
What evidence exists that describes what adult patients can drink up to 2 hours before their scheduled surgery and is shown to be safe and prevent complications?

This report aims to summarize the best available evidence around preoperative fasting practices in adults undergoing elective/scheduled surgery, specifically in regards to safety and improved patient outcomes in the perioperative period. This information is to support a new protocol being introduced at the Clinical Practice Review Committee at the MUHC.

Key Messages:

- The traditional practice that recommends patients fast from solids and fluids from midnight before surgery (NPO from midnight) is considered overzealous and can cause serious risks to the patient including discomfort, nausea, vomiting, fluid volume depletion, hypotension, malnutrition, glycemic derangements and electrolyte imbalance.
- The current recommended practice for the minimum duration of preoperative fasting is 2 hours after clear fluids or six hours after a light meal, and eight hours after a meal that includes meat, fried or fatty foods.
- The current, best available evidence for the shortened fasting times is considered safe and does not increase the risk of aspiration while under anesthesia.
- Oral carbohydrate drinks administered preoperatively is considered safe as per the best available evidence, in that it does not pose an increased risk of aspiration during surgery. However:
 - There is weak evidence to suggest that preoperative oral carbohydrates contribute to the adult patient's well-being (improving nausea, vomiting, thirst, dehydration etc...prior to surgery).
 - There is weak and sometimes contradictory evidence that preoperative oral carbohydrates will improve insulin resistance following surgery.
 - Preoperative oral carbohydrates has been shown to minimally decrease length of hospital stay following surgery, but the evidence is less robust.
 - Little to no evidence was found regarding the safety or outcomes of preoperative carbohydrate loading in patients with diabetes or delayed gastric emptying, or other high risk groups.
- The de-implementation of the 'NPO from midnight' rule continues to be challenging in practice. Patient and staff education, as well as flexible fasting policies are strategies suggested in the best available evidence to improve the implementation of the current standards.

Who is this summary for?

This summary was requested by Denis Gaumond, Co-chair Clinical Practice Review Committee, at the MUHC.

Information about this summary:

This report covers a broad collection of literature and evidence sources with a search emphasis on systematic reviews.

This summary includes:

Key findings from a broad collection of recently published literature (mainly 2014) and evidence sources.

This summary does not include:

Recommendations, additional information, or detailed description of the interventions in the studies.

1. Background:

Restricting oral intake of patients undergoing elective surgery to prevent an increase in gastric volume and decrease in gastric pH is a longstanding practice that aims to reduce the risk of aspiration during anesthesia. Traditionally, the practice of no food or fluid intake from midnight (NPO from midnight) before a scheduled surgery has been shown to cause more complications to the patient awaiting surgery, including dehydration, discomfort, confusion, nausea and vomiting and possibly higher risk of aspiration due to an increase in gastric fluid volume. In practice, this is exaggerated as the start times of surgery is often delayed resulting in patients being NPO for more than 8 hours. In addition, the metabolic response to the surgery itself is characterized by endogenous insulin resistance, which could delay patient recovery and be associated with infectious complications and morbidity.

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The American Society of Anesthesiologists (ASA) issued new standards in 1999 to reduce the preoperative fasting times, known as the 2-4-6-8 rule: clear fluids and breast milk can be ingested 2 and 4 hours prior to surgery, respectively, and cow's milk, a light breakfast and fatty foods can be ingested 6-8 hours before surgery, respectively. The Enhanced Recovery After Surgery (ERAS) Pathway also recommends preoperative carbohydrate loading to further mitigate preoperative complications and postoperative insulin resistance and delayed recovery.

This rapid review will present summaries of the best available evidence with regards to preoperative oral intake and specifically around preoperative oral carbohydrate treatment in adult patients undergoing scheduled surgery. Detailed search strategies were developed by an experienced librarian (specific search terms are available upon request). Sources: Medline via OvidSP, Embase via OvidSP, Joanna Briggs Institute via OvidSP and CINAHL Complete via EbscoHost. Search concepts included Subject Headings and text words. Search date: October 7th, 2014.

The population included in this rapid review were adults (over 18) who were undergoing a scheduled elective surgery, and most were categorized in ASA I-II groups. No studies regarding high risk patients (diabetic patients or patients with delayed gastric emptying) were found.

It is important to note that systematic reviews were found to help answer the question for this review. Therefore, since they are considered to contain all available evidence up until the point of publication, this rapid review will report on studies published in 2014 to complement the conclusions of the systematic reviews.

Duplicates and out of scope articles were discarded by the librarian. The analysis of studies and the report were prepared by the Evidence-informed decision making advisor.

