

The Effect of an Enhanced Recovery Protocol in Bariatric Surgery Postoperative Pain

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June 16, 2017

Abstract

Pain management in bariatric surgery patients is challenging because of multiple factors including chronic pain conditions, perception differences, and varied impacts of pain medications. As a result, postoperative pain tends to be poorly managed leading to increased opiate consumption in this population (Raebel et al., 2013). The enhanced recovery protocol is a newer multimodal postoperative management protocol with demonstrated improved pain control in abdominal surgery patients (Thompson et al., 2012). It has also been shown to be safe in bariatric surgery patients (Awad et al., 2012). In order to study its effects as a pain management protocol in bariatric surgery patients, a retrospective chart analysis was completed of 285 bariatric surgery patients at a Midwestern hospital. Statistical analysis comparing surgical patients from October 1, 2015 to March 31, 2016 (Traditional Recovery) to patients from April 1, 2016 to September 30, 2016 (Enhanced Recovery) demonstrated a nonsignificant decrease in average pain scores. There was a statistically significant decrease in the length of stay in the enhanced recovery patients, compared to the traditional recovery group. While there was no statistically significant change in HCAHPS scores, there were noticeable increases in satisfaction for enhanced recovery patients.

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Introduction

Pain management is a common problem for many individuals in the hospital. Research has demonstrated that during any given day, 44 to 88 percent of patients are suffering from pain (Zoëga et al., 2015). Of this population, almost one-third suffer from what is classified as severe pain or pain that is patient reported to be a seven or greater on a numerical 0-10 pain scale with 10 as the greatest amount of pain (Zoëga et al., 2015). While pain is experienced in every patient population, patients in the postoperative period are known to have higher rates of pain and are more likely to have severe pain. Poorly managed postoperative pain has many negative effects for patients including a reduction in patient satisfaction as well as the potential to develop chronic pain (Nanof, 2016). Chronic pain has various definitions, but the most widely accepted definition is pain that lasts longer than six months and serves no protective purpose (McCance, Huether, Brashers, & Rote, 2010). Chronic pain is a growing problem within the United States that has resulted in numerous public health issues including the current opiate crisis.

One critical population that is at risk for pain management issues is the bariatric surgery population. While several potential reasons exist, there are two key reasons as to why pain management is challenging. The first is that bariatric patients (patients with a body mass index (BMI) of 30 or greater) have notably lower pain perception thresholds (Raebel et al., 2013). Pain perception in the body occurs because of nociceptors interpreting a noxious stimulus as a potential threat and thereby transmitting this threat to the brain, resulting in an unpleasant sensation. This result causes the body to perform an action to negate that response (McCance, Huether, Brashers, & Rote, 2010). Therefore,

pain is perceived sooner in bariatric populations and is perceived as being more severe than in patients of normal BMI (20-26). While it is not precisely known what causes the change in perception rates in obese patients, it is more than likely due to the result of increased body weight misshaping receptors and increased inflammation. As a result, patients undergoing processes such as surgery are more likely to perceive pain at early stages of recovery and have more intense pain.

The second major reason for issues with pain management in a bariatric patient is a lack of research into non-traditional pain management models within the population. Despite research that demonstrates non-opiate medications being successful for pain management in non-surgical settings, bariatric surgery patients are typically managed via the usage of opiate pain medications in the postoperative period (Raebel et al., 2013). Opiate usage, while not only potentially dangerous because of its sedating properties, is closely tied with several complications, in particular, nausea and vomiting (Ziemann-Gimmel, Hensel, Koppman, & Marema, 2014). Chronic opiate usage also increases drastically in post-operative populations that are managed exclusively with opiates in the post-operative period (Raebel et al., 2013).

