Preoperative Carbohydrate Loading in the Reduction of Postoperative Nausea and Vomiting

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Doctor of Nursing Practice Scholarly Project Proposal

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Postoperative nausea and vomiting (PONV) is defined as nausea, retching, or vomiting episodes occurring within the first 24 hours postoperatively (Singh et al., 2015). Postoperative nausea and vomiting is the most common post-anesthetic complication, with an international and national incidence of approximately 30% in adults (American Society of Perianesthesia Nurses [ASPAN], 2006; Singh et al., 2015). There are several risk factors for PONV, each of which increases the incidence an additional 20%; the most predominant is female gender, and others include being a non-smoker, a history of PONV, and receiving opioids in the postoperative period (Apfel et al., 2012; Singh et al., 2015). Additionally, there are intraoperative links to PONV such as the use of inhalational agents, length of surgery, and type of surgery (Apfel et al., 2012). In addition to causing discomfort to the patient, PONV has been associated with dehydration, electrolyte imbalance, complications at the surgical site, and prolonged hospital stay, and is the most common reason for unanticipated hospital admission in the postoperative period (Yilmaz et al., 2013, Singh et al., 2015). Although there are no statistics available at the medical institution of interest, PONV was identified as a relevant issue in the post-anesthesia recovery unit.

There are several pharmacologic treatments currently used for the prophylaxis and treatment of PONV, but none have eradicated the issue. Since pharmacologic methods alone are not 100% effective, non-pharmacologic interventions warrant consideration. A more contemporary intervention associated with a reduction in PONV is preoperative carbohydrate loading. Preoperative carbohydrate loading consists of administering a 12.5% carbohydrate beverage at two intervals: prior to midnight the evening before surgery and two hours before surgery (Hausel, Nygren, Thorell, Lagerkranser, & Ljungqvist, 2005; Yilmaz et al., 2013). The

exact mechanism by which preoperative carbohydrate loading reduces PONV remains unclear, but is thought to be due to decreased postoperative insulin resistance (Singh et al., 2015). Additionally, preoperative carbohydrate loading has been associated with several positive outcomes. In the preoperative setting, patients who consumed the carbohydrate beverage reported decreased anxiety, discomfort, hunger, and thirst (Hausel et al., 2005; Sada et al., 2014; Yilmaz et al., 2013). Postoperative benefits include decreases in metabolic stress, anxiety, and length of stay (Sada et al., 2014; Singh et al., 2015). Moreover, when compared to traditional preoperative fasting, patients who received carbohydrate beverage preoperatively had less PONV (Hausel et al., 2005; Yilmaz et al., 2013).

The purpose of this scholarly project was to develop a clinical practice guideline (CPG) for the use of preoperative carbohydrate loading to reduce PONV in healthy adult surgical patients undergoing cholecystectomy. It is anticipated that after completion of this project there will be a decreased incidence of PONV in adult patients undergoing cholecystectomy in the medical institution of interest.

Theoretical Framework

The theoretical framework selected for this scholarly project was the Ottawa Model of Research Use (OMRU). Evidence-based innovation, potential adopters, practice environment, interventions, adoption, and outcomes are the components of this complex model. These six components influence one another creating a fluid multi-directional framework with three stages: assessment, monitoring, and evaluation (Logan & Graham, 2004). Assessment, the first stage in the model, involves identifying barriers and support within the practice environment, potential adopters, and the evidence-based innovation. During the assessment stage, information regarding available resources, possible influences, attitudes, motivation, and perceptions are used to create

strategies to decrease resistance and formulate the best intervention. The next stage is monitoring, which includes the intervention and adoption components. This stage involves implementing and tracking the progress of the evidence-based intervention. The final stage is evaluation, which encompasses the outcomes related to the evidence-based intervention and exploring the true impact of the change (Logan & Graham, 2004).

For this scholarly project, the OMRU was used to provide an organizing structure for the design and methods in the creation of a CPG. The OMRU was developed to assist with translating research into practice, and is therefore ideal for creating a CPG (Logan & Graham, 2004). The assessment and monitoring stages of the OMRU were used in the development and implementation of a CPG for the use of preoperative carbohydrate loading. The assessment stage was used to guide the literature review and assist in the identification of barriers related to the potential adopters of the guideline and the practice environment. Information obtained during the assessment stage was used to overcome barriers, construct a CPG that correlated to the culture of the institution of interest, and plan interventions to assist with implementation. The monitoring stage was used to encourage the use of the guideline and make sure it is being used as intended.

Literature Review

The focus of this literature review is to determine the efficacy of preoperative carbohydrate loading on the reduction of PONV in adults undergoing elective cholecystectomy. The review will begin with an individual analysis of relevant randomized clinical trials (RCTs) highlighting key strengths and limitations. The evidence will then be synthesized noting commonalities.

Yilmaz et al. (2013) conducted a randomized prospective single-blinded study to compare the effects of consuming a carbohydrate (CHO) beverage two hours before surgery to

preoperative fasting on PONV and antiemetic use. The study consisted of 40 patients undergoing elective laparoscopic cholecystectomy who were assigned to a CHO group or a fasting (NPO) group. The CHO group received 400 mL of a 12.5% carbohydrate beverage two hours before surgery, while the NPO group fasted for eight hours prior to surgery. In the post-anesthesia care unit, there was no statistically significant difference in Verbal Descriptive Scale (VDS) scores or antiemetic use between the two groups ($p > 0.05$); however, 12-24 hours after surgery the CHO group had significantly lower VDS scores and antiemetic use ($p = 0.001$). The limitations of this study include the small sample size and the use of different CHO beverages. The study design had several strengths: most notably, there was no statistically significant difference in demographics or outcomes between groups, and a standardized method to dose other medications intraoperatively was used. Finally, the use of a standardized scale for symptoms and the fact that patients received education on how to use the VDS scale helps validate the results.