The studies that are reviewed are of low to moderate quality. Many of the articles that were identified in the initial search are not summarized here due to very poor quality. A list of all the articles found and reviewed is available upon request (sonia.castiglione@muhc.mcgill.ca).

Levels of Evidence (adapted from OHRI KTA Evidence Summary document)

Each piece of evidence presented in this summary is assigned a level.

This assignment is based on the evidence being presented and not on the claim made by the authors.

- ☀ **Platinum:** systematic reviews and meta-analysis
- ✳ **Gold:** Randomized controlled trials
- ★ **Silver:** Observational studies (non-randomized trials, case-control, time-series, cohort studies, case series, literature reviews, qualitative studies.
- ☆ **Bronze:** Expert committee guidelines, reports or opinions, commentary or editorials.
- **Level of evidence** cannot be determined.

2. Summary of Findings:

a. Best available evidence on safe perioperative fasting practices.

☀ A 2003 Cochrane systematic review examined 38 randomized controlled comparison studies in relation to different preoperative fasting regiments (duration, type and volume of permitted intake) in and perioperative complications and patient well-being. The findings, based on “healthy” adult participants (those with low risk of regurgitation or aspiration during anesthesia) confirmed that there was no evidence that a shortened fluid fasting regiment increased the risk of aspiration or regurgitation. In fact, participants who were invited to drink water had lower gastric volumes than groups that followed a standard fast of NPO from midnight. As well, there was no difference in participants’ gastric volume or pH with a shortened fast compared to a standard fast. The authors encourage clinicians to “adjust any remaining standard fasting policies [NPO from midnight] for patients that are not considered ‘at-risk’ during anesthesia.” [1]

✳ A 2014 randomized crossover design study wanted to establish the safety of adding a modest amount of milk to tea when following current preoperative fasting guidelines. With 10 healthy volunteers, gastric emptying was found to be similar with those who consumed black tea versus tea with milk. Due to the small number in the sample, and that these participants were not undergoing surgery, it becomes difficult to generalize the results and therefore must be interpreted as a preliminary study. [2]

✳ A 2014 randomized double blind crossover study evaluated the time course changes in gastric fluid volume (GFV) and the carbohydrate loading efficiency (using blood glucose levels) or either Oral rehydration solution (ORS) and arginine containing oral nutritional supplement (ONS) in 10 healthy adult male participants. The ORS solution showed faster gastric emptying using MRI than the ONS, whereas the ONS showed sustained blood glucose increase and did not reach a GFV of less than 1ml/kg after 120 minutes. The authors conclude that the “use of preoperative oral fluids supplemented with glucose and protein should be tailored to each patient’s specific needs.” [3]

★ A 2014 Joanna Briggs Institute Evidence Summary of the best available evidence provides a strong recommendation (Grade A) that the minimum duration of pre-operative fasting should be 2 hours after clear fluids or six hours after a light meal and eight hours after a meal that includes meat, fried or fatty foods. [4]

★ ✳ Many recent literature reviews and opinion papers advocate for the implementation of reduced fasting times (2 hours prior to surgery) as best practice. They discuss that the new standards are safe and can in fact reduce the risk of aspiration versus the traditional ‘NPO from midnight’ rule. [5-7]

★ A 2014 literature review discusses preoperative carbohydrate loading as one of the factors in the ERAS protocol that can improve the patients’ health during the perioperative period. The author concludes that this intervention is a low cost and simple approach that may improve insulin resistance and prevention of preoperative hypothermia. [8]

b. Safety of Preoperative oral carbohydrate treatment.

☀ A 2014 U.K. systematic review (without meta-analysis) reviewed as a secondary outcome, the effect of preoperative carbohydrate loading on gastric emptying and gastric acidity. Five studies reported no difference on time to gastric emptying between the groups that received placebo or fasting from midnight or intravenous glucose and carbohydrate loading. Three studies found no difference in the effect on gastric pH following a preoperative carbohydrate drink with placebo or intravenous glucose or fasting. Only one study was found and concluded that preoperative oral carbohydrate loading in diabetic patients is probably safe. The authors conclude that “the practice of providing oral carbohydrate drinks before surgery is probably safe as it leaves the stomach in 90 minutes and does not affect gastric acidity.”[9]

