of aspiration include those with hiatus hernia, oesophageal reflux, bowel obstruction, pregnant patients, the morbidly obese, bulbar palsy, etc.

3. Rational and Evidence Based Approach to Preoperative Fasting

For many years anaesthetists have followed the 6 hours fasting rule for preoperative fasting. This has been found to be generally safe except for some patients at higher risk mentioned in section 2.

More recently, it has been found that ingestion of clear fluids up to 2-3 hours before surgery does not increase the volume of gastric fluid[11,12]. Clear fluids include water, glucose drink and non-particulate fruit juices. It has since been proven that it is safe to liberalize our guidelines in otherwise healthy patients. Patients, especially children who are permitted to ingest clear fluids up to 2 hours preoperatively will be less hungry and thirsty, and hence less irritable[12]. This reduces the likelihood of dehydration and hypotension with the induction of anaesthesia. It also reduces the stress on the parents.

Hence demanding a 6 hour fast from clear fluids from our patients is now not considered acceptable[12].

4. Malaysian Guidelines for Preoperative Fasting

The Committee recommends the following:

Age	Substance ingested	Fasting Time
Children	Clear fluids*	2 hours
	Breast Milk	4 hours
	Formula Milk, solids	6 hours
Adults	Clear fluids	2 hours
	Milk, solids	6 hours

*Clear fluids include: water, glucose drink, 'Ribena', cordial drinks, clear fruit juices, black tea

Summary: 'the 2-4-6 rule'[13] :-

- 2 hours clear fluids,
- 4 hours breast milk,
- 6 hours formula milk and solids

Practical Guidelines:-

Cases scheduled for am list:

- no solid food from 12 midnight the night before surgery
- breast milk up to 4 hours before surgery for infants
- clear fluids until 2-3 hours before scheduled time of surgery. This should be encouraged in children to prevent dehydration which can result in increased irritability preoperatively and even hypotension during surgery.
- oral premedications 1-2 hours before surgery with up to 150 ml of water[9,14].

Cases scheduled for pm list:

- light breakfast at 7 am
- clear fluids until 2-3 hours before scheduled time of surgery.

Emergencies:

- in most cases if the operation is a semi-emergency, one should follow the above.
- if the operation cannot wait in view of risk to patient or unborn baby, a regional anaesthetic should be considered where feasible.
- there is often delayed gastric emptying in trauma and patients in labour, and one should be careful even if the patient has fasted for an 'adequate' duration.
- extreme care should be taken in cases with gastric outlet or bowel obstruction, however long their duration of fasting.

5. Acid Aspiration Prophylaxis

This is recommended routinely in pregnant patients and in patients with oesophageal reflux. It is not routinely recommended in other cases[10].

Proton-pump Inhibitor – given in cases where there is increased risk of reflux[15].

H2-antagonists – these reduce both volume and acidity of gastric contents. Give oral ranitidine 150 mg p.o. the night before surgery, repeat on the morning of surgery; i.v. ranitidine 50 mg for emergency cases e.g., Caesarean section.

Antacids reduce acidity but increase gastric volume. Non-particulate antacids are recommended to avoid risk of pneumonitis from aspiration of particulate antacids.
Give sodium citrate 0.3M 30 mL p.o. on arrival at the O.T. (for Caesarean sections).

6. Rationale for the Above Guidelines

2 hours fasting for clear fluids: the ample evidence supporting this is summarized in a Cochrane review[12].

4 hours fasting for breast milk: Assessing gastric emptying by repeated measure of intragastric volume reported that gastric emptying was more rapid when infants were fed with human milk than when they were fed infant formula[16]. Other data showed that three hours after the test meal, 75 percent of infants fed breast milk had entered the fasting state compared with only 17 percent of those ingesting formula[17]. Litman, et al. compared the volume and acidity of residual gastric fluid volume in patients under 1 year of age who were either fed clear liquids or nursed in close proximity to induction of anesthesia[18]. No differences between the clear-liquid and breast-fed groups were demonstrated for either residual volume or pH. The authors tracked the number of infants with a residual gastric fluid volume of >1 mL/kg. Significantly more of the breast-fed infants met this arbitrary criterion, prompting the investigators to terminate the study. Litman recommended that breastfeeding should be terminated 3 hours prior to induction, compared to 2 hours prior for clear liquids.

This study, like those preceding it, suffers from conclusions which are not drawn from the incidence of aspiration pneumonitis, but from the measurable variables of volume and acidity. Are there sufficient data to define the safe fasting interval for breast milk? The incidence of both risk factors were the same for both groups of infants in Litman's study. If one agrees with these studies, it is possible to conclude that infants should be allowed to ingest either clear liquids or breast milk up to 2 hours prior to induction of anaesthesia. Hence, in our Malaysian guidelines published in 1998[19], 3 hours fasting after breast milk was recommended in infants below 6 months.

Considering the small sample size, the present committee feels that a more conservative approach might be to recommend cessation of breastfeeding 4 hours before anaesthesia until more data are available. Once sufficient clinical experience has been accumulated for each fasting interval, it will be possible to determine whether this practice is safe.