In a randomized prospective double-blinded study, Sada et al. (2014) explored the effect of a carbohydrate-rich drink administered preoperatively on several clinical parameters in patients undergoing open abdominal surgery. This study included 142 patients, of whom 71 patients underwent open cholecystectomy and 71 patients open colorectal surgery. The patients were assigned to a study group, a placebo group, or a control group. The study group received 800 mL of a 12.5% CHO beverage the night before surgery, and another 400 mL two hours before surgery. The placebo group received a clear liquid with a similar taste to the CHO beverage in the same volume and time interval as the study group. The control group could not eat or drink after midnight. For the patients who underwent open cholecystectomy there was a significant difference in nausea in the first 24 hours after surgery between the study and control groups ($p<0.05$), but no significant difference between the study and placebo groups ($p>0.05$).

There was no significant difference in PONV among the groups who underwent open colorectal surgery ($p>0.05$). The strengths of the study are highlighted though the double-blinded research design, the use of the same anesthetic, and the absence of prophylactic PONV medications. In addition, the presentation of taste of the placebo and CHO beverages were comparable. The limitations include a small sample size and no regulation of intraoperative fluid management.

Singh et al. (2015) conducted a prospective RCT to explore the effect of a carbohydrate-rich beverage on PONV and pain. The study included 120 patients undergoing elective laparoscopic cholecystectomy evenly divided into a CHO, placebo and control group. The CHO group received 400 mL of a 12.5% CHO beverage the night before surgery, and an additional 200 mL the morning of surgery. The placebo group received an identical amount of flavored water at the same times as the CHO group. The control group could not eat or drink after midnight. The CHO group experienced significantly less nausea and vomiting compared to placebo and control groups at 0-4 hours postoperatively and significantly less vomiting than the control group at 4-12 hours postoperatively ($p<0.05$). The randomized study design and comparability of age and gender amongst groups were the major strengths of the study. The small sample size, use of observation to collect data, and difference in taste between the CHO and placebo beverages were the major limitations of the study.

Hausel et al. (2005) conducted a RCT to examine the effects of a CHO beverage on PONV in patients undergoing laparoscopic cholecystectomy. Over three hospitals, 172 patients were divided into a CHO group, a placebo group, and a fasting group. The CHO group received 800 mL of a 12.5% carbohydrate beverage the night before surgery and another 400 mL the morning of surgery. The placebo group received flavored water in the same fashion. The fasting group could not consume anything by mouth after midnight. The CHO group had significantly

less PONV than the fasting group 12-24 hours postoperatively. There was a significant decrease in PONV as time progressed in the CHO and placebo groups ($p<0.05$). Nausea scores on the Visual Analog Scale (VAS) increased after surgery for the fasting and placebo group, but there was no significant increase in the CHO group ($p>0.05$). The investigators conducted the study at three hospitals and the used two mechanisms to evaluate PONV strengthening the study. The small sample size, use of PONV prophylaxis for select patients, as well as the large amount of intravenous fluids used intraoperatively were some of the limitations of the study.

After a thorough literature search, four RCTs contained recent data relevant to preoperative carbohydrate loading decreasing the incidence of PONV in patients undergoing cholecystectomy. There were several similarities in study design among the trials. Three out of four RCTs contained a placebo group, while all trials compared a CHO group to a fasting group. The study by Sada et al. (2014) was the only study to contain patients undergoing open cholecystectomy and open colorectal surgeries, finding no advantage to preoperative CHO loading for open colorectal surgeries. The other trials were performed on patients undergoing laparoscopic cholecystectomy. The inclusion and exclusion criteria were similar and all studies used a 12.5% CHO beverage given at similar times. While the volumes of the CHO beverage differed among studies, there were no reported complications regardless of the volume given. The study by Yilmaz et al. (2013) was the only study that did not give the CHO beverage the evening before surgery. In comparing the overall weaknesses, the major issue is the small sample sizes ranging from 40-172 patients; however, each study was designed in a manner to eliminate significant differences among study groups. Additionally, there was heterogeneity in methods used to evaluate and frequency of monitoring PONV among the trials. The studies conducted by Hausel et al. (2005), Singh et al. (2015), and Yilmaz et al. (2013) monitored patients 24 hours

postoperatively, while Sada et al. (2014) monitored 48 hours postoperatively. The results from all studies demonstrate a reduction in PONV to some extent with the administration of a preoperative carbohydrate beverage compared to preoperative fasting. While studies with larger sample sizes are warranted, the overall evidence suggests preoperative carbohydrate loading can decrease the incidence of PONV in patients undergoing cholecystectomy.

Methods

Design, Sample, and Setting

This was a quality improvement project for the development of a CPG for the use of preoperative carbohydrate loading for patients undergoing elective cholecystectomy. The project was carried out in the perioperative unit of a small community hospital on the east coast. Because there was more than one sample for this project, identification of each sample is discussed in their corresponding phase in the procedure section. A timeline for the project proposal can be found in Appendix C.

Procedure

The development of the CPG was divided into three phases with a unique sample in each phase. Phase one began by recruiting an expert panel to aid in the development of the CPG, which took place over the first two weeks of the project. The expert panel consisted of an anesthesiologist and two nurse anesthetists currently on staff at the hospital of interest. Once identified, an email was sent to the expert panel explaining the purpose of the project, their role, and a tentative timeline including scheduled meetings with them. A draft of the CPG draft was emailed to the expert panel for review using the Appraisal of Guidelines for Research and Evaluation (AGREE) II tool. Next, a meeting was held with the expert panel to discuss the results of the Agree II tool and allow the panel to make recommendations for changes to the

CPG. A two-week allotment was scheduled to revise the CPG. Upon revision, the CPG was resubmitted to the expert panel for final review. Following the expert panel review, the project proceeded to phase two. During phase two, the chief anesthesiologist received a copy of the CPG via email for review. In the second week of the second month, the CPG was reevaluated based on the feedback received from the chief anesthesiologist and changes were emailed to the expert panel.

