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Oral Carbohydrate Administration Prior to Colorectal Surgery: Practice Change Outcomes and Economic Analysis

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The University of Southern Mississippi

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ORAL CARBOHYDRATE ADMINISTRATION PRIOR TO
COLORECTAL SURGERY: PRACTICE CHANGE
OUTCOMES AND ECONOMIC ANALYSIS

by

Joshua Kendrick Ezelle

A Capstone Project
Submitted to the Graduate School
and the Department of Advanced Practice
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Nursing Practice

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ABSTRACT

ORAL CARBOHYDRATE ADMINISTRATION PRIOR TO COLORECTAL SURGERY: PRACTICE CHANGE OUTCOMES AND ECONOMIC ANALYSIS

by Joshua Kendrick Ezelle

December 2016

Difference in recovery times has been an interest of mine for many years. I observed that an open heart surgery routinely recovered and discharged on the third post-op day, while a colorectal patient often required a hospital stay of five to ten days. I began researching recovery methods of colorectal patients. I found enhanced recovery techniques like decreased narcotic, use of NSAIDs, early ambulation, and the use of medications that assist with bowel peristalsis are being employed nationally. Other techniques are now starting to be used with positive results. One of these is Carb-loading. Carb-loading is the oral intake of a small amount of carbohydrates (CHO) prior to surgery.

The fasting state of patients awaiting colorectal surgery directly increase the stress response of the body. Studies have shown a decrease in mean hospital days for patients who are given Maltodextrin prior to surgery when compared to patients who have no oral intake prior to surgery.

A thorough search of literature revealed several research studies on the benefits of Carb-loading. These articles provided information about the results associated with Carb-loading as an enhanced recovery technique and safety issues involved with oral intake prior to colorectal surgery.

A retrospective chart review was conducted at my practice site over a three-month period. This provided a needs assessment to determine how many patients would be candidates for Carb-loading prior to colorectal surgery. Inclusion criteria were ASA classification of 3 or less, ages 18 to 65, and undergoing non-emergent colorectal surgery.

The retrospective chart review yielded 24 patients meeting inclusion criteria. The mean length of stay was 4.46 days. With a benchmark average savings of 1.1 days found in the literature review, my practice site could save up to \$156,816 in a one-year period if Carb-loading was employed.

After sharing this information with surgeons at my clinical site, three of the four surgeons interviewed asked for more information and all four said they would consider a change in practice.

ACKNOWLEDGMENTS

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LIST OF ABBREVIATIONS

<i>CHO</i>	carbohydrate
DNP	Doctorate of nursing practice
HS	hour of sleep
<i>LOS</i>	length of stay
<i>NPO</i>	nothing by mouth
<i>USM</i>	The University of Southern Mississippi

CHAPTER I – INTRODUCTION AND PROBLEM

Surgery and anesthesia are both associated with loss of normal bowel function for multiple reasons. Stimulation of the sympathetic nervous system, blockade of the parasympathetic nervous system, use of paralytics, lower intraoperative blood pressure, and fasting states of patients all decrease motility and interrupt bowel functions. Furthermore, intestinal manipulation during colorectal surgery can compound motility issues. Colorectal surgical patients are at a high risk of infection due to the nature of the surgical techniques and state of the body at the time of surgical repair. Digital and surgical manipulation of the bowel may also lead to increased formation of bowel ileus that can further decrease bowel function (Frisman & Wallstrom, 2013).

Preoperative surgical techniques are designed to increase patient safety upon induction of anesthesia. Limiting the quantity of gastric content, and decreasing the acidity of the remaining gastric content help accomplish a safer surgical experience (Singleton, 2012). This concept is utilized in practice by limiting the preoperative oral intake to nothing by mouth (NPO) usually beginning at midnight the day of surgery. Withholding oral intake prior to surgery decreases the likelihood of aspiration on induction of anesthesia. This method is time proven to decrease aspiration, but it does nothing to prevent a normal catabolic response to the stress of surgery (Singleton, 2012).

Evidence supporting the efficacy of ingesting preoperative highly concentrated carbohydrate (CHO) containing solutions (Carb-loading) is growing. Further, there is no evidence that Carb-loading increases dangers of aspiration if done in a specific time period (Singleton, 2012). Carb-loading, especially for colorectal surgical procedures has proven beneficial in many areas that ultimately lead to a decrease in length of stay (LOS).

Improvements are also noted in loss of muscle mass, earlier return of bowel motility, and a reduction of insulin resistance (Yuill, Richardson, Davidson, Garden, & Parks, 2005).

Stress caused by surgery can impact surgical recovery in many ways. Surgical stimulation causes an increase in cortisol and glucagon production, while decreasing insulin production simultaneously. In effect, this causes a catabolic response that drives glucose levels up and decreases recovery quality (Desborough, 2000).

