

# Perioperative Fasting and Children: A Review Article

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## ARTICLE INFO ABSTRACT

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This review provides an overview of the present knowledge on the aspects of preoperative fasting with the assessment of the evidence quality. A systematic research was conducted in electronic databases in order to identify trials published between 1990 and 2014 concerning preoperative fasting, early resumption of oral intake and the effects of oral carbohydrate mixtures on gastric emptying and postoperative recovery. The publications were classified in terms of their evidence level, scientific validity and clinical relevance. The key recommendations are that children be encouraged to drink clear fluids within up to 2 hours before elective surgery (including Caesarean section) and all but one member of the guideline groups consider that tea or coffee, with milk added (up to about one fifth of the total volume), are still clear fluids. Furthermore, solid food consumption should be prohibited for up to 6 hours before elective surgery for children. However, patients should not have their operation cancelled or delayed only because they are chewing gums or sucking a boiled sweet immediately prior to the induction of anaesthesia. These recommendations also apply to those patients with obesity, gastro-oesophageal reflux and diabetes. There is insufficient evidence to support the routine use of antacids, metoclopramide or H<sub>2</sub>-receptor antagonists before elective surgery in non-obstetric patients. Infants should be fed before elective surgery. Breast milk is considered a safe option for up to 4 hours and other kinds of milk for up to 6 hours. The present review takes into account the safety and possible benefits of preoperative carbohydrates while offering advice on the postoperative resumption of oral intake.

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## Methods

A review was conducted in the electronic databases Ovid, MEDLINE and Embase so as to identify the trials published between 1990 and late 2014 concerning preoperative fasting, early resumption of oral intake and the effects of oral carbohydrate mixtures on gastric emptying and postoperative recovery.

## Current Status of Knowledge

### 1. Fluid Consumption Recommendations

Children need to be encouraged to drink clear fluids (including water, pulp-free juice and tea or coffee without milk) within up to 2 hours before elective surgery (1-3).

### 2. Solid Food Consumption Recommendations

Solid food should be prohibited for as long as 6 hours before elective surgery for children (4,5).

### 3. Recommendations for Patients with Delayed Gastric Emptying

Patients with obesity, gastro-oesophageal reflux and diabetes can safely follow all the

guidelines mentioned above (6,7). Studies in preoperative fasting have not evaluated such groups of patients adequately enough to provide definitive evidence. However, the evidence which does exist is indicative of certain limitations in gastric emptying which can be noticeably delayed using Opioid Analgesics. Yet again, there is insufficient evidence for making any definitive recommendations (1,2). On the other hand, the patients who have recently taken sufficient Opioids, and thus experienced significant effects on their gastric emptying difficulties, are unlikely to undergo elective surgery as often (7,9).

### 4. Medication Recommendations

There is insufficient evidence of any clinical benefits so as to recommend the daily use of antacids, metoclopramide or H<sub>2</sub>-receptor antagonists before elective surgery (10).

### Prokinetic Medications

In contrast to the prevalence of the perioperative use of prokinetics, there is limited

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evidence to support the prophylactic use of such agents as to reduce the risk of perioperative aspiration of gastric contents (8).

There are single studies which have investigated the effects of prokinetics on gastric pH as well as gastric fluid volume during anaesthesia induction (8).

In their research, Bala et al. (11) compared the combination of ranitidine-erythromycin with ranitidine-metoclopramide. Forty patients were given either erythromycin 250 mg and ranitidine 150 mg or ranitidine 150 mg and metoclopramide 10 mg orally within 60–90 minutes before the induction of anaesthesia. There was no significant difference in either gastric pH or fluid volume (11).

So far, there is insufficient evidence that preoperatively administered metoclopramide independently improves the clinical outcome, reduces gastric fluid volume or increases gastric pH (12).

#### **Histamine-H2 antagonists and proton pump inhibitors**

A recent meta-analysis, (13) which compares these medications with therapeutic targets, suggests that pre-medicating with ranitidine is more effective than prepulse inhibitions (PPIs) in reducing the volume of gastric secretions as well as increasing gastric pH (13).

#### **Preoperative carbohydrates**

*Gastric emptying and potential benefits recommendations:* It is considered safer for patients (including diabetics) to drink carbohydrate-rich drinks within 2 hours before elective surgery (12).

The evidence for safety is derived from the studies of products specifically developed for perioperative use (predominantly maltodextrins); not all carbohydrates are necessarily safe (12).

Allowing patients to drink clear fluids within 2 hours prior to surgery is not likely to produce any major changes in the metabolism, as these kinds of beverages do not often contain sufficient energy. The best known method for changing the metabolism from the overnight fasted state to that of a fed state is the use of carbohydrates. The key change required to be achieved is a prompt insulin response, preferably to an extent similar to the one observed after the intake of a meal (14).

#### **5. Carbohydrates versus Clear Liquids or Intravenous Infusion**

In their study, Taniguchi et al. (15) investigated the safety and efficiency of oral rehydration in comparison with intravenous rehydration prior to general anaesthesia. Fifty patients were randomised to either oral rehydration solution or the same volume of an intravenous electrolyte solution. The volume of gastric content, as measured directly after induction, was significantly lower in the oral rehydration group (15).