Enhanced recovery protocols are multimodal patient management protocols aimed at reducing patient length of stay and complications (Thompson et al., 2012). Initially used in colorectal patients as a way to increase the rate of return of bowel function, these multimodal protocols are slowly being adapted for other surgical specialties, including bariatrics. Hallmarks of these protocols are the use of multiple classifications of pain medications and early feeding of patients. The result has been tied to statistically significant decreases in patient length of stay and lower pain scores (Thompson et al.,

2012). Bariatric surgery is one of the most recent specialties to adopt these protocols. Current research on enhanced recovery protocols has been limited to the focus of safety in bariatric patients and has yet to study the potential benefit of improved pain control.

Problem Statement

Current opiate-only protocols are resulting in substandard, post-operative pain management in bariatric surgery patients and increasing rates of complications. As noted by Ziemann-Gimmel, Hensel, Koppman, and Marema (2013), opiate-only protocols are associated with increased postoperative nausea, vomiting, and respiratory distress. Lack of research into other protocols, especially multimodal post-operative pain management protocols, including enhanced recovery protocols, is lacking in bariatric surgery patients, and negatively impacting patient outcomes.

Purpose of the Project

The purpose of this project was to evaluate the effectiveness of the enhanced recovery protocol in the management of postoperative pain and postoperative perceptions of pain control in patients undergoing laparoscopic bariatric surgery.

Clinical Question

In order to gain insight into the impacts of enhanced recovery protocols in bariatric surgery pain management, the following PICO question was developed:

“Does the utilization of an enhanced recovery protocol in laparoscopic bariatric surgery patients reduce pain scores and improve patient satisfaction with pain control in the immediate postoperative period in comparison to those utilizing traditional pain management techniques?”

Outcomes

The aforementioned question was proposed with the following outcomes expected:

1. Enhanced recovery protocols with pain management in laparoscopic bariatric surgery populations will result in significantly lower pain scores compared to traditional pain management protocols, as evidenced by postoperative patient pain ratings on the numerical pain scale.

Bariatric surgery patients, using enhanced recovery protocols, will have significantly higher satisfaction regarding pain control, in comparison to traditional pain management protocol.

There will be increased understanding of the relationship between patient related pain scores and patient characteristics (gender, age, body mass index, length of stay, and surgery type).

Assessment of the Organization

The site of this study was a major Midwest surgical hospital. Currently, this hospital is the primary hospital for all non-gynecological and non-obstetric services within its organization. It is predominately a surgical hospital, with some of the busiest operating rooms in the state (BestCare.org, 2016a). The hospital is also a Magnet-designated hospital for nursing excellence (BestCare.org, 2016a).

One surgical specialty that is provided at this hospital is bariatric surgery. Bariatric surgery was, until September 30, 2016, a service provided by two surgeons. The hospital's program is a designated Center of Bariatric Surgery Excellence by the American Society of Metabolic and Bariatric Surgery (BestCare.org, 2016b).

Post-operative care of most laparoscopic bariatric surgery patients is provided almost exclusively on one inpatient Medical-Surgical unit within the hospital. This unit is a 33-bed unit that also receives patients with other needs who are medically stable. Unstable patients, as well as high-risk patients, are treated within the hospital's intensive care unit.

Pain management in a postoperative patient is a major concern to this organization. Currently, the hospital has a Pain Performance Improvement committee that meets regularly to discuss pain management issues as well as propose solutions to address these issues. In addition there is much support for nursing research projects aimed at improving pain management, especially within the bariatric surgery population. Recently though, there has been a change in medical personnel that could potentially limit the effectiveness of the study in generating change.

Review of the Literature

In order to develop this project, a thorough search of the literature was completed via multiple databases (CINAL, Google Scholar, and PubMed). As a result of this search, six articles were deemed to be applicable to the proposed PICO question. Analysis of these articles established several key themes as well as a noted lack of overall research on pain management in this population.

Raebel et al. (2013) identified the key need for this type of research. In a retrospective study of bariatric surgery patients, the authors noted an increase in overall usage of chronic opiates. From this analysis they extrapolated that poor postoperative pain management occurred when mostly opiates were prescribed. The authors concluded that this may have led to the development and worsening of chronic pain in this

population. In addition, the opiate dosages were not correlated to the amount of weight lost by these patients (Raebel et al., 2013).