Project Question

1. Does consuming highly concentrated CHO solutions preoperatively by patients undergoing colorectal surgery decrease hospital LOS?
2. Does Carb-loading of pre-operative patients undergoing colorectal surgery offer a monetary savings compared to patients who do not consume highly concentrated CHO solutions?

Problem Statement

The fasting state of patients awaiting colorectal surgery directly increases the stress response of the body (Wang, Wang, Wang, & Qin, 2010). Studies have shown a decrease in mean hospital days for patients who are given Maltodextrin two hours prior to surgery when compared to patients who have no oral intake prior to surgery (Frisman & Wallstrom, 2013). The purpose of this study is to provide evidence to influence surgeons to change current practice by administering Maltodextrin two hours prior to colorectal surgery in appropriate patients.

The implementation of this project will have two goals. The first goal is to compare the LOS of patients who receive preoperative Maltodextrin with LOS of fasting

patients. The second goal will be compare the cost differences associated with differences in the mean LOS.

Significance of the Problem

In the changing landscape of healthcare, many patient care criteria and treatments are rapidly evolving. Since passage of the Affordable Care Act, reimbursement is being dictated by patient outcomes and satisfaction. Further, hospital stays are being reimbursed by surgical codes not by days of hospitalization, which reward those hospitals with shorter LOS. All aspects of hospital care are now being scrutinized at every level. This increase in scrutiny is designed to help streamline health care in order to standardize aspects of care, and achieve the best care outcomes with the lowest cost. One area with a large degree of variance in methods of care, surgery, and recovery is colorectal surgery.

Sanchez-Jimenez et al., (2014) report that delays in regaining bowel function after colorectal surgery are problematic. Delayed return of bowel function is usually due to a postoperative ileus (Sanchez-Jimenez et al.,2014). An ileus is a painful blockage of the intestines caused by lack of peristalsis. The loss of intestinal peristalsis is due to many factors including: long periods of preoperative fasting, loss of postoperative physical mobility, increased narcotic use and decreased intestinal perfusion during surgery (Sanchez-Jimenez et al., 2014).

A major concern of all surgeons and anesthesia providers is safety. In the surgical population aspiration is at the forefront of every surgical and anesthesia provider's safety checklist. One of the drawbacks of carb-loading is the requirement of oral intake in a period usually designated NPO. A study conducted by Maltby, Lewis, Martin, and Sutherland (1991) found that gastric pH and gastric volumes were consistent whether

NPO for eight hours or three hours. This study validated the safety of shorter NPO requirement times, which provides support for a CHO drink administered preoperatively. Another major concern of carb-loading is the patients' ability to comply with carb-loading protocols. Hendry et al., (2007) studied the patient's ability to obtain carb-loading prescriptions, which may counteract effects of a bowel prep, comply with protocol, and to complete the regimen. The study found that 74% of patients were able to comply with preoperative carb-loading requirements and complete the conditioning (Hendry et al., 2007).

By providing pre-operative CHO three hours prior to surgery, patients thirst and hunger will decrease. Decreasing patient hunger and thirst discomfort may increase patient satisfaction ratings.

Project Model

The Rosswurm and Larrabee model (1999) is based on theoretical and research literature related to evidenced-based practice, research utilization, standardized language, and change theory. This model assists advanced practice nurses to develop and integrate an evidenced-based change. It also supports evidenced-based practice changes collected from quantitative and qualitative data, clinical experience, and contextual evidence.

The Rosswurm and Larrabee model was implemented in this project in many areas. I assessed the need for change by identifying a local hospital that does not include Carb-loading into current preoperative colorectal surgeries. LOS was compared between the colorectal surgical patients at my clinical site and the LOS recorded in the literature review.

The problem was linked to an intervention. Carb-loading was studied during the literature review as well by interviewing surgeons who use it in their current practice. This helped form the outcome indicator LOS.

The review of literature acted as the synthesis of best evidence practice. It is the benchmark research that my comparative basis of length of stay was measured as an external variable.

My capstone project was the design for my proposed change in practice. This allowed me to report my findings to the surgeons of my research site and introduce them to Carb-loading. All four of the surgeons interviewed have expressed interest in further research that may lead to a change in practice.

Pre-operative Carb-loading order sets were obtained from a facility that is currently using routine Carb-loading prior to colorectal surgeries. This provided an overview of the practice for the surgeons at my research site and may allow for integration into current practice. Maintenance of this project will be monitored if it is accepted into practice at my clinical site. This will be done to monitor the effect of Carb-loading in my clinical site's patient population.

