SCOAP Metric:

Pre-Operative Carbohydrate Loading

Rationale: Research indicates that a preoperative carbohydrate supplement two to three hours prior to surgery may optimize glucose control, decrease insulin resistance and improve patient wellbeing postoperatively.

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Frequently Asked Questions

1. **What is preoperative carbohydrate loading?**
    - Preoperative carbohydrate loading is an additional nutritional guideline that has become a documented and incorporated strategy for the global enhanced recovery after surgery perioperative care pathway (Ackerman, 2019).
    - Preoperative carbohydrate loading consists of drinking 8-10 oz of a clear carbohydrate beverage up to 2 hours prior to surgery.
    - While the American Society of Anesthesiologists recommend the timing and administration of preoperative fluids and solids as a clear liquid fast of 2 hours prior to surgery and a fast of six hours for a light meal. Only the European Society of Anesthesiology mentions preoperative carbohydrate drinks currently in their guidelines (Ackerman, 2018).
    - Examples of specific carbohydrate loading could be a 500 mL clear apple juice or cranberry cocktail 2 to 3 hours prior to surgery (AHS Pre-operative, 2019).
    - Carbohydrate containing clear liquids are usually composed of 12% carbohydrate in maltodextrin form (Pogatschnik,2015).

2. **What is the Physiology of preoperative carbohydrate loading?**
    - The body's response to surgical stress results in endocrine and immunologic system changes. This includes release of catecholamines, cortisol, glucagon and growth hormone in addition to interleukin 6 and IL-1. This may cause immunosuppression and insulin resistance postoperatively (Ackerman 2018).
        - Other factors of surgical stress are a loss of tissue, strength, respiratory mechanics and delayed wound healing (Ackerman 2018).
    - It has been hypothesized that the metabolic shifts that cause detrimental homeostatic responses could be diminished when the body is in a fed rather than a fasting state.
        - A fasting state (such as nothing by mouth for 8 hours) results in catabolic pathways predominating with reduced muscle uptake of glucose and regular insulin levels, while a carbohydrate fluid 2 hours before surgery creates anabolic pathways, restored glycogen, increased muscle uptake of glucose, elevating insulin and halting protein catabolism. (Ackerman 2018).

3. **What are the benefits of Carbohydrate loading?**
    - Carbohydrate loading has been found to decrease insulin resistance, decrease nausea and vomiting, optimize glucose control and possibly improve wound healing postoperatively (Ackerman, 2018).
    - Carbohydrate loading has been shown to improve patient wellbeing post operatively. One study conducted found that of 252 patients undergoing abdominal surgery, those that had preoperative carbohydrate fluids had less hunger, anxiety, and less discomfort relating to malaise and fatigue. In comparison the group that fasted was observed to have a notable increase in fatigue, weakness, hunger, and thirst (Pogatschnik,2015).

- An additional study found that there was a correlation between patients receiving pre-operative carbohydrate supplementation and their corresponding preoperative anxiety levels and duration of length of stay (Tran, 2013).
    - Studies suggest that preoperative anxiety is related to greater pain postoperatively and increased LOS. Patients receiving preoperative carbohydrate loading have been found to have a lesser degree or anxiety and thirst immediately prior to surgery (Tran,2013).
- In another analysis, patients who received preoperative carbohydrate loading had a shorter length of stay postoperatively compared to patients that underwent traditional fasting guidelines. This could be due to perioperative and postoperative hyperglycemia that has been shown to be related to postoperative complications (Tran, 2013).

Measure Change Concepts

STANDARDIZE:
Standard: Preoperative carbohydrate supplement offered 2 to 3 hours prior to surgery.
Process:

- Define population that will be offered preoperative carbohydrate supplement.
- Standardize process and preoperative orders to include preoperative carbohydrate loading oral supplement prior to surgery.
- Adopt method to evaluate, monitor and regulate patient fasting and carbohydrate supplement prior to anesthesia.

Responsibility: Clearly define responsibility for preoperative carbohydrate loading to preop/holding area.
Timing: Preoperative
Documentation: Design and implement systematic documentation of patient preoperative carbohydrate loading on every patient chart (paper or electronic).

DESIGN SYSTEMS TO AVOID MISTAKES:
Protocol:

- Provide protocol for consistent measurement and delivery of preoperative carbohydrate supplement.
- Revise charting to include required field for carbohydrate loading prior to surgery.

USER REMINDERS:

- Checklists (SCOAP Surgical Checklist), embedded prompts

GIVE PEOPLE ACCESS TO INFORMATION:

- Provide staff education
- Provide regular feedback to physicians/surgeons/departments from SCOAP reports

See Attached Resources and References list

CONSIDER PEOPLE AS IN THE SAME SYSTEM:

- Include Pre-op, nursing, anesthesiology, surgeons, PACU staff on team

USE AUTOMATION:

- EMR alerts

PARTNER WITH PATIENT:

- Provide patient/family education about the benefits of Preoperative Carbohydrate Loading 2 to 3 hours prior to surgery.
- Include on patient/family brochure (when applicable)

CELEBRATE SUCCESS:

- Keep team members, physicians, and stakeholders informed about the progress that has been made using multiple forums (newsletters, awards, success stories posters, balloons,

References

Ackerman, R. S., Tufts, C. W., DePinto, D. G., Chen, J., Altshuler, J. R., Serdiuk, A., Cohen, J. B., & Patel, S. Y. (2020). How Sweet Is This? A Review and Evaluation of Preoperative Carbohydrate Loading in the Enhanced Recovery After Surgery Model. *Nutrition in Clinical Practice*, *35*(2), 246–253

This is a Review of Preoperative Carbohydrate Loading in the Enhanced Recovery after Surgery model. Preoperative carbohydrate loading has been shown to decrease surgical stress response and insulin resistance and improve perioperative complications. Currently the European Society of Anesthesiologists provide recommendations for its use but there are barriers to its adoption over current fasting guidelines in the United States. Carbohydrate loading involves drinking 8-10 oz of clear carbohydrate beverage up to 2 hours before surgery. While it has been shown to be beneficial there are areas of surgical interest that need more research before a full recommendation such as concerning Bariatric surgery and for Type II Diabetic patients.