★ A 2014 Joanna Briggs Institute Evidence Summary weakly recommends (Grade B) the preoperative administration of oral carbohydrates. The best available evidence that was summarized was of lower quality and was heterogeneous and therefore they caution that clinician judgment is recommended when this approach is considered. [10]

c. Preoperative oral carbohydrate treatment and patient well-being

☀ A 2014 U.K. systematic review (without meta-analysis) reviewed eight studies examining the impact of carbohydrate loading on patient wellbeing, as a secondary outcome. In these studies, thirst, hunger, anxiety, depression, pain, tiredness, weakness, inability to concentrate, mouth dryness and nausea were

measured using the visual analogue scale (7 studies), modified Beck questionnaire (1 study) and assessment by nursing staff (1 study). They reported that overall, the studies showed an improvement in patient well-being, specifically with regards to thirst, hunger, anxiety and tiredness with oral carbohydrates compared to placebo or fasting. One study demonstrated a significant decrease in postoperative nausea and vomiting with carbohydrate loading compared to the fasting group. Three studies did not show any effect of carbohydrate loading on patient well-being. [9]

d. *Preoperative oral carbohydrate loading and insulin resistance.*

☼ A 2014 U.K. systematic review (without meta-analysis) reviewed as their main outcome, the effect of preoperative carbohydrate loading on insulin resistance involving adults undergoing a general surgical operation. 6 studies demonstrated a significant reduction in insulin resistance with preoperative oral carbohydrate loading using varied methods and times for measurement. Though the review demonstrated some limitations, such as narrowed search scope and limited information about the population and intervention of carbohydrate loading employed by the studies, the authors concluded that preoperative carbohydrate loading will have a positive influence on the counteracting insulin resistance as part of the postoperative surgical outcome. [9]

✳ A 2014 double-blind randomized controlled trial investigated the relationship between insulin sensitivity and beta cell function (insulin response) before and after elective hip replacement surgery in 23 adult non-diabetic participants randomized to preoperative carbohydrate fluid or tap water. It was found that the preoperative carbohydrate drink did not improve the insulin resistance evoked by the surgery. The authors concluded that this was in line with other similar studies using consistent methods (IVGTT to assess beta function and hyperinsulinaemic glucose clamp to measure insulin sensitivity.) [11]

e. *Preoperative oral carbohydrate treatment and length of stay*

☼ A 2014 Cochrane systematic review with meta-analysis was performed and included 19 trials for a total of 1351 participants to determine the association between preoperative oral carbohydrate treatment and postoperative length of stay. It found that preoperative carbohydrate treatment was associated with a small reduction in postoperative length of stay, between 0.4-0.56 days sooner compared with placebo or fasting in adults undergoing elective surgery. The authors also found that preoperative carbohydrate treatment did not differ in postoperative complication rates compared with placebo or fasting. The authors mention that the quality of the reviewed evidence was low to moderate, and therefore needs to be considered when making clinical decisions. [12]

✳ A 2014 single site, parallel group, randomized controlled trial investigated whether consuming preoperative carbohydrate fluid resulted in significantly shorter time to readiness for discharge compared with usual care. This was measured by recording the time to when patients achieved certain milestones (time until first flatus and/or bowel movement, eating 75% of diet etc...). The results showed that there was no significant difference in the mean time to readiness for discharge, 4.3 days for the carbohydrate group versus 4.1 days for the treatment group. However, this result may be financially and clinically significant. The authors conclude that the practice of preoperative carbohydrate loading is safe but unable to confirm if it has an effect on lowering postoperative hospital stays. [13]

f. Preoperative oral carbohydrate treatment and nutritional status

☼ A 2014 U.K. systematic review (without meta-analysis) as a secondary outcome, reviewed the effect of preoperative carbohydrate loading on the postoperative nutritional status of the patient. 5 studies demonstrated unclear results of the impact. [9]

★ A 2014 literature review discussed strategies for preoperative nutrition optimization. The authors conclude that preoperative oral carbohydrate treatment may work to shift patients from the fasting to fed state to promote postoperative healing, possibly with severely malnourished patients. [14]

g. Perioperative fasting practices and implementation implications

★ A 2014 survey investigated the extent to which best practice guidelines around updated preoperative fasting practices are currently being followed in the Royal Infirmary of Edinburgh and to identify potential areas of improvement. 292 patients were surveyed and found that the historical practice of 'nil by mouth after midnight' was slow to change where patients reported fasting considerably longer than the standard set by the current preoperative guidelines (i.e. 2 hours). The authors recommend that staff and patient education on under and over fasting is critical as is the development of supportive documents (verbal and written) and that instructions to patients should be flexible and made according to the timing of surgery and patient medical history. [15]

★ In 2014, 73 nurses and physicians from surgical clinics in a Turkish hospital were surveyed on their practices of applying the APA's 2-4-6-8 fasting rule. At this institution, it was found that the nurses and physicians reported keeping their patients fasting much longer than the suggested current standards. They recommend the generation of hospital policies on preoperative fasting. [16]