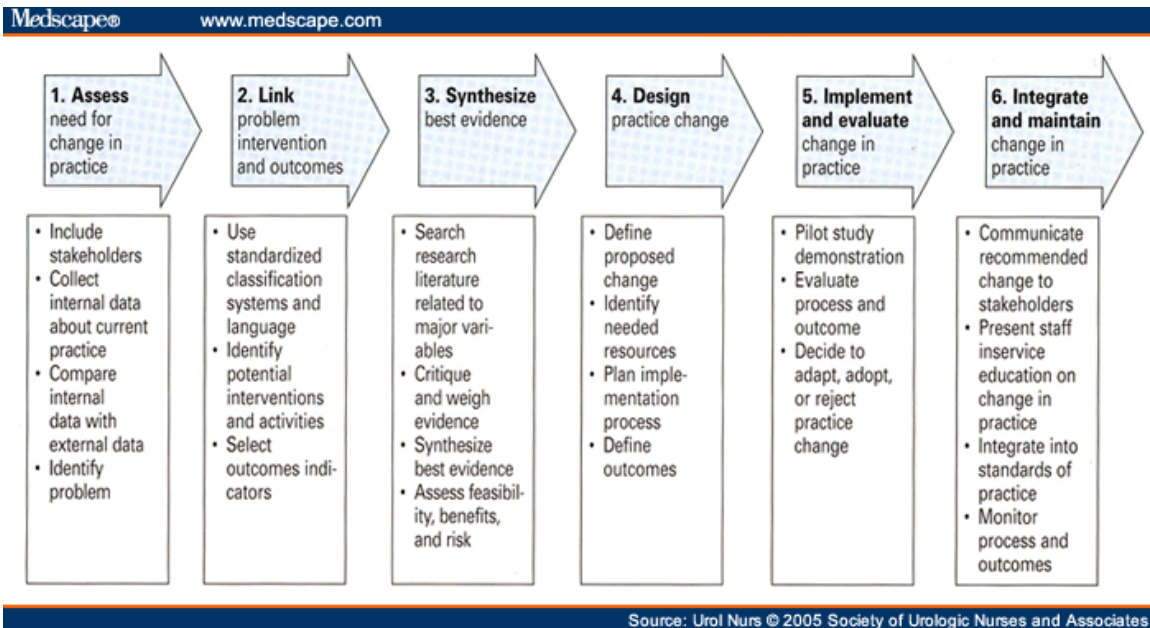


Figure 1. Rosswurm and Larrabee model for change to evidence-based practice.

Note: Pipe, Wellik, Buchda, Hansen, and Martyn (2005)

Doctor of Nursing Practice Essentials

Doctor of Nursing Practice (DNP) essentials are basic elements that must be met in order to obtain a DNP degree. There are eight DNP essentials. This project meets all eight to a degree, however, three were strongly met. These three will be discussed in more depth in this section.

Essential II is the organizational and systems leadership for quality improvement and systems thinking. This project assesses the need for Carb-loading, and provides a structure for change of practice to the surgeons of the practice site.

Essential IV is information systems/technology and patient care technology for the improvement and transformation of health care. Electronic health records were assessed to conduct a thorough retrospective chart review. This allowed the project to accurately assess the need for a practice change.

Essential VI Interprofessional collaboration for improving patient and population health outcomes. Surgeons, anesthesiologist, nurses, billing coders, and administrators were collaborators on this project.

Essentials II, IV, and VI were the central essentials explored in this project. All eight essentials were covered during the fulfillment of this project. All of the essentials and their relationship to this project can be found in Appendix C.

CHAPTER II – LITERATURE REVIEW

There are multiple preventative measures and treatments aimed at accelerating postoperative bowel motility. These methods are often used in a multi modal approach to accelerate return of bowel function and ultimately decrease LOS and complications after colorectal surgery. One method that is gaining popularity is the practice of Carb-loading, the consumption of a concentrated CHO liquid two hours before colorectal surgery.

A comprehensive search strategy was used to locate articles relating to preoperative CHO intake before colorectal surgery with accelerated bowel motility. Multiple databases were accessed for this literature review. Databases included CINAHL with full text, PubMed, EBSCO, and Google Scholar. Search terms included carbohydrate, carb-loading, colorectal surgery, outcomes, and motility. Inclusion criteria were articles published in the last ten years, English language, and report on surgical outcomes. The large majority of articles found in this search were studies on CHO consumption and physical exercise. The exclusion criteria therefore, were articles dealing with carbohydrate intake and recovery after physical exercise. This eliminated non-research articles, leaving five articles pertinent to this project (see Appendix A).

Jones, Badger, and Hannon (2011) examined evidence regarding use of CHO drinks as preoperative nutrition for colorectal surgery. They conducted a comprehensive literature review in order to determine the safety and postoperative effect Carb-loading would have on colorectal surgical patients. In traditional surgical preparation patients are required to fast beginning at midnight the day of surgery. This has been done to assure the patient's stomach is empty, and to prevent aspiration upon induction of anesthesia. More recent fasting strategies include allowing patients to eat solid food up to six hours

before surgery and consumption of clear liquids within two hours of surgery (Jones et al. 2011.)