Once the expert panel approved the CPG, a final date was selected to present the CPG to the staff during grand rounds. Phase three, which took place in the final month, consisted of provider feedback of the CPG. In the first two weeks of the final month, the CPG was presented to the anesthesia staff at grand rounds. After the CPG presentation, a practitioner feedback questionnaire (PFQ) (Appendix E) was distributed to a sample of 20 nurse anesthetists and anesthesiologists for evaluation of the CPG. There was a two-week allotment for collection of the PFQs and data analysis. Once the data was analyzed, there was a final meeting with the expert panel and chief anesthesiologist in the last week of the last month to discuss the data obtained from the questionnaires and make final edits to the CPG.

Data Collection

The AGREE II tool (Appendix D) has construct validity and is the gold standard for guideline evaluation, therefore it was used to analyze the CPG in phase one of the project (Brouwers, et al., 2010). The AGREE II tool was developed by the AGREE Next Steps Consortium (http://www.agreetrust.org, 2009) to assess the quality of a CPG. This tool has 23 items within six distinct domains and an additional section for an overall assessment of the CPG, as shown in Appendix D. Each item is graded on a 7 point Likert scale ranging from “strongly agree” to “strongly disagree.” Within its corresponding domain, each item is scored and the

results equate to the quality of the CPG in that domain (AGREE Next Steps Consortium, 2009). The AGREE II tool was sent electronically to the members of the expert panel.

In phase three of the project, a PFQ was used to measure the end users' attitudes towards the CPG. The PFQ contains 23 questions answered via a three point Likert scale ranging from "strongly agree" to "strongly disagree." The PFQ is a valid and reliable tool created specifically for the adopters of a guideline (Brouwers, Graham, Hanna, Cameron, & Browman, 2004). An additional question was added to the PFQ to obtain demographic data regarding the subject's number of years in practice. The PFQ was distributed in paper/pencil format after the presentation of the CPG. A copy of the PFQ can be found in Appendix E.

Data Analysis

The AGREE II tool examines each domain separately with the corresponding scores denoting the quality of the information in that domain. Using the results obtained from the three members of the expert panel, each item within the domain was totaled, then the minimum score in the domain was subtracted. This number was divided by the difference of the maximum score and the minimum score to create a percentage. The percentage obtained was used to determine if the CPG is of high quality or poor quality (AGREE Next Steps Consortium, 2009). The scores for each domain were discussed with the expert panel. Items receiving a percentage reflecting poor quality were discussed with the expert panel for recommended revisions. Using the data from the PFQ, subjects' results will be grouped by the number of years of experience into one of three groups: 0-5 years of experience, 5-10 years of experience, and greater than ten years of experience. Simple statistical tests were used to analyze the response to each question and compare the responses of each group.

Human Rights Protection

The proposal for this project was submitted to the University of Maryland Baltimore Institutional Review Board for a Non-Human Subjects Research determination. Participation and assistance in this project was voluntary and this was verbally disclosed to participants. To protect the anonymity of the participants no identifiers were collected. To safeguard the data, the PFQs were submitted via a secure box and stored in a locked office. Additionally, the electronic data used for data analysis was stored on a password-protected computer.

Results and Discussion

The three members of the expert panel completed the AGREE II tool and each domain was analyzed independently in accordance with the scoring directions. All domains received a score of 100%, except the second domain, stakeholder involvement, which scored 94%. The question asking whether "the views and preferences of the target population have been sought" was the only question not to receive the highest possible score. One panel member stated "it was not clear whether the views and preferences of the public and potential patients regarding treatment of PONV were included in the guideline information." However, when the team members were consulted regarding the AGREE II tool results there were no recommendations to change the guideline. All members agreed that the overall quality of the guideline was high, and could be presented to anesthesia staff.

After presentation of the CPG to the anesthesia staff, there was a 100% response rate of the PFQ of those in attendance. The number of years of experience was divided into three groups: 0-5 years, 5-10 years, and greater than ten years. The years of experience of anesthesia staff in attendance was 38.9%, 22.2%, and 38.9% respectively. An overwhelming majority (94%) agreed there was a need for a CPG on this topic. Approximately 89% reported that the CPG draft recommendation was clear and agreed with the guideline as stated. However, only

77% reported they would feel comfortable if their patients received the care recommended in the CPG; 17% were unsure, and one respondent did not answer. When asked whether they would use the guideline in their own practice, 83% agreed, 6% disagreed, and 11% were unsure. Of those who did not agree, 66% had greater than 10 years experience, and 33% less than five years. The largest variation regarded whether the CPG was too rigid to apply to individual patients; 33% agreed, 22% disagreed, and 45% were unsure. Despite this, 83% agreed the CPG would produce more benefit for patients than harm. The results of the PFQ were discussed with the expert panel via email and no recommendations were made to change the guideline.

Assessment of Implementation

The Content Assessment Index (CAI) tool (Appendix G) was selected to perform a cultural assessment of the anesthesia department in the small community hospital intended for project implementation. The CAI affords the ability to evaluate a practice environment and identify likely barriers and enablers to the CPG implementation. The CAI consists of 37-items divided into three elements for scoring. The elements are culture, leadership, and evaluation (McCormack, McCarthy, Wright, Slater, & Coffey, 2009). The completed CAI tool as well as the results can be found in Appendix G. The culture element scored the highest at 83%, evaluation scored 75%, and leadership scored 71%. These results indicate the overall culture of anesthesia department of interest is an environment conducive to CPG project implementation. Additionally, the CAI tool revealed barriers and enablers to implementation as described below.

Barriers and Enablers

Although it has been identified that the anesthesia staff are receptive to the CPG, the culture of the hospital may create hurdles to adopting the CPG. More specifically, key barriers that may lead to implementation failure of the CPG are related the overall absence of using

evidence-based practice to dictate care and inadequate patient education. Although anesthesia providers include patients in the decision making process, verbal communication is the primary means of communication. Over half of the medical information given to patients is improperly interpreted or forgotten due to verbal communication with the patient using medical terminology without adjusting for literacy levels (Vetter, Downing, Vanlandingham, Noles, & Boudreaux, 2014). According to Vetter et al. (2014), verbal and written communication along with a standardized preoperative instruction sheet can improve medication compliance on the day of surgery. These items should be colorful and animated to account for patients with lower literacy levels or those who do not speak English (Vetter et al., 2014). In order to successfully implement this CPG, patient compliance with preoperative instructions is imperative. Therefore, a standardized colorful animated preoperative instruction sheet will be given to patients and reinforced verbally.