Thompson et al. (2012) noted that in patients undergoing major abdominal surgery, the length of stay was shorter and pain levels were statistically lower in patients treated using enhanced recovery protocols in comparison to traditional techniques (i.e. opiate heavy protocols). While this study was applied to generalized abdominal surgeries, the results have the potential to be applied to and replicated in the bariatric population.

Currently, there are only two major studies on enhanced recovery protocols in bariatric populations and they both have several weaknesses. Both Awad et al. (2014) and Lemanu et al. (2013) studied the enhanced recovery protocol for safety and efficacy in various bariatric populations. These explorations determined that the protocol is safe to use and that it is associated with shorter lengths of stay and fewer complications in this population (Awad et al., 2014; Lemanu et al., 2013). However, both studies lack description of any other inherent benefits, including the potential for improved pain scores and management as stated by Thompson et al. (2012). Lemanu et al. (2013) is also limited in the respect of replicability because it fails to describe in detail what specific protocol was used. Awad et al. (2014) also failed to provide adequate comparisons to other studies with bariatric patients.

One of the key points that is clearly established by Awad et al. (2014) is a drastic reduction in complications and readmissions post-operatively. Dehydration, nausea, and vomiting are among the most common complications of bariatric surgery and associated with overall poorer outcomes and the development of other complications. As noted in

both Ziemann-Gimmel, Goldfarb, Koppman, and Marema (2014) and Ziemann-Gimmel, Hensel, Koppman, and Marema (2013), these complications are closely associated with opiate usage and can be reduced by utilizing multimodal protocols. Ziemann-Gimmel, Hensel, Koppman, and Marema (2013) also noted that multimodal pain protocols significantly reduced overall opiate consumption.

From this review, the evidence suggests that the usage of an enhanced recovery protocol should have the potential to result in significantly improved patient pain scores as well as reduce complications and chronic opiate usage. This present study was designed to study the impact of enhanced recovery protocols on pain scores and patient perceived satisfaction in pain control.

Conceptual and Theoretical Framework

Pain, as a concept, is a complicated sensation that is not easily defined or described. There is a wide range of different definitions and descriptions from researchers in the field. Pain has both subjective and objective components, meaning that definitions of pain must address both of these facets. One of the most widely held descriptors for pain is “pain is what the patient says it is” (McCance, Huether, Brashers, & Rote, 2010, p. 482). The most commonly held definition of pain is that it is an unpleasant sensation that occurs as a result of a threat or perceived threat to body systems (McCance, Huether, Brashers, & Rote, 2010). This pain sensation is designed to help promote action to remove the threat.

Similar to the fact that there are many different definitions of pain, there are also many different theories utilized to describe how pain stimuli are transmitted through the body. One such theory surrounding pain that justifies the usage of multimodal pain

management regimens, such as the enhanced recovery protocol discussed in the PICO question, is the Gate Control Theory of Pain. This theory was originally proposed by Melzack and Wall (1965) as one of the first papers to purport a neurological basis for pain. The primary basis of this theory is that in order for pain to be perceived, the pain signal must be strong enough to trigger an action potential allowing for signal transmission (Melzack & Wall, 1965).

According to this theory, pain is transmitted and modulated via a series of different fibers within the spinal cord. Cells of the substantia gelatinosa modulate pain by allowing or stopping pain signals (McCance, Huether, Brashers, & Rote, 2010). Signals from large A-delta fibers lead to the closing of the gate, meaning that pain stimuli never reach the central nervous system, resulting in no pain perception (McCance, Huether, Brashers, & Rote, 2010). But signals from smaller C fibers prevent the substantia gelatinosa from closing the gate, allowing signals to be transmitted and perceived, resulting in the sensation of pain (McCance, Huether, Brashers, & Rote, 2010). Increased pain stimuli further results in adaption of the nervous system in response to pain (Melzack & Wall, 1965).