Lower volumes of stomach contents help maintain a more alkaline pH of gastric contents. Lower volumes of less acidic stomach content are considered of paramount importance to anesthesia providers. Lower volumes decrease the chance of aspiration of stomach contents, while higher pH decreases the chance of developing aspiration pneumonia if aspiration does occur (Jones et al., 2011).

The most common method of carb-loading is to drink 800ml of a CHO rich clear liquid the evening prior to surgery and 400ml of the same solution two to three hours preoperatively. This process neither increased stomach content volume nor altered pH. The lack of change in stomach contents shows that there is no increased risk for aspiration pneumonia and can be considered safe from an anesthesia provider's vantage point (Jones et al., 2011).

The study concluded that preoperative carbohydrate drinks were effective in accelerating the return of bowel function. This decreased the length of hospitalization and slowed muscle loss following colorectal surgery. Diabetic implications were not studied in depth. Further research involving diabetes and Carb-loading is needed to ensure safety parameters for this population (Jones et al., 2011).

Lidder et al. (2013) studied the effects of preoperative and early postoperative consumption of CHO drinks in colorectal surgeries. A surgically induced catabolic response releases glucagon, cortisol, and catecholamines, which are considered stress hormones. Increased levels of these hormones cause cellular dysfunction, and insulin resistance ensues as a result. Insulin resistance is a loss of insulin sensitivity at a cellular

level. A relationship between higher insulin resistance and longer postoperative LOS has been well established (Lidder et al., 2013).

One hundred-twenty patients were randomized into four demographically equivalent groups. The groups included preoperative CHO consumption, early postoperative CHO consumption, preoperative and postoperative consumption of CHO solution, and a placebo group. Outcome measurements included pulmonary function, hand strength, intestinal permeability, and insulin resistance (Lidder et al. 2013).

All groups showed a decrease in postoperative pulmonary function, hand strength, intestinal permeability and increase in insulin resistance. However, the groups receiving CHO solution both preoperatively and postoperatively improved more rapidly than the placebo group in all measured functions. The group that received both preoperative and postoperative CHO replacement demonstrated the most improvement at a higher rate than all other groups (Lidder et al., 2013).

A 2005 study conducted by Yuill et al. focused on the effects of oral CHO consumption prior to elective abdominal surgery. This study consisted of a double blind, randomized trial in which patients undergoing abdominal surgery either consumed a CHO drink or a placebo two to three hours prior to anesthetic induction. The results of the trial were based on muscle atrophy, blood glucose, insulin levels, and LOS.

Seventy-two patients were recruited for the study. Of these patients sixty-five completed the study. Thirty-four randomized patients receive the placebo, while thirty-one randomized patients received the CHO solution. The results of the study were a reduction of loss of muscle mass by .6 cm, a decrease in mean LOS of two days, and little

difference in blood glucose and insulin levels as compared to the control group (Yuill et al., 2005).

Wang et al. (2010) conducted a study on preoperative oral CHO consumption versus placebo on insulin resistance after colorectal surgery. This study measures postoperative insulin resistance by measuring phosphatidylinositol 3-kinase (PI3K) and protein kinase B (PKB), which are signaling pathways induced by insulin. Forty-eight patients undergoing colorectal surgery for removal of colon cancer mass were randomly divided into three groups. Group 1 received 400ml of a CHO drink three hours before surgery, group 2 fasted after midnight, and group 3 received a 400ml placebo drink three hours prior to surgery (Wang et al., 2010).

Group 1 postoperative insulin resistance was found to be much lower than in the fasting and placebo groups as evidenced by PTB and PI3K levels being significantly higher in the CHO group. Improvements in patient reported hunger, thirst, and anxiety were also found in the group receiving the CHO drink preoperatively (Wang et al., 2010).

Mathur et al. (2010) conducted a study of preoperative oral CHO treatment in major abdominal surgery. The goal was to determine if there is a decrease in hospital stay for patients undergoing major abdominal surgery after receiving preoperative oral CHO solution. The aim of administering preoperative CHO is to decrease the stress response of the endocrine and inflammatory systems, which leads to insulin resistance. Reduction of insulin resistance causes lower postoperative blood glucose levels. This has been attributed to lower infection rates and better clinical outcomes (Mathur et al., 2010).

A randomized controlled trial was conducted to evaluate preoperative CHO consumption versus a placebo in 142 patients. Sixty-nine patients received the CHO

drink two hours before anesthesia induction while seventy-three patients received the placebo. The groups were matched to evenly distribute surgical procedures, epidural anesthesia, and fasting period before anesthesia (Mathur et al., 2010).