However, the failure to show a change in the incidence of aspiration pneumonitis in children allowed clear liquids ad libitum as close as 2 hours prior to induction of anaesthesia suggests that even less restriction in feeding guidelines may be possible. To precisely define the safe duration of fast, it is important not only to focus on gastric volume, but also to pay close attention to the factors known to be related to pneumonitis. In several studies done after the implementation of a 2 hour fast from clear fluids and 4 hours fast from milk, there has been no report of an adverse event resulting from the implementation of more flexible fasting policies[12].

6 hours fasting for formula milk and solid food: there is some controversy in this area, with some recommending 4 hours for formula milk[20], including our original Malaysian guidelines in 1998[19]. Formula milk takes longer to leave the stomach compared to breast milk[17]. There is no absolute definition of what is a solid food. In practical terms, solids are foods that are in a solid state within the stomach. Gelatin is solid before ingestion, but it promptly liquefies in the stomach and is rapidly emptied. *In contrast, cow's milk is a liquid that separates into a liquid phase plus solid phase (curds) after ingestion*. This solid component of milk can take hours to empty from the stomach, which has great clinical significance in paediatric anaesthetic practice.

The committee feels that at present the evidence is equivocal regarding reducing *the fasting time to 4 hours for formula milk in infants*[12,13,20]. Until larger studies are performed, the committee has decided to stick to the traditional recommendation of 6 hours fasting for formula milk. However, the committee recognizes that some paediatric anaesthetists practice a 4 hour fast from formula milk[20] for infants below 6 months, including some in our present committee.

Why not 8 hours fasting for fatty meals, as what is recommended by the ASA[10]? Adult investigations in the non-perioperative setting suggest that full meals require >8 h to empty from the stomach. As such, the ASA recommendation is 8 hours fasting after a full fatty meal[10].

Although increased gastric contents increase the risk of aspiration pneumonia, there is no known gastric fluid volume that places a particular patient at clinically relevant risk or eliminates all risk[9].

In Malaysia and the UK[13], we have traditionally followed a 6-hour fast from solids without much problems. In several Anaesthetic Mortality

and Morbidity Incident Monitoring surveys, pulmonary aspiration has been identified to cause mortality and morbidity[21,22,23]. In most of these, problems with airway management during intubation or extubation, problems with management of the laryngeal mask airway, or inadequate depth of anaesthesia have been identified as being contributory[21,22,23]. In some emergency cases where aspiration had occurred the stomach was known to be full. No mention was made that increasing the duration of preoperative fasting may have helped in any of these cases.

Hence, the committee feels that it is unnecessary to change our current practice of 6 hours fasting for solids unless there is evidence that it is unsafe. We decided to change our fasting guidelines for clear fluids and breast milk because there is good evidence that it is safe to do so. Anaesthetists need to remember however, that a large meal may take more than 8 hours to empty from the stomach.

We need to remind ourselves that even after a prolonged fast, there is enough gastric acid in the stomach in many of our patients (0.4 mL/kg of fluid of pH<2.5) to cause severe aspiration pneumonitis[6,7,8]. Hence, *we have to be careful even in 'adequately' fasted patients*. Also, different people have different gastric emptying times, which also depends on the amount and type of food consumed[9] - it may take >9hours for a full meal to empty from the stomach. Many of us (including the main author's personal experience) know of anecdotal reports of patients vomiting out solids even after an overnight fast. However, the presence of gastric contents does not equate to aspiration. We must handle the airway carefully and with respect even in 'adequately' fasted patients. *Extra care must be taken in high risk cases like pregnant patients, obese patients, patients with reflux, and emergencies when the patient is not adequately fasted. Extreme care must be taken in those with gastric outlet or bowel obstruction even if they have fasted for a prolonged duration*. Tracheal intubation may not always be the answer – in fact in one study the majority of cases of pulmonary aspiration occurred during laryngoscopy and intubation[2]. Regional anaesthesia should be considered where feasible in these patients. If general anaesthesia is indicated, a 'rapid sequence induction' technique with two functioning efficient suckers at hand should be considered. In case intubation fails, a 'Pro-Seal laryngeal mask airway' should be at hand.

7. Quick Reference Guide

APPENDIX A: Guidelines for Preoperative Fasting – Substance Ingested

Age	Substance Ingested	Fasting Time
Children	Clear Fluids* Breast Milk Formula Milk, Solids	2 hours 4 hours 6 hours
Adults	Clear Fluids* Milk, Solids	2 hours 6 hours

*Clear fluids include: water, glucose drink, 'Ribena', cordial drinks, clear fruit juices.

Summary - 'the 2-4-6 rule'13:-

- 2 hours clear fluids,
- 4 hours breast milk,
- 6 hours formula milk and solids

APPENDIX B: Practical Guidelines

Cases on am list	- no solid food from 12 midnight the night before surgery - breast milk up to 4 hours before surgery for infants - clear fluids until 2-3 hours before scheduled time - oral premed 1-2 hours before surgery with up to 150 ml of water9,14
Cases on pm list	- light breakfast at 7 am - clear fluids until 2-3 hours before scheduled time of surgery
Emergencies	- if the operation is a semi-emergency, one should follow the above. - if the operation cannot wait in view of risk to patient or unborn baby, a regional anaesthetic should be considered where feasible. - there is often delayed gastric emptying in trauma and patients in labour, and one should be careful even if the patient has fasted for an 'adequate' duration; extreme care should be taken in cases with gastric outlet or bowel obstruction, however long their duration of fasting.

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