Within the peripheral and central nervous system, several different receptors further regulate the perception of pain. These nociceptors activate C fibers, resulting in pain sensation (McCance, Huether, Brashers, & Rote, 2010). In order to effectively treat pain, protocols must be designed to affect different receptors. Currently each class of pain medication acts on a different group of receptors to treat pain. For example, opiates, such as morphine and dilaudid, bind to opiate receptors in the central nervous system (Kee, Hayes, & McCuiston, 2012). Acetaminophen, on the other hand, inhibits

prostaglandin synthesis preventing pain sensation (Kee, Hayes, & McCuiston, 2012.) By utilizing multiple different medications that impact different receptors, providers limit the ability of nociceptors to trigger a pain stimulus and reduce the potentiation of such stimuli as described by the Gate Control Theory of pain.

In obese patients, or those patients who have a BMI greater than 30, pain receptors are heavily impacted by the additional weight, resulting in distortion of receptor surfaces. This distortion means that these patients perceive pain differently and require different medication to help control pain. Pain thresholds in obese individuals are notably lower and do not respond as well to traditional medications as in individuals of healthy weights (Raebel et al., 2013). In light of these facts, multimodal pain protocols treat pain more effectively because they impact multiple pain receptors. It is because of this, that enhanced recovery protocols have the potential to change pain management pathways in obese patients.

Methodology

Sample

The project population consisted of all bariatric surgery patients who underwent the specified laparoscopic bariatric surgery procedures at the study location between October 1, 2015, and September 30, 2016. The procedures included for analysis were: laparoscopic gastric sleeve, laparoscopic Roux-n-Y, and laparoscopic duodenal switch. Patients who received their operation between October 1, 2015, and March 30, 2016 had their pain managed using a traditional means of managing postoperative pain. Patients who received surgery from April 1, 2016 to September 30, 2016, predominately had their pain managed utilizing the enhanced recovery protocol. Any patients who received their

surgery from any provider other than surgeons from the bariatric surgery clinic were excluded from the project.

Setting

The setting for this project was the surgical care unit (consisting of Preop, the operating room, the post anesthesia care unit (PACU)), and the inpatient postoperative care unit at a large surgical hospital within the Midwest. The inpatient care unit is a 33-bed unit that cares for bariatric surgery patients as well as a variety of medical and surgical patients, predominately under the age of 65. Most of the data generated for the project was generated from the inpatient postoperative care unit because of the focus on postoperative pain management in this study.

Design

This project was quantitative, and consisted of a retrospective chart analysis and review of patient satisfaction data. Prior to April 1, 2016, postoperative bariatric surgery patients had their acute post-operative pain managed via the following traditional protocol:

- Dilaudid (hydromorphone) patient-controlled analgesia titrated by nursing, based upon patient assessment
 - Intermittent intravenous (IV) acetaminophen (Ofirmev) on an as needed basis every eight hours
 - IV ketorolac (Toradol) on an as needed basis with limits on number of doses and dosage adjusted by patient renal function
 - Pain management in PACU mainly consisting of IV fentanyl

Nausea management on an as needed basis consisting of doses of Zofran, Phenergan, Reglan, and/or Compazine

IV Protonix to prevent peptic ulcers

Diet limited to nothing by mouth until 0600 on post-operative day one when ice chips were allowed. Then the diet was advanced per surgeon order.