No improvement in postoperative fatigue was noted in the study. The mean LOS in the CHO group was seven days versus eight days for the placebo group. The gap was the widest between CHO and placebo groups with patients who did not receive an epidural or laparoscopic procedure. In this subset of patients, the CHO group means LOS was seven days compared to a mean LOS of nine days with the placebo group (Mathur et al., 2010).

A 2005 study conducted by Svanfeldt et al. examined the effects of oral CHO administration on the action of insulin in healthy patients. The study was a crossover-randomized trial among six healthy patients. Each patient was tested four separate times in four separate groups. The groups consisted of NPO after midnight, NPO after a single CHO evening dose, NPO overnight with a morning dose, and NPO except for both an evening and morning CHO dose.

Statistical analysis was performed using t-test and ANOVA. Insulin sensitivity was found to be highest among the morning and morning /evening combination groups. Insulin resistance was highest among the NPO and evening only groups. The results of the study concluded that oral CHO administration three hours before testing enhanced insulin action by approximately 50% (Svanfeldt et al., 2012).

A 2006 study conducted by Noblett et al. examined the connection between preoperative oral CHO consumption and GI function, LOS, and strength. The study was performed on elective colorectal surgical patients. This study was a double-blind

randomized trial consisted of three groups. The first group fasted prior to surgery. The second group received only water after midnight prior to surgery. The third group received Maltodextrin, a CHO rich oral solution, prior to surgery. The results of the study showed a marked reduction in LOS with the Maltodextrin group with seven days compared to thirteen days with the water group and ten days with the fasting group. An improvement was also seen in time to first bowel movement of three days postoperatively, compared to four days in the fasting group and five days on the water only group was shown. Little difference was noted between the groups on grip strength (Noble et al., 2006).

A 2013 meta-analysis study conducted by Awad, Ljungqvist, Varadhan, and Lobo examined the results of multiple randomized control trials of elective surgical patients who were treated preoperatively with oral CHO. The method was to compare studies using randomized non-diabetic adults undergoing elective surgery. The study group was treated with 50 grams or greater of an oral CHO solution two to four hours before the elective procedure. The primary purpose of the study was to determine if decrease in LOS was obtained with the study group. The secondary was to measure outcomes of insulin resistance, nausea, vomiting, and increase in postoperative complications.

The 1685 patients were included from twenty-one randomized studies. The control group consisted of 952 patients, while the study group consisted of 733 patients. The most favorable results were recorded in the surgical group of major abdominal surgery. The study found that this sample group was discharged 1.08 days earlier than the control group. The findings were considered to have a low to moderate quality of evidence due to a high diversity in the population of the study (Awad et al., 2012).

This review of literature supports the administration of an oral CHO in the preoperative time frame of two to six hours by patients undergoing colorectal surgery. The evidence shows a varying degree of benefit, and very little evidence for complications related to preoperative CHO consumption. A decrease in LOS greater than one day was recorded in four of the five articles. A decrease in insulin resistance was also recorded in three of the studies in varying degrees. From an anesthesia standpoint there seems to be very little added risk of aspiration among the general population. The diabetic population needs further study as these patients are prone to slow gastric emptying and may be at higher risk for aspiration.

CHAPTER III -METHODOLOGY

Prior to this project, a SWOT analysis and logic model were created to guide the project (see Appendices D and E).

Population

The population of this study was adults between the ages of 18 to 65 years of age undergoing non-emergent colorectal surgery. The sample of this project includes patients between the ages of 18 and 65 years of age undergoing non-emergent colorectal surgery with an ASA of 3 or less. Upon approval by the institutional review board (IRB) of both The University of Southern Mississippi and a southeastern Mississippi hospital, the sample was gathered from a retrospective chart review conducted at a southeastern Mississippi hospital. See Appendix B. Inclusion criteria for this project are ASA classification of three or less, ages 18 to 65, and undergoing non-emergent colorectal surgery. Exclusion criteria are ages less than 18 and greater than 65 years of age, ASA classification of four or greater, emergent colorectal surgery, Crohn's disease, and inpatient ICU stay directly prior to surgery.

Sample

Demographic information of diagnosis, LOS, age, ASA classification, body mass index, and gender was recorded on a password protected excel spreadsheet. Each patient was assigned an ID number to protect identity. A comparison of LOS was made between the Carb-loaded patients of the literature review and the sample group of non-CHO loaded patients at this practice site. A projection was made to determine how many patients would have been candidates for the oral consumption of CHO prior to colorectal

surgery at this practice site between the dates of March 1, 2016 and May 31, 2016 using a retrospective chart review method.

Cost Analysis

A cost analysis was generated comparing cost of savings of LOS. This was based on the average cost per day of a medical surgical floor accrued at this practice site. The Cost per day was multiplied by the projected average savings of LOS per patient. This savings was multiplied by the projected number of patients that this practice will have in one year. This projected a monetary saving that was provided to the practice site surgeons, administrators, and anesthesia providers.