The current culture within the anesthesia department does not align with evidence-based practices, however they do seem receptive to change. The difficulty arises with the willingness of surgeons and nursing staff to adopt the CPG as well as the financial implications involved in the implementation process. Luxford, Hill, and Bell (2006) created a matrix framework based on Rogers' theory of diffusion of innovations that can be used to identify barriers to implementing a CPG. This framework will be useful in the implementation of the CPG as it accounts for potential barriers to compliance and in the creation of implementation strategies to augment adoption. As recommended by the matrix framework, the anticipated patient outcomes will be presented to the intended users of the CPG as this improves staff compliance (Luxford, Hill, & Bell, 2006).

The CAI tool revealed several enablers within the anesthesia department that will assist in the implementation of the CPG. The most pertinent is that patients are encouraged to be active participants in their own care. Within the anesthesia department, patients are presented with two general options for the anesthetic plan with rationales for each and the patient decides what they prefer based on the information provided. The Evidence Informed Decision Making through Engagement (EIDME) Model provides a patient-centered implementation model that can be used to leverage change and enhance patient involvement in their care. According to the model, patients and clinicians need to have an evidenced-based discussion free of bias that acknowledges the patient's values and beliefs in order for shared-decision making to occur (Moore, Titler, Low, Dalton, & Sampselle, 2015). By incorporating this model the communication between the anesthesia provider and the patient can be optimized to further engage the patient in the decision making process.

In the anesthesia department, decisions on care and management are clearly documented by staff, another pertinent enabler. Successful implementation of a practice change will require adequate documentation of new interventions. In order to streamline the documentation, checklists will be used to ensure the interventions are placed in the medical record appropriately. According to Robins and Dai (2015), the use of a checklist will provide a systems approach to communicating relevant information and increase the accuracy of handoff communication among staff. Furthermore, checklists have been proven to decrease errors that occur due to miscommunication (Robins & Dai, 2015). The use of a checklist among providers will provide a way to communicate new interventions that will take place with the implementation of the clinical practice guideline.

Summary

This scholarly project developed a CPG for the use of preoperative carbohydrate loading to reduce PONV in healthy adult surgical patients undergoing cholecystectomy. Despite the many advances in the healthcare arena, PONV persists as a significant complication in the postoperative period. There is adequate evidence to support the use of preoperative carbohydrate loading to decrease the incidence of PONV for adults undergoing a cholecystectomy. Collaboration with an expert panel, approval from the chief anesthesiologist, and feedback from the anesthesia staff made it possible to create a quality CPG that aligns with current evidence, yet unique to the intended hospital. A cultural assessment of the practice environment ensures strategies are in place for successful implementation of the CPG and account for the enablers and barriers within the targeted anesthesia department.

Future Plans

Following CPG implementation, data will need to be collected on several outcome measures to substantiate the effect of the CPG. Most notably, the incidence of PONV, length of stay, antiemetic use, and patient satisfaction should be monitored on all patients who are deemed eligible for the CHO beverage according to the CPG. The expert panel involved in the guideline creation should create a task force to monitor data and update the CPG according to emerging evidence. In the future, the use of preoperative CHO loading will be expanded to other surgical procedures.

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Appendix A

Evidence Review Table

Author, year	Study objective/intervention or exposures compared	Design	Sample (N)	Outcomes studied (how measured)	Results	*Level and Quality Rating
Hausel, Nygren, Thorell, Lagerkranser, & Ljungqvist (2005)	The purpose of the study was to examine the effects of CHO beverage on PONV in patients undergoing laparoscopic cholecystectomy	Randomized clinical trial	n = 172 CHO group n= 55 Placebo group n = 59 Fasted group n = 58	Visual Analog Scale and observed Episodes of PONV at 0-4, 4-12, and 12-24 hour intervals	The CHO group had significantly less PONV than the fasting group 12-24 hours postoperatively. There was a significant decrease in PONV as time progressed in the CHO and placebo groups. Nausea scores on the Visual Analog Scale (VAS) increased after surgery for the fasting and placebo group, but there was no significant increase in the CHO group	2 B
Sada, Krasniqi, Hamza, Gecaj-Gashi, Bicaj, & Kavaja (2014)	"To assess whether preoperative oral administration of carbohydrate-rich liquid drinks (CRLD) has an impact on patient well-being, clinical status, time to regain activities of daily living and reduction in the length of hospital stay in patients undergoing open abdominal surgery."	Randomized double-blind prospective study	n = 71 Study group n = 22 Placebo group n = 23 Control group n = 24	Nausea was one of the seven parameters measured using the Visual Analog Scale (VAS), measured twice. The first within the first 24 hours after surgery, the second 36-48 hours after surgery.	When comparing the study group and the control group, there was a significant difference in nausea in the first 24 hours after surgery. When comparing the study group and placebo group, there was no significant difference at both time intervals.	2 B
Singh, Dahiya, Bagaria, Saini,	To explore the effect of a carbohydrate-rich beverage on PONV and pain	Prospective Randomized clinical trial	n = 120 CHO group n = 40 Placebo group n = 40 Control group n = 40	The nursing staff observed for complaints of nausea and episodes	The CHO group experienced significantly less nausea and vomiting compared to placebo and control groups at 0-4 hours	2 B