★ A 2014 Joanna Briggs Institute Evidence Summary, strongly recommends (Grade A) that fasting policies should be flexible to allow for varying ages and pre-existing medical conditions, and (Grade B) for various types of surgery. They also recommend that staff be educated around reduced fasting times, and that patients need education of fasting requirements to be provided sufficiently in advance of the procedure. [4]

☆ A 2014 U.K. report was published on the successful implementation of a policy that allows for preoperative sugary drinks with a shortened fast in women awaiting caesarean section (CS). The implementation was facilitated by multidisciplinary briefings at the start of the day and at intervals throughout the day to prioritize the surgical list. The authors report that at no time has "a need ever risen to delay a CS to allow two hours to elapse after completion of two interceding operations." [17]

3. Additional sources:

● A power point presentation, authored by MGH Surgeon, Dr. Franco Carli (date unclear) was found locally and can be helpful in summarizing the evidence around preoperative fasting practices and carbohydrate loading.

- A written patient education sheet (dated in 2014) was created at the MUHC, as part of the ERAS protocol, and provides guidelines for patients fasting from solids and fluids prior to scheduled surgery and recommendations for preoperative carbohydrate drinks.

4. References:

1. Brady, M.C., et al., *Preoperative fasting for adults to prevent perioperative complications*. Cochrane Database Syst Rev, 2003. **4**.
2. Hillyard, S., et al., *Does adding milk to tea delay gastric emptying?* British Journal of Anaesthesia, 2014. **112**(1): p. 66-71.
3. Nakamura, M., et al., *The effects on gastric emptying and carbohydrate loading of an oral nutritional supplement and an oral rehydration solution: a crossover study with magnetic resonance imaging*. Anesthesia & Analgesia, 2014. **118**(6): p. 1268-73.
4. Pamaiahgari, P., *Preoperative Fasting in Adults: Clinician Information*, in *Evidence Summaries*. 2014.
5. Liddle, C., *Nil by mouth: best practice and patient education*. Nursing Times, 2014. **110**(26): p. 12-14.
6. Pimenta, G.P. and J.E. de Aguilar-Nascimento, *Prolonged preoperative fasting in elective surgical patients: why should we reduce it?* Nutrition in Clinical Practice, 2014. **29**(1): p. 22-8.
7. Sprogis, S., *Recommended fasting practices for adult, low risk patients prior to elective procedures requiring general anaesthesia*. Australian Nursing & Midwifery Journal, 2014. **21**(7): p. 28-31.
8. Yatabe, T., T. Tamura, and M. Yokoyama, *Effect of preoperative carbohydrate loading on the management of blood glucose and body temperature*. Journal of Anesthesia, 2014. **28**(1): p. 148-51.
9. Bilku, D.K., et al., *Role of preoperative carbohydrate loading: a systematic review*. Annals of the Royal College of Surgeons of England, 2014. **96**(1): p. 15-22.
10. Fong, E., *Elective Surgery: Preoperative Carbohydrate Loading*, in *Evidence Summaries*. 2014.
11. Ljunggren, S., R.G. Hahn, and T. Nystrom, *Insulin sensitivity and beta-cell function after carbohydrate oral loading in hip replacement surgery: A double-blind, randomised controlled clinical trial*. Clinical Nutrition, 2014. **33**(3): p. 392-398.
12. Smith, M.D., et al., *Preoperative carbohydrate treatment for enhancing recovery after elective surgery*. Cochrane Database Syst Rev, 2014. **8**: p. Cd009161.
13. Webster, J., et al., *Does preoperative oral carbohydrate reduce hospital stay? A randomized trial*. AORN Journal, 2014. **99**(2): p. 233-42.
14. Evans, D.C., et al., *Nutrition optimization prior to surgery*. Nutrition in Clinical Practice, 2014. **29**(1): p. 10-21.
15. Falconer, R., et al., *Preoperative fasting: current practice and areas for improvement*. Updates in Surgery, 2014. **66**(1): p. 31-9.
16. Karadag, M. and O. Pekin Iseri, *Determining health personnel's application trends of new guidelines for preoperative fasting: findings from a survey*. Journal of PeriAnesthesia Nursing, 2014. **29**(3): p. 175-84.
17. Andrews, J.C. and D.M. Levy, *Preoperative fasting: sugary drinks for women behind 'two in the queue' for caesarean section*. International Journal of Obstetric Anesthesia, 2014. **23**(1): p. 89-90.

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