Practice Protocol

An interview of two surgeons who are currently using preoperative Carb-loading order sets at another hospital about 200 miles away from my practice site was conducted. Both surgeons were questioned about their perception of patient benefit to risk ratios, differences in LOS compared to standard preoperative methods, cost of treatment, and estimated savings during the interview. In order to provide surgeons at the practice site with an innovation adopter's guide of practice, a copy of their standing orders was also obtained to use as an example for later physician interactions at my practice site.

Upon completion of the retrospective chart review and analysis of the data, an information pamphlet was created supplying evidence-based information on preoperative CHO consumption with colorectal surgery, comparison of LOS, and cost saving projections for the practice site. A survey of the general surgeons was conducted on readiness of acceptance of Carb-loading prior to colorectal surgery. A short presentation was made to the surgeons to report my findings and address possible concerns. After the

presentation a review survey was conducted to ascertain the surgeons' willingness to accept Carb-loading as a potential practice change.

CHAPTER IV – RESULTS AND DISCUSSION

A three-month chart review was conducted at the practice site between the dates of March 1, 2016 through May 31, 2016. The search used the inclusion criteria of patients with an ASA classification of 3 or less, ages 18 to 65, and undergoing non-emergent colorectal surgery. Exclusion criteria used were ages less than 18 and greater than 65 years of age, ASA classification of 4 or greater, emergent colorectal surgery, and Crohn's disease. After examination of the data one more exclusion criteria was added. In patients transferred from ICU were also excluded due to an extended LOS likely associated with comorbidities.

The chart review produced 30 patients in the three-month time frame. Six of these patients were excluded. The first patient exclusion was due to emergent surgery. Four patients were excluded due to ICU admissions prior to surgery. The final patient was excluded on the basis of a Crohn's disease diagnosis.

Twenty-four patients met the inclusion criteria. The average LOS was 4.46 days (n=24). This means that this clinical site can reasonably expect 96 patients per year that will meet the criteria for preoperative Carb-Loading prior to colorectal surgery. The 96 patients a year is based on an eight patients per month average found in the retrospective chart review.

Financial Analysis

The literature review found an average decrease in LOS of 1.1 days. However, the patients in the literature review recorded stays of seven to ten days (Noblett et al.,2006). In these studies, Carb-loading was used as a primary enhanced recovery technique. The patient population of the practice site has a much lower average postop LOS of 4.46 days.

A discussion with the surgeons at the practice site agreed that it is not unreasonable to expect the same level of decrease in length of stay of 1.1 days between the two populations. This is due to two factors. A lower average LOS at the practice site, and Carb-loading will be incorporated as a multimodal enhanced recovery technique at the practice site. It would be used along with early mobility, decreased narcotics, use of Ofirmev, and use of Reglan on post-op patients. These other enhanced recovery techniques have accounted for substantial savings in LOS already. They agreed, however, that some savings in LOS and cost may be realized.

The average billed cost of stay on a medical surgical floor at the practice site is \$1485 per day. If this hospital did see that average savings recorded in the literature review of 1.1 days, a yearly savings of \$156,816 could be realized. This is based on 96 projected patients per year saving 1.1 days per hospital stay. One could expect a lesser amount based on the already reduced LOS at the practice site.

Maltodextrin is sold in bulk and is extremely affordable. Bulk prices average 54 cents per dose. Patients classically consume two doses prior to surgery. Carb-loading can also be performed with an alternative of consuming Gatorade prior to bed the night before surgery. Retail cost of 16 oz. of Gatorade is \$1.50.

Surgeon Survey

Five general surgeons performed all of the surgeries whose charts were reviewed. Four of the surgeons participated in a brief report of findings of the conducted chart review. A short explanation of Carb-loading as an enhanced recovery technique was given. An explanation of dosing routines of the literature review was provided along with the actual Carb-loading technique incorporated by the two early adopter surgeons at

another site. Both of these surgeons use an alternative technique of Carb-loading with 16 oz. of Gatorade the night prior to surgery just prior to bed.

The four surgeons surveyed were all interested in Carb-loading as an enhanced recovery technique including research articles and early adopters contact information. All four surgeons requested more in depth information. The information found in this capstone was forwarded to all of the surgeons so that more investigation on Carb-loading may be conducted at a later date. The four surgeons shared two main concerns. They were concerned about patients' ability to follow directions at home prior to surgery. NPO safety was also a major concern. All four surgeons preferred the preoperative Gatorade the night before vs the preoperative CHO three hours pre-op.

Discussion

Carb-loading in its simplest definition is the oral intake of CHO prior to an expected stress to the body. Athletes developed this technique as an enhanced workout recovery technique. The literature shows a significant decrease in LOS for colorectal surgical patients. It is not possible to accurately predict the monetary savings at a hospital that has already incorporated multiple enhanced recovery techniques into standard practice. A benchmark prediction from the literature was used to compare LOS cost savings. A study is needed at the practice site to compare Carb-loading to a placebo group if the practice change is adopted. The benefits of reduction of insulin resistance decrease of LOS, and earlier motility are well documented when used as a primary enhanced recovery technique. Decreases in reports of thirst and hunger were found in the literature. This may help post-op patient satisfaction scores as well.