Tran, Susan, Wolever, Thomas, Errett, Lee, Ahn, Henry, Mazer, C. & Keith, Mary. (2013). Preoperative Carbohydrate Loading in Patients Undergoing Coronary Artery Bypass or Spinal Surgery. *Anesthesia & Analgesia*, 117, 305-313.

In this study, twenty-six patients that underwent a coronary artery bypass graft and 12 undergoing spinal surgery were part of a randomized test to receive 800mL of oral carbohydrate supplement the evening before and 400 mL 2 hours before surgery or to fast as per hospital protocol. The results did not find an improvement in postoperative insulin sensitivity, but postoperative glucose levels and other secondary outcomes show promise from preoperative carbohydrate loading warranting further studies. One study found that there was a relationship with patients that receive carbohydrate supplementation and preoperative anxiety levels and duration of length of stay. Studies suggest that preoperative anxiety is related to greater pain postoperatively and increased LOS. Patients receiving preoperative carbohydrate loading have been found to have a lesser degree or anxiety and thirst immediately prior to surgery.

Pogatschnik, C., & Steiger, E. (2015). Review of Preoperative Carbohydrate Loading. *Nutrition in clinical practice: official publication of the American Society for Parenteral and Enteral Nutrition*, *30*(5), 660–664.

A preoperative carbohydrate containing liquid that is composed of 12% carbohydrate has benefits for the surgical patient and could be a multimodal approach to reduce the length of stay and complication rates post-surgery. Carbohydrate loads prior to surgery have been shown to increase patient comfort post-surgery by improving postoperative thirst, hunger, malaise, fatigue and anxiety. Carbohydrate loading has been a focus on the enhanced recovery after surgery protocol (ERAS) which focuses on patient outcomes and recovery by reduced perioperative stress to enhance patient recovery.

Thomas, S. (2013). A randomized placebo-controlled trial of preoperative carbohydrate drinks and early postoperative nutritional supplement drinks in colorectal surgery. *Colorectal Disease., 15*(6), 737-45.

This study measured 120 patients into four demographically matched groups. Patients were given a carbohydrate or placebo drink preoperatively and a polymeric supplement or placebo drink postoperatively. The primary outcome measured was insulin resistance and the secondary outcomes measured included intestinal permeability, pulmonary function, handgrip strength and postoperative complications. The study found that oral nutritional supplements given preoperatively and postoperatively improve handgrip strength, pulmonary function and insulin resistance. This study recommends oral nutritional supplements should be given preoperatively and postoperatively.

Azagury, D. (2014). Does perioperative nutrition and oral carbohydrate load sustainably preserve muscle mass after bariatric surgery? A randomized control trial. *Surgery for Obesity and Related Diseases., 11*(4), 920-926.

In this study, a randomized control trial of patients undergoing gastric bypass were compared. One set of patients continued their surgery with standard management and interventions while the other set consumed an oral carbohydrate drink 12 and 2 hours prior to surgery and immediately in a postoperative peripheral parenteral nutrition. The results measured were lean body mass and length of stay following bariatric surgery. The study found that carbohydrate loading did not have an impact on short term or long-term LBM and was not seen to have a benefit in the bariatric population for this specific reason. Perioperative comfort, another measure that may have positive outcomes with carbohydrate loading prior to surgery, was not measured.

Kielhorn, B. A., Senagore, A. J., & Asgeirsson, T. (2018). The benefits of a low dose complex carbohydrate/citrulline electrolyte solution for preoperative carbohydrate loading: Focus on glycemic variability. *American journal of surgery*, *215*(3), 373–376.

This study evaluated the administration of a simple carbohydrate drink to a low dose complex carbohydrate solution and the effects on perioperative hyperglycemia in colorectal surgery. The study was to compare the outcomes on hyperglycemia during colorectal surgery on non-diabetic patients when consuming commercially available sports drink and a low dose maltodextrin electrolyte solution. There was a decreased incidence of length of stay and postoperative complications among the low-dose complex carbohydrate cohort compared to simple commercially available sports drink. Further studies will be needed to assess the benefits and impact on this treatment on perioperative outcomes, complications and length of stay.

ERAS Alberta, Surgery Strategic Clinical Network. (2019, July). AHS Pre-operative Fasting and Carb Loading. Alberta Health Services.

This guideline was published by the Alberta health Services Surgery Strategic Clinical Network. It outlines questions and answers for healthcare providers on preoperative fasting and Carb Loading. The Canadian Anesthesiologists' Society (CAS) Guidelines to the Practice of Anesthesia, Revised Edition 2019 have recommended a minimum duration of preoperative fasting for adults before surgical procedures. This includes 8 hours after a meal with meat, fried or fatty foods, 6 hours after a light meal and 2 hours after clear fluids. It is recommended that a carb load of 500 mL of apple juice or cranberry cocktail 2 to 3 hours prior to surgery may assist patients by reducing surgical stress, accelerating recovery and decreasing post-surgical complications.