On April 1, 2016, the surgeons, in order to improve upon length of stay and complications, began utilizing the following enhanced recovery protocol:

Pre-operative doses of meloxicam and gabapentin

Intra-operative doses of ketamine, Ofirmev (IV acetaminophen), and magnesium sulfate

PACU pain relief with IV fentanyl

Floor pain relief with scheduled Ofirmev until postoperative day one with a transition to the scheduled oral Tylenol; scheduled IV Toradol for six doses; IV

Buprenex as needed for severe breakthrough pain; and as needed oral oxycodone and tramadol added postoperative day one

Nausea managed via the usage of as needed Zofran, Phenergan, and/or

Compazine, which is similar to the traditional protocol

Venous thrombus emboli prevention achieved with subcutaneous heparin

Patients receive Protonix daily for gastric ulcer prevention, similar to the traditional protocol

Patients also placed on a modified clear liquid diet on the day of surgery, then progressed to a modified, high-protein full liquid diet

Data Collection

Patient-reported average pain scores, surgery type, length of stay, BMI, age, and gender were collected from the electronic medical record via a request to the informatics department. Data were then transferred from Excel to SPSS for analysis.

In addition, Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPs) data for pain management was generated post hospital stay via phone survey by the PRC Corporation. Randomly selected patients were asked the questions, “Was your pain controlled?” and “Did your nurse help with your pain?” The percentage of “always” responses was calculated and then reported to the organization. This data were inputted into SPSS software and analyzed.

The preferred method of pain documentation within the organization is the numerical pain scale. The numerical pain score has been demonstrated to be both a reliable and valid tool for assessing patient pain severity (Williamson & Hoggart, 2005). In this pain scale, patients describe their pain utilizing a numerical analog representing the perceived severity of their pain. These scales can vary from a zero to ten (eleven point scale) or a zero to 100 (101 point scale). The most commonly used scale is zero to ten (Williamson & Hoggart, 2005) which is the documented scale in this study with zero signifying no pain and 10, the highest level of pain. The patient reported pain scores from October 1, 2015 to September 30, 2016, of patients who met inclusion requirements were analyzed. The enhanced recovery protocol was implemented by bariatric staff starting on April 1, 2016 as demonstrated by their ordering of the protocol in the EMR.

Post-hospitalization, patient perception of pain control was assessed by analyzing patient responses to two questions asked as part of the HCAHPs post-stay survey. In

regards to pain management, the two specific questions asked as part of the tool were: “Was your pain controlled?” and “Did your nurses help with your pain?”. Patient responses are then reported to various agencies, including the Centers for Medicare and Medicaid as a percentage of patients who answer “always” to each question. These scores were analyzed based upon results reported for each quarter in the previously specified study time frame. Validity and reliability for the HCAHPs as a tool for analyzing care quality, was demonstrated by a three state-pilot study in 2003 (Centers for Medicare and Medicaid, 2003).

Ethical Considerations

Data for the proposed project were collected via a chart audit of documented numeric pain scores from the patients’ EMR and publically reported HCAHP data. Permission was gained from the study location to access the EMR for the purpose of analysis. Data from the EMR were de-identified so that the patient name was not associated with the information. Basic demographic information including gender, age, body mass index (BMI), length of stay, and surgery type was retrieved with pain scores, without any other identifying information. This information was utilized only on the basis of understanding the overall patient population being studied and to determine if there is any relationship between the enhanced recovery protocol, patient pain scores, and patient satisfaction information (HCAHPS). Patients were coded using an alphabetic, numeric system (A1, A2, A3... for traditional recovery patients and AA1, AA2, AA3... for enhanced recovery patients) in order to differentiate between patients. Data were stored exclusively on the investigator’s personal computer and not on portable data devices, such as USB thumb drives. This computer was located in a private/locked

location and is password protected. Following the completion of the study and its analysis, the data will then be deleted from the hard drive upon study completion (per standard protocol), to keep it confidential. Data were not modified in any way other than the previously stated manner.

Patient satisfaction data was obtained from reports provided to the hospital from a local third-party survey organization. This information is also publically reported to a variety of sources, in particular, the Centers for Medicare and Medicaid and is, therefore, public knowledge. This allows for no special permission being needed to be obtained for this analysis. This data were also analyzed and retained by the organization and reported as numerical data only, without any patient information being provided. Permission was obtained from the organization to ensure no breach of ethics.