Kaman, Kaje, Vagadiya, Sarin, Edwards, Attri, &Jain (2015)				or vomiting or retching at 0-4, 4-12, and 12-24 hours postoperatively	postoperatively and significantly less vomiting than the control group at 4-12 hours postoperatively.	
Yilmaz, Cekmen, Bilgin, Erten, Ozhan, & Cosar (2013)	To investigate the effects of a CHO beverage two hours before surgery to preoperative fasting "on gastric pH and residual volume, PONV and antiemetic use in patients undergoing elective laparoscopic cholecystectomy"	Randomized single-blinded prospective study	n=40 Pre-operative carbohydrate group n=20, Pre-operative fasting group n=20	The patients were explained how to use the Verbal Descriptive Scale (VDS) to grade their nausea levels. 0 = no complaint, 1 = mild degree of nausea, 2 = moderate degree of nausea, 3 = frequent vomiting 4 times, 4 = severe vomiting, continuous.	There was no statistically significant difference in VDS scores or antiemetic use between the CHO group and the fasting group in the post anesthesia care unit; however, 12-24 hours after surgery the CHO group had significantly lower VDS scores and antiemetic use compared to the NPO group.	2 C

Appendix B

Strengths and Weaknesses Table

Author, year	Study objective/intervention or exposures compared	Strengths	Weaknesses	Quality Rating
Hausel, Nygren, Thorell, Lagerkranser, & Ljungqvist (2005)	The purpose of the study was to examine the effects of CHO beverage on PONV in patients undergoing laparoscopic cholecystectomy	• Randomized design, CHO and placebo groups were double blinded • Study conducted at three hospitals • CHO and placebo beverage were equivalent in taste and labeling • There were no significant differences demographics or interventions amongst groups • Used two mechanisms to evaluate PONV • Clear inclusion and exclusion criteria • Excluded surgeries stating after noon.	• Small sample size • Large amount of intravenous fluids used intraoperatively • Use of PONV prophylaxis for select patients • Investigators were not blinded to the fasting group • Patients were able to eat and drink until midnight. The amounts were not recorded or regulated. • The use of observation to report PONV	B
Sada, Krasniqi, Hamza, Gecaj-Gashi, Bicaj, & Kavaja (2014)	"To assess whether preoperative oral administration of carbohydrate-rich liquid drinks (CRLD) has an impact on patient well-being, clinical status, time to regain activities of daily living and reduction in the length of hospital stay in patients undergoing open abdominal surgery."	• Randomized double blind research design • Use of the same anesthetic for each group • Did not administer any prophylactic PONV medication • The presentation and taste of the placebo and CHO beverages were comparable	• Small sample size • No regulation of intraoperative fluid management	B
Singh, Dahiya, Bagaria,	To explore the effect of a carbohydrate-rich beverage on	• Randomized design • Comparability of age and gender amongst groups	• Small sample size • Use of observation to determine PONV	B

Saini, Kaman, Kaje, Vagadiya, Sarin, Edwards, Attri, &Jain (2015)	PONV and pain.		• Difference in taste between CHO and placebo beverages	
Yilmaz, Cekmen, Bilgin, Erten, Ozhan, & Cosar (2013)	To compare the effects of consuming a CHO drink two hours before surgery to preoperative fasting on gastric pH and residual volume, PONV and antiemetic use in patients undergoing elective laparoscopic cholecystectomy	• Carbohydrate beverage contained 12.5% glucose, identical labeling and had indistinguishable tastes • No statistically significant difference in demographics and outcomes between groups • All patients received general anesthesia using the same concentration of inhalational agents with a standardized method for using other medications intraoperatively. • To control for the duration of fasting, only procedures starting before noon were included. • Study design; patients, investigators, and staff were blinded. • that patients received education on how to use the VDS scale	• Small sample size • Used different CHO beverages	C

Appendix C

Timeline

- Submit Proposal to committee members by April 2016.
- Present Proposal to committee members on May 2016.
- Submit project proposal to UMB and hospital Institutional Review Boards (IRBs) by May 2016.
- Implement project from September 2016 to February 2017.
- Analyze, synthesize and evaluate data by March 2017.
- Submit final scholarly project manuscript to committee for review by March 2017.
- Present final scholarly project report to Committee by March 2017.

Appendix D

Abbreviated AGREE II Tool

Domain 1. Scope and Purpose

1. The overall objective(s) of the guideline is (are) specifically described.
2. The health question(s) covered by the guideline is (are) specifically described.
3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

Domain 2. Stakeholder Involvement

4. The guideline development group includes individuals from all relevant professional groups.
5. The views and preferences of the target population (patients, public, etc.) have been sought.
6. The target users of the guideline are clearly defined

Domain 3. Rigour of Development

7. Systematic methods were used to search for evidence.
8. The criteria for selecting the evidence are clearly described.
9. The strengths and limitations of the body of evidence are clearly described.
10. The methods for formulating the recommendation are clearly described.
11. The health benefits, side effects, and risks have been considered in formulating the recommendations.
12. There is an explicit link between the recommendations and the supporting evidence.
13. The guideline has been externally reviewed by the experts prior to its publication.
14. A procedure for updating the guideline is provided.

Domain 4. Clarity of Presentation

15. The recommendations are specific and unambiguous.
16. The different options for management of the condition or health issue are clearly presented.
17. Key recommendations are easily identifiable.

Domain 5. Applicability

18. The guideline describes facilitators and barriers to its application.
19. The guideline provides advice and/or tools on how the recommendations can be put into practice.
20. The potential resource implications of applying the recommendations have been considered.
21. The guideline presents monitoring and/or auditing criteria.

Domain 6. Editorial Independence

22. The views of the funding body have not influenced the content of the guideline.
23. Competing interests of guideline development group members have been recorded and addressed.