The interest shown in Carb-loading by the general surgeons of the practice site shows a strong possibility for a practice change in the future. These surgeons and anesthesia providers must conduct further research on patient safety pertaining to aspiration risks and patient benefits before Carb-loading is adapted. Alternative techniques of Carb-loading with Gatorade the night prior to surgery was perceived as a safer technique when surveying the general surgeons. All four surgeons showed more enthusiasm concerning this technique and showed interest in LOS information collected by the north Mississippi hospital.

There may be future implications for this study to be continued in manner that combines controlled pre-operative Hemoglobin A1C with Carb-loading in an effort to decrease postoperative infection rates. This may well have implications outside of colorectal surgeries.

APPENDIX A – Literature Matrix

AUTHOR	YEAR	DESIGN	FRAME WORK	SAMPLE	FINDINGS	NOTES
Lian, L., Patel, S., Shen, B.	2010	Quantitative, Historical cohort	No theoretical framework was used	n=11(patients with crohn's disease with ileal pouchanastomosis Control=44 patients with ulcerative colitis with ileal pouch anastomosis	Patients with preoperative Crohn's disease were much more likely to develop Crohn's disease in the anastomosis than patients with preoperative ulcerative colitis.	The risk of failure of restorative proctocolectomy is extremely high in Crohn's patient due to postoperative development of Crohn's in the anal pouch. This is a small sample size due to a very small population
Frisman, G., Wallstrom, A.	2013	Systematic review of 34 randomized controlled trials	No theoretical framework was used	The thirty four studies that were included produced 2243 patients undergoing colorectal surgery.	Probiotics, early feedings, spinal anesthesia, and non-opioid analgesics accelerated bowel motility in colorectal surgical patients.	Carb-loading was inconclusive on bowel motility.
Awad, Varadhan, Ljungqvist, and Lobo	2013	Meta-analysis of randomized control trials	No theoretical framework was used	1685 patients were included using twenty one randomized studies. The control group consisted of 952 patients while the sample group was made up of 733 patients	examined the results of multiple randomized control trials of elective surgical patients who were treated preoperatively with oral carbohydrates. The method was to compare studies using randomized non-diabetic adults undergoing elective surgery. The sample groups were treated with 50grams or greater of an oral carbohydrate solution 2-4 hours before the elective procedure	that this sample group was discharged 1.08 days earlier than the control group

Jones, C., Badger, S. A., & Hannon, R.	2011		No theoretical framework was used			This process neither increased stomach content volume nor altered pH.
Lidder, Thomas, Flemings, Hosie, Shaw, and Lewis	2013	Quantitative, Historical cohort	No theoretical framework was used	One hundred twenty patients were randomized into four demographically equivalent groups.	. Groups receiving carbohydrate solution both preoperatively and postoperatively improved more rapidly than the placebo group in all measured functions. The group that received both preoperative and postoperative carbohydrate replacement demonstrated that most improvement at a higher rate than all other groups	

APPENDIX B – IRB Approval Letters

USM IRB Approval



INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 16090702
PROJECT TITLE: Oral Carbohydrate Administration prior to Colorectal Surgery: Practice Change Outcomes and Economic Analysis
PROJECT TYPE: New Project
RESEARCHER(S): Joshua Ezelle
COLLEGE/DIVISION: College of Nursing
DEPARTMENT: Advanced Nursing Practice
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 09/12/2016 to 09/11/2017
Lawrence A. Hosman, Ph.D.
Institutional Review Board

Hospital IRB Approval



DATE: August 3, 2016

TO: Joshua Ezelle, RN,BSN

FROM: [REDACTED] General Hospital Institutional Review Board

STUDY TITLE: [929023-1] ORAL CARBOHYDRATE ADMINISTRATION PRIOR TO COLORECTAL SURGERY: PRACTICE CHANGE OUTCOMES AND ECONOMIC ANALYSIS

SUBMISSION TYPE: HIPAA IRB Waiver of Authorization

ACTION: APPROVED

APPROVAL DATE: July 20, 2016

EXPIRATION DATE: July 19, 2017

REVIEW TYPE: Full Committee Review

The [REDACTED] General Hospital Institutional Review Board ([REDACTED] IRB) has reviewed and approved the Waiver of Authorization for use of protected health information (PHI) for this research study as outlined in the approved research protocol.