There were no known conflicts of interest by any parties involved in this project. During the study, the primary investigator currently worked on the surgical floor where information was generated and collected. As a result of the completion this project, this investigator did not receive any compensation, promotion or change in employment status. This project was completed in order to advance knowledge in the field, with the overarching goal to improve patient care in the bariatric population.

Data Analysis

Statistical analysis of data was completed to assess significance of the clinical question and the proposed outcomes. This analysis was completed utilizing SPSS software version 22 (IBM Corporation). Demographic variables (average age, percentage of female and male gender, average BMI, percentage of surgery types, and average length of stay in days) were obtained in both the traditional and enhanced recovery groups.

Average pain scores for the group who received traditional pain management methods and those receiving the enhanced recovery protocol were calculated. These scores were analyzed via the utilization of a Wilcoxon Rank Sum test to determine if there was a significant difference between the two groups. Average length of stay was compared between the traditional recovery and enhanced recovery groups and also analyzed by Wilcoxon Rank Sum test. A linear regression was used to determine the relationship between the patient reported pain scores and patient characteristics (age, length of stay and Body Mass Index [BMI]) for each study group. A Mann Whitney U test was used to look at the mean difference between the two patient groups' reported pain scores and gender. A Kruskal Wallis analysis was completed to analyze the difference between surgery type and the traditional/enhanced pain scores. Patient satisfaction, through the HCAHPS, was also analyzed via a t-test to determine if statistical significance existed between scores in the traditional and enhanced recovery groups.

Results

The traditional recovery group consisted of 132 patients while the enhanced recovery group had 153 patients. The average age of the traditional recovery group was 47.85 year (range 17-79 years) in comparison to the enhanced recovery group whose average age was 45.9 years (range 18-74 years). The percentage of females in the traditional recovery was 85.9 percent compared to the enhanced recovery group with a percentage of 80.4. The percentage of males was significantly lower for both the traditional and recovery groups, with the traditional recovery group consisting of 14.4% males and the enhanced recovery group consisting of 19.6% males. The average BMI for both groups were very similar, with the average for the traditional recovery group being

44.02 and the enhanced recovery group being 44.08. The majority of the laparoscopic surgeries for both groups was the Roux-en-Y accounting for 48.5 percent of the surgeries in the traditional recovery group compared to 50.3 percent in the enhanced recovery group. The percentages of the other surgeries performed were the following: laparoscopic sleeve (traditional with 37.1 % versus enhanced recovery with 37.9 %) and the laparoscopic duodenal switch (DS) (traditional recovery with 14.4 % versus enhanced recovery with 11.8 %). See Table 1 for detailed results.

The average pain score for the enhanced recovery group was lower than the traditional recovery group (3.88 versus 4.1) but was not statistically significant using the Wilcoxon Rank Analysis ($Z = -1.665$, $p = 0.096$) (Table 2). There was a statistically significant difference for length of stay between enhanced recovery and traditional recovery patients using a Wilcoxon Rank Analysis (3.73 versus 4.40; $Z = -3.312$; $p = 0.001$).

There was a statistically significant relationship using linear regression between the average pain score and length of stay for the traditional recovery patients ($t = 2.040$, $p = 0.043$), that was not present in enhanced recovery patients (See Table 3). There were no other statistically significant linear regression relationships noted between pain, age and BMI. There were no significant differences between groups in average pain scores and gender determined by Mann-Whitney U test (Table 4). There were also no significant difference in the two study groups between pain and surgery type analyzed via Kruskal-Wallis (Table 5).

Using the independent t-test, there were no statistically significant differences in patient satisfaction between the HCAHPS scores for patients undergoing enhanced

recovery compared to traditional recovery (See Table 6). There was a noticeable increase in the averages of the HCAHPS scores in the group who was part of the enhanced recovery protocol (See Table 7).