Overall Guideline Assessment

1. Rate the quality of this guideline.
2. I would recommend this guideline for use.

AGREE II Tool Results

DOMAIN 1. SCOPE AND PURPOSE				
	Item 1	Item 2	Item 3	**Total**
CRNA 1	7	7	7	21
CRNA 2	7	7	7	21
MDA	7	7	7	21
TOTAL	21	21	21	63
DOMAIN 1. SCORE = 100%				

DOMAIN 2. STAKEHOLDER INVOLVEMENT				
	Item 4	Item 5	Item 6	**Total**
CRNA 1	7	7	7	21
CRNA 2	7	6	7	20
MDA	7	5	7	19
TOTAL	21	18	21	60
DOMAIN 2. SCORE = 94%				

DOMAIN 3. RIGOUR OF DEVELOPMENT									
	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	**Total**
CRNA 1	7	7	7	7	7	7	7	7	56
CRNA 2	7	7	7	7	7	7	7	7	56
MDA	7	7	7	7	7	7	7	7	56
TOTAL	21	21	21	21	21	21	21	21	168
DOMAIN 3. SCORE = 100%									

DOMAIN 4. CLARITY OF PRESENTATION				
	Item 15	Item 16	Item 17	**Total**
CRNA 1	7	7	7	21
CRNA 2	7	7	7	21
MDA	7	7	7	21
TOTAL	21	21	21	63
DOMAIN 4. SCORE = 100%				

DOMAIN 5. APPLICABILITY					
	Item 18	Item 19	Item 20	Item 21	**Total**
CRNA 1	7	7	7	7	28
CRNA 2	7	7	7	7	28
MDA	7	7	7	7	28
TOTAL	21	21	21	21	84
DOMAIN 5. SCORE = 100%					

DOMAIN 6. EDITORIAL INDEPENDENCE			
	Item 22	Item 23	**Total**
CRNA 1	7	7	14
CRNA 2	7	7	14
MDA	7	7	14
TOTAL	21	21	42
DOMAIN 6. SCORE = 100%			

OVERALL GUIDELINE ASSESSMENT		
	Overall Quality	**Recommend for Use**
CRNA 1	7	Yes
CRNA 2	7	Yes
MDA	7	Yes

Appendix E

Practitioner Feedback Questionnaire

For each item, please check off the box that most adequately reflects your opinion.

1. Are you responsible for the care of patients for whom this draft guideline report is relevant? This may include the referral, diagnosis, treatment, or follow-up of patients.	Yes ☐	No ☐	Unsure ☐
1a. How many years have you been practicing?	0-5 years ☐	5-10 years ☐	Greater than 10 years ☐
If you answered "*No*" or "*Unsure*", there is no need to answer or return this questionnaire. If you answered "*Yes*", please answer the questions below and return to **[enter expected destination of surveys]**.			
	Strongly agree	Neither agree or disagree	Strongly disagree
2. The rationale for developing a guideline is clear.	☐	☐	☐
3. There is a need for a guideline on this topic.	☐	☐	☐
4. The literature search is relevant and complete (e.g., no key evidence was missed nor any included that should not have been) in this draft guideline.	☐	☐	☐
5. I agree with the methodology used to summarize the evidence included in this draft guideline.	☐	☐	☐
6. The results of the evidence described in this draft guideline are interpreted according to my understanding of the evidence.	☐	☐	☐
7. The draft recommendations in this report are clear.	☐	☐	☐
8. I agree with the draft recommendations as stated.	☐	☐	☐
9. The draft recommendations are suitable for the patients for whom they are intended.	☐	☐	☐
10. The draft recommendations are too rigid to apply to individual patients.	☐	☐	☐
11. When applied, the draft recommendations will produce more benefits for patients than harms.	☐	☐	☐
12. The draft guideline presents options that will be acceptable to patients.	☐	☐	☐
13. To apply the draft recommendations will require reorganization of services/care in my practice setting.	☐	☐	☐
14. To apply the draft guideline recommendations will be technically challenging.	☐	☐	☐
15. The draft guideline recommendations are too expensive to apply.	☐	☐	☐
16. The draft guideline recommendations are likely to be supported by a majority of my colleagues.	☐	☐	☐
17. If I follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious.	☐	☐	☐

18. The draft guideline recommendations reflect a more effective approach for improving patient outcomes than is current usual practice. (If they are the same as current practice, please tick NA). *NA* ☐	☐	☐	☐
19. When applied, the draft guideline recommendations will result in better use of resources than current usual practice. (If they are the same as current practice, please tick NA). *NA* ☐	☐	☐	☐
20. I would feel comfortable if my patients received the care recommended in the draft guideline.	☐	☐	☐
21. This draft guideline should be approved as a practice guideline.	☐	☐	☐
22. If this draft guideline were to be approved as a practice guideline, I would use it in my own practice.	☐	☐	☐
23. If this draft guideline were to be approved as a practice guideline, I would apply the recommendations to my patients.	☐	☐	☐

Adapted from: Brouwers, M.C., Graham, I.D., Hanna, S.E., Cameron, D.A., & Browman, G.P. (2004). Clinicians' assessments of practice guidelines in oncology: The CAPGO survey**.** *International Journal of Technology Assessment in Health Care, 20*(4), 421-6.

Appendix F

PREOPERATIVE CARBOHYDRATE LOADING TO REDUCE POSTOPERATIVE NAUSEA AND VOMITING IN PATIENTS UNDERGOING CHOLECYSTECTOMY: A CLINICAL PRACTICE GUIDELINE

BACKGROUND/SIGNIFICANCE

Postoperative nausea and vomiting is the most common post-anesthetic complication, with an international and national incidence of approximately 30% in adults (American Society of Perianesthesia Nurses [ASPAN], 2006; Singh et al., 2015). This undesirable outcome can lead to dehydration, electrolyte imbalance, infection, and prolonged recovery (Yilmaz et al., 2013). Current research suggests that preoperative fasting increases the incidence of perioperative complications, including PONV and does not ensure gastric emptying or a reduction in gastric volume and acidity (Yilmaz et al., 2013). Jones, Badger, and Hannon (2011) assert that preoperative fasting causes insulin resistance, which leads to increased glucose release and hyperglycemia. Therefore, current evidence recommends a decrease in preoperative fasting periods and institution of carbohydrate loading as strategies to decrease the risk of PONV (Jones, Badger, & Hannon, 2011). In surgical patients undergoing cholecystectomy, research demonstrates that ingestion of carbohydrate-rich solutions 2 hours before surgery has been shown to decrease postoperative headache, dehydration, hunger and PONV, in all age groups (Yilmaz et al., 2013). Similarly, Kratzing (2011) suggests that consumption of carbohydrate-containing beverages 2 hours before surgery is associated with a reduction in insulin resistance, decreased protein losses, shorter hospital stay, and enhanced patient comfort.