In approving this Waiver of Authorization, the [REDACTED] IRB has determined the following criteria has been met:

The use or disclosure of the requested information involves no more than a minimal risk to the privacy of individuals based on, at least, the presence of the following elements:

- An adequate plan to protect the identifiers from improper use and disclosure
- An adequate plan to destroy the identifiers at the earliest opportunity consistent with conduct of the research, unless there is a health or research justification for retaining the identifiers or such retention is otherwise required by law.
- Adequate written assurances that the requested information will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the research study, or for other research for which the use or disclosure of the requested information would be permitted by the Privacy Rule.
- The research could not practicably be conducted without the waiver or alteration
- The research could not practicably be conducted without access to and use of the requested information

In making this determination the [REDACTED] IRB has followed the requirements of the Common Rule using Full Board Review procedures.

APPENDIX C – Doctor of Nursing Essentials

	Doctor of Nursing Essentials	How the Essential is Achieved
I.	Scientific Underpinnings for Practice	By using physiological evidence and a change model, a positive change will be made to the health status of colorectal surgical patients.
II.	Organizational and Systems Leadership for Quality Improvement and Systems Thinking	The goal of this project is to change current preoperative practices that will improve patient outcomes.
III.	Clinical Scholarship and Analytical Methods for Evidence-Based Practice	This essential was met through the conduction of an evidence review for this doctoral project.
IV.	Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	The concept behind this doctoral project is to improve current patient preoperative routines. Information systems will be used to extract information and compare outcomes of current patients with the outcomes of patients in the benchmark literature review.
V.	Health Care Policy for Advocacy in Health Care	The intended purpose of this doctoral project is to introduce a new practice guideline to the practice site that will improve patient outcomes for colorectal surgical patients.
VI.	Interprofessional Collaboration for Improving patient and Population Health Outcomes	The doctoral project relies upon the collaboration between anesthesia providers, preoperative nursing staff, IT, business department, and the general surgeons.
VII.	Clinical Prevention and Population Health for Improving the Nation’s Health	This project is geared to changing current preoperative routines to minimize the length of stay and patient risk.
VIII.	Advanced Nursing Practice	The analysis of evidence based data, the synthesis of that data, the implementation of practice change, and adding to the clinical knowledge are expected of the advanced practice nurse.

APPENDIX D – SWOT Analysis

Strength	Weakness	Opportunities	Threats
<p>Strengths include an enhance recovery technique that allows for faster return of bowel motility, faster return to pre-surgical assessment level, decrease in insulin resistance, and decrease in length of stay. Use of early surgeon adopters as resource.</p>	<p>The weakness of this project will be requiring preoperative patients to drink a clear liquid carbohydrate mixture prior to surgery. This is out of the normal preoperative routine of NPO after midnight to decrease the chance of aspiration.</p>	<p>Opportunities will be earned by utilizing a needs assessment that will show the number of patients that could be affected per year at a hospital. A cost analysis of the solution administration and estimated saving of enhanced recovery will be used to educate physicians, anesthesiologists, and nurses. Chance to increase patient satisfaction, decrease LOS, hunger, and anxiety.</p>	<p>The major threat to the adoption of this project will be the surgeons. Many will perceive an alteration in NPO status as an increased risk of liability. This is why any patients with a comorbidity that could slow gastric emptying will not be a candidate for this enhanced recovery technique.</p>

APPENDIX E – Logic Model

Inputs	Activities	Outputs	Initial Outcomes	Intermediate Outcomes	Long-term Outcomes
<p>Necessary research information will be sought using a multiple site searches of relevant literature.</p> <p>Local general surgeons will be consulted for expertise as willing nearby early adopters.</p>	<p>Proposal will be created as a facility guideline to incorporate preoperative carbohydrate consumption prior to colorectal surgeries.</p> <p>Finding of the literature review will support change to current NPO status by showing improved morbidity, decreasing time of stay, and decreasing cost of hospitalization with carbohydrate intake.</p>	<p>Findings will be discussed with multiple levels of providers and administrators. Ultimately GI and general surgery practitioners will have the largest impact on acceptance. PACU, ICU, and step-down floor administrations that recover colorectal surgeries may have and impact on facility decisions.</p>	<p>With initial acceptance and changes to current preoperative NPO procedures, benefits to patients will be seen in the areas of insulin resistance, return of bowel motility, and decrease in associated hospital related morbidities. All will lead to increased patient outcomes.</p>	<p>Increase in patient outcome, patient satisfaction, and decrease in cost associated with high morbidities will prompt more facility involvement.</p>	<p>A trend in regional preoperative care may be seen. As improvement in patients outcomes and reimbursements continue to rise, many surgeons will value shorter hospital stays over the 2 hour increase in preoperative time that is associated with the preoperative carbohydrate intake. This will lead to continued utilization of this preoperative technique.</p>

APPENDIX F – Data Collection Tool

	age	ASA	diagnosis	LOS	ICU LOS	med-surg LOS
Subject A						
Subject B						

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