In another experiment, Kaska et al. performed a randomised controlled trial comparing preoperative fasting with preoperative preparation with either oral or intravenous intake of carbohydrates, minerals and water (16). Oral intake shortly before surgery did not increase gastric residual volume and was not associated with any additional risks.

#### **6. Recommendations for perioperative fasting in children and infants**

Children should be encouraged to drink clear fluids (including water, pulp-free juice and tea or coffee without milk) within 2 hours before elective surgery (12).

For another thing, infants ought to be fed before elective surgery. Breast milk is regarded as the safest option up until 4 hours and other kinds of milk for up to 6 hours.

The results are based on the reviews and guidelines which were published during the late 90s and more recently (17,18,19,20,21–24). Fasting, for the most part, aims at decreasing the risk of pulmonary aspiration. However, the incidence rate of such complications has proven to be rather low in the recent series. Despite the fact that the risk of aspiration appears to be slightly greater in children than in adults, (25) the difference is less significant than what was previously reported. Almost all recent surveys indicate relatively good outcomes of such an event in the paediatric population compared with previous studies (12).

There is a lot of evidence declaring that clear fluids can be given within 2 hours prior to surgery in neonates, infants and children. In neonates and infants, gastric emptying of clear fluids follows first-order kinetics as it does in older children and adults (26). Allowing clear fluids prior to surgery establishes the comfort of the child and the

parents, decreases the thirst and diminishes the risk of preoperative dehydration in young infants (27). The amount of fluids permitted in the preoperative period does not appear to have an impact on the intragastric volume or the pH level of children (17). This also applies to the overweight and obese children (28).

### **Breast milk and infant formula**

The fasting time for breast milk and infant formula is slightly more controversial. It was demonstrated more than 25 years ago that the gastric emptying of 110–200 ml of human milk was 82 ± 11% after 2 hours in neonates and infants of younger than 1 year of age, 84 ± 21% after whey-hydrosylated formula, 74 ± 19% after whey-predominant formula, 61 ± 17% after casein-predominant formula and 45 ± 19% after cow milk (29). Consequently, human milk and whey-predominant formula emptied faster than casein-predominant formula and cow milk. Two other studies performed before anaesthesia also claimed that breast milk empties from the stomach faster than most formulas in infants and they both require more than 2 hours to ensure complete gastric emptying (26,30). According to these data, the American guidelines recommended 4 hours of fasting time for breast milk and 6 hours for infant formula and non-human milk (19). These recommendations were also endorsed by the Royal College of Nursing which implied that there was insufficient evidence to change the contemporary practice (i.e. breast milk within 4 hours and formula and cow milk within 6 hours) (18). Scandinavian guidelines recommended 4 hours of fasting for breast milk but also for formula milk in infants of younger than 6 months of age (1). Thus, it is advisable to finish breast feeding within 4 hours before anaesthesia and to stop infant formula 4–6 hours prior to anaesthesia depending on the age and the local considerations. Both cow milk and powdered milk are considered as solid food (12).

### **Solid Food**

Recommendations for solid food fasting in children do not differ from those proposed for healthy adults. There is no evidence against such recommendations.

### **Trauma**

Data on fasting in injured children are

minimal. One study suggested that the amount of gastric content could depend on the nature of the trauma. Nevertheless, gastric content was not associated with the length of fasting (31). Gastric volume was better linked to the interval between the last meal and the trauma. Therefore, the injured child should be considered as a patient with a full stomach. However, an increasing number of minor surgical procedures are done under sedation in the emergency department. The available literature does not provide sufficient evidence to conclude that pre-procedure fasting results in a decreased incidence of adverse outcomes in children undergoing either moderate or deep sedation (32, 33).

### **Postoperative Fluids**

Oral fluid intake is usually allowed within the first 3 postoperative hours in most paediatric patients. Early oral fluid intake was previously required in most institutions before discharging the patient from hospital. This view was challenged as it has been reported that withholding oral fluids postoperatively from children undergoing day surgery reduces the incidence of vomiting (34, 35). However, the most recent studies did not find that postoperative fasting reduces the incidence of vomiting after general anaesthesia in children when compared with a liberal regimen (36). As a result, it seems reasonable to let children eat and drink according to their own desires, but not to insist on oral intake before discharge.

### **Summary of Recommendations**

*Fasting in children:* Children should be encouraged to drink clear fluids (including water, pulp-free juice and tea or coffee without milk) within 2 hours before elective surgery.

Solid food should be prohibited for up to 6 hours before elective surgery in children. However, infants should be fed before elective surgery. Breast milk is considered to be a safe option within up to 4 hours and other kinds of milk for up to 6 hours.

### **Prokinetic and other pharmacological interventions**

There is insufficient evidence of clinical benefit to support the daily use of antacids, metoclopramide or H<sub>2</sub>-receptor antagonists

before elective surgery.

### Oral carbohydrates

It is safer for patients (including diabetics) to drink carbohydrate-rich beverages within 2 hours before elective surgery.

The evidence for safety is derived from the studies of products specifically developed for perioperative use (predominantly maltodextrins); not all carbohydrates are necessarily regarded to be safe. Drinking carbohydrate-rich fluids before elective surgery improves subjective well being, reduces thirst and hunger as well as postoperative insulin resistance.

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