SCOPE AND PURPOSE

- The overall objective of this clinical practice guideline serves to evaluate whether preoperative carbohydrate loading can reduce the incidence of PONV among surgical adult patients undergoing open and laparoscopic cholecystectomy.
- The purpose of this guideline will seek to address the clinical question…Does preoperative carbohydrate loading reduce PONV in adult surgical patients undergoing open and laparoscopic cholecystectomy procedures?

FOCUS

- This guideline applies to men and women adult surgical patients, 18 years of age and older undergoing open and laparoscopic cholecystectomy procedures
- This guideline does not apply to patients with any of the following:
- Conditions (including pharmacologic treatments) that might impair gastrointestinal motility such as gastro-esophageal reflux
- Pregnancy
- ASA 3 or higher
- Medications which impair gastrointestinal motility
- Past history of PONV and motion sickness
- Documented cholelithiasis or suspected jaundice
- Potential for difficult airway management
- Diabetes or any endocrine disorder

STAKEHOLDER INVOLVEMENT

- Third year Student Registered Nurse Anesthetists (SRNAs) attending the University of Maryland, Baltimore School of Nursing will be involved with the guideline's development.
- The Director of Anesthesia, staff anesthesiologist, and staff CRNAs of a small community hospital in Maryland will also assist in the guideline's development.
- The aforementioned providers comprise the expert panel and will be responsible for grading the CPG using the Agree II instrument.
- The Director of Anesthesia and lead CRNA are recognized as clinical administrators and will be responsible for finalizing the guideline.
- Target users of the guideline include anesthesia providers, GI surgeons and perioperative nurses. The intended audience for the practice guideline primarily involves men and women adult surgical patients undergoing open and laparoscopic cholecystectomy procedures and will serve inform clinical decisions and reinforce standards of care.

METHODOLOGY

Evidence Search

- A search was conducted using the PubMed, EMBASE, and CINAHL databases with the terms "preoperative carbohydrate loading" and "postoperative nausea and vomiting" yielding limited results.
- The criterion was broadened and an additional search was conducted using the terms "preoperative carbohydrate", and "nausea". Twelve potential studies were identified.
- Inclusion criteria were the use of a preoperative carbohydrate beverage, comparison of a carbohydrate group to another group, abdominal surgery, and randomized design.
- The time period used for the search ranged from January 2005 to April 2016.
- Eight studies were excluded due to duplication or irrelevant titles and abstracts.
- Study findings from published scientific literature were aggregated and are reported in summary form as described below.
- All literature relevant to the topic was considered when evaluating the findings.
- Four randomized clinical trials contained recent data relevant to preoperative carbohydrate loading.

Summary of Literature Review

- All four studies had a common procedure, cholecystectomy, though there was a variance in the surgical approach.
- Investigators agree that preoperative carbohydrate loading decreases the incidence of PONV among patients undergoing open and laparoscopic cholecystectomy procedures.
- The studies were appraised based on the level and quality of the research using The Johns Hopkins Nursing Evidence-Based Practice Model (Appendix A).
- All four research studies were randomized controlled trials and had "A" to "B" quality ratings (Newhouse et al., 2005).
- All studies used a 12.5% CHO beverage administered at similar times. While the volumes of the CHO beverage differed among studies, there were no reported complications regardless of the volume given.
- The sample sizes among the four research studies ranged between 40 and 172. Given the relatively small sample sizes in each of the studies, the ability to detect statistically significant differences among treatment groups is limited. However, study participants

were randomized to treatment conditions in all the studies, reducing the risk of observer bias.

- There was heterogeneity in methods used to evaluate the frequency of monitoring PONV among the trials. For example, the Visual Analog Scale (VAS) and Verbal Descriptive scale was used to evaluate incidence of PONV.
- Pre-operative carbohydrate loading can be safely used without increased risk of pulmonary aspiration when used up to 2 hours prior to surgery. It has also been demonstrated that preoperative carbohydrate loading improves preoperative wellbeing in patients by decreasing hunger, anxiety, nausea and discomfort.
- While studies with larger sample sizes are warranted, the evidence suggests preoperative carbohydrate loading can decrease the incidence of PONV in patients undergoing cholecystectomy.

Methods for Formulating the Recommendations

- The original Guidelines were developed by a Task Force of 7 members, including anesthesiologists, nurse anesthetists, and DNP nurse anesthesia students.
- The Task Force developed the original Guidelines by means of a six-step process:
    1. A consensus was reached on the criteria for evidence.
    2. Original published research studies from peer-reviewed journals relevant to preoperative carbohydrate loading were reviewed and evaluated.
    3. Expert consultants were asked to review and comment on a draft of the Guideline using the AGREE II tool.
    4. The Task Force held a series of meetings to solicit input on the draft recommendations.
    5. Target users were surveyed to assess their opinions on the feasibility of implementing the Guidelines. (see appendix E for Provider Feedback Questionnaire, {PFQ}).
    6. All available information was used to build consensus within the Task Force to finalize the Guideline recommendations.

BENEFITS/RISKS OF PREOPERATIVE CARBOHYDRATE LOADING

Health Benefits:

- Decreased hunger, anxiety, nausea, insulin resistance and discomfort.
- Decreased hospital length of stay, increase patient satisfaction and reduced health cost.

Potential Harms:

- Carbohydrate loading is proven to be safe, when administered to the target population up to 2 hours before surgery
- Preoperative fasting is associated with risk of dehydration, hypoglycemia, and potential for insulin resistance.

EXTERNAL REVIEW OF THE CPG

- The guideline should be updated every three years based on the most recent evidence

PRACTICE RECOMMENDATIONS

- Adult surgical patients 18 years of age and older undergoing open and laparoscopic cholecystectomy procedures should receive **12.5% CHO beverage: 800 mL the evening before surgery and an additional 400 mL 2 hours before surgery.** The purpose of this recommendation is intended to reduce postoperative nausea and vomiting and improve patient outcomes. The recommendation is **NOT intended** for patients with the following:
- Conditions (including pharmacologic treatments) that might impair gastrointestinal motility such as gastro-esophageal reflux
- Pregnancy
- ASA 3 or higher
- Medications which impair gastrointestinal motility
- Past history of PONV and motion sickness
- Documented cholelithiasis or suspected jaundice
- Potential for difficult airway management
- Diabetes or any endocrine disorder

Treatment Alternatives

1. Antiemetic agents should be used for the prevention and treatment of nausea and vomiting when indicated.
2. Multiple antiemetic agents may be used for the prevention or treatment of nausea and vomiting when indicated.

FACILITATORS AND BARRIERS TO GUIDELINE APPLICATION

Facilitators

- Patient education
- Provider involvement and feedback
- Accessibility
- Guideline is user friendly: content is clear and concise

Barriers

- Cost of education and training
- Resistance to change
- Patient refusal to participate

PUTTING RECOMMENDATIONS INTO PRACTICE

- PFQ and Agree 2 tool available in Appendices
- An electronic copy of clinical practice guideline will be available
- Summary documents available in the perioperative and surgical areas for end users
- Potential resource implications of applying the recommendations have been considered

Monitoring and/or Auditing Criteria

- Ongoing analysis of results of Practitioner Feedback Questionnaire
- Incorporating recommendations and making adjustments to guideline content based on results from the AGREE II tool

EDITORIAL INDEPENDENCE

- There is no specific funding body
- There are no competing interests

Appendix G

Content Assessment Index

The Context Assessment Index (CAI)

For each of the following statements, please put a cross in one box only.
A – Strongly agree; A – Agree; D – Disagree; SD – Strongly disagree
HCP= Healthcare professionals

		SA	A	D	SD
01	Personal and professional boundaries between HCPs are maintained	☑	☐	☐	☐
02	Decisions on care and management are clearly documented by all staff	☐	☑	☐	☐
03	A proactive approach to care is taken	☐	☑	☐	☐
04	All aspects of care/treatment are based on evidence of best practice	☐	☐	☑	☐
05	The nurse leader acts as a role model of good practice	☐	☑	☐	☐
06	HCPs provide opportunities for patients to participate in decisions about their own care	☑	☐	☐	☐
07	Education is a priority	☐	☑	☐	☐
08	There are good working relations between clinical and non-clinical staff	☐	☑	☐	☐
09	Staff receive feedback on the outcomes of complaints	☐	☑	☐	☐
10	HCPs in the MDT have equal authority in decision making	☐	☐	☑	☐
11	Audit and/or research findings are used to develop practice	☐	☐	☑	☐
12	A staff performance review process is in place which enables reflection on practice, goal setting and is regularly reviewed	☐	☑	☐	☐
13	Staff have explicit understanding of their own attitudes and beliefs towards the provision of care	☐	☑	☐	☐
14	Patients are encouraged to be active participants in their own care	☐	☑	☐	☐
15	There is high regard for patients privacy and dignity	☑	☐	☐	☐
16	HCPs and healthcare support workers understand each others role	☑	☐	☐	☐
17	The management structure is democratic and inclusive	☐	☑	☐	☐
18	Appropriate information (large written print, tapes, etc) is accessible to patients	☐	☐	☑	☐
19	HCPs and patients work as partners providing individual patient care	☐	☑	☐	☐

20	Care is based on comprehensive assessment	☑	☐	☐	☐
21	Challenges to practice are supported and encouraged by nurse leaders and nurse managers	☐	☑	☐	☐
22	Discussions are planned between HCPs and patients	☐	☑	☐	☐
23	The development of staff expertise is viewed as a priority by nurse leaders	☐	☑	☐	☐
24	Staff use reflective processes (e.g. action learning, clinical supervision or reflective diaries) to evaluate and develop practice	☑	☐	☐	☐
25	Organisational management has high regard for staff autonomy	☐	☑	☐	☐
26	Staff welcome and accept cultural diversity	☑	☐	☐	☐
27	Evidenced-based knowledge on care is available to staff	☐	☐	☑	☐
28	Patients have choice in assessing, planning and evaluating their care and treatment	☐	☑	☐	☐
29	HCPs have the opportunity to consult with specialists	☐	☑	☐	☐
30	HCPs feel empowered to develop practice	☐	☑	☐	☐
31	Clinical nurse leaders create an environment conducive to the development and sharing of ideas	☑	☐	☐	☐
32	Guidelines and protocols based on evidence of best practice (patient experience, clinical experience, research) are available	☐	☑	☐	☐
33	Patients are encouraged to participate in feedback on care, culture and systems	☐	☑	☐	☐
34	Resources are available to provide evidence-based care	☐	☑	☐	☐
35	The organisation is non-hierarchical	☐	☐	☑	☐
36	HCPs share common goals and objectives about patient care	☑	☐	☐	☐
37	Structured programmes of education are available to all HCPs	☑	☐	☐	☐

Element: Culture

Statement Numbers	1	3	7	9	12	15	16	18	21	23	24	28	31	33	34	36	**Total Score X 1.5625**
Scores	4	3	3	3	3	4	4	2	3	3	4	3	4	3	3	4	**= 82.8%**

Element: Leadership

Statement Numbers	2	6	10	17	22	27	29	**Total Score x 3.57**
Scores	3	4	2	3	3	2	3	**= 71.4%**

Element: Evaluation

Statement Numbers	4	5	8	11	13	14	19	20	25	26	30	32	35	37	**Total Score x 1.78**
Scores	2	3	3	2	3	3	3	4	3	4	3	3	2	4	**= 74.8%**