Discussions/Conclusions

Demographically, the traditional and enhanced recovery groups were very homogenous in nature. Overall, the Traditional Recovery group had slightly fewer participants than the Enhanced Recovery group (traditional group $N=132$; enhanced recovery $N=153$). The average age for the traditional recovery group is 47.8 years in comparison to the enhanced recovery group with an average age of 45.9 years. The majority of both groups was female (traditional recovery=85.9% $N=113$; enhanced recovery=80.4%, $N=123$). The average BMIs were very close (traditional recovery=44.02; enhanced recovery=44.08) The most common procedure performed was the laparoscopic Roux-en-Y (traditional recovery 48.5%, $n=64$; enhanced recovery 50.3%, $n=77$). (See Table 1). The homogenous nature of the groups benefited the study because it strengthens the comparisons between the two groups and helps to reduce the potential of a confounding variable between groups.

Regarding pain scores, there was a notable difference between the two groups, with the enhanced recovery patients reporting lower average pain scores. Despite this relationship between the enhanced recovery group and the traditional group not being statistically significant, the downward trend in pain scores signifies a potential benefit for bariatric surgery patients using the enhanced recovery protocol. However, the lack of a statistical significance may indicate that the different protocols may not have had a definite effect on pain management. Other factors that could be at play include gender

variation, a variation in BMI, and a variation in the type of surgery. The possible presence of other chronic pain disorders such as fibromyalgia and osteoarthritis within the patient populations, and nursing care variation between these two groups could also be influencing factors. Due to slight variation in the basic demographic makeup of the two study groups, it is possible that an unknown variable is influencing the patient reported pain score, although the analysis of the demographic variables did not demonstrate any significant relationship. Previous studies, including Rabel et al. (2013) have noted that pain perception thresholds are much lower in patients with higher BMIs. Therefore, with the average BMI being slightly higher for enhanced recovery patients, the pain scores should be slightly higher. Yet the enhanced recovery patient pain score average was lower, therefore signifying a potential patient benefit.

Another potentially confounding variable that may be present in this study is the high rate of female patients. Female gender is closely associated with numerous chronic pain conditions, including fibromyalgia, which has been demonstrated to be difficult to control. Chronic pain conditions are often exacerbated by acute pain issues, including the pain created by surgical procedures. The presence of these dual pain conditions makes it difficult to manage the patients' pain because providers are forced to manage two different sources of pain that are impacted by different pain pathways (i.e. neuropathic pain vs somatic pain). Different pain medications work better for different types of pain. With the holding of patient medication postoperatively for extended periods of time, one type of pain could potentially not be controlled. It also means that preoperative doses of medication may not be at appropriate levels to control various types of pain to promote quality pain control.

When solely comparing HCAHPS scores in the traditional recovery group and in the enhanced recovery protocol, there were no statistically significant differences. Although it is notable that in the enhanced recovery patient, there was a higher rate of overall satisfaction in pain control with the average score of 76.6 for the enhanced recovery group, as well as higher satisfaction in this group on questions, “Was your pain controlled” and “Did your nurse help with your pain”. According to McCance, Huether, Brashers, & Rote (2010), poor pain control is associated with increased rates of emotional distress, mental illness (in chronic pain cases), and overall poor patient outcomes. This potential reduction of risk and the previously noted benefits of the enhanced recovery protocol as stated by Awad et. al (2014), clearly justify the adoption of this protocol in the bariatric population.

As stated, this study did have a lack of statistically significant differences between the study groups for the second HCAHPS question, “Was your pain controlled?”. Given that average pain scores were lower in the enhanced population, it should be presumed that pain control was much better for this group and should have resulted in higher average patient satisfaction scores. However, this did not occur. In this population and any surgical population, the use of the term “always” to answer the question, “was your pain controlled” is misleading. It is highly unlikely that the patient “always” has their pain controlled postoperatively. Surgical patients usually have some pain postoperatively, especially in PACU where the pain experienced is usually above their goal for pain. Therefore, it is almost impossible for them to say that their pain was “always” under control. Patients can also have increased rates of pain on the post-surgical floor, associated with events such as gas pain and surgical site pain. These types

of pain are difficult to control due to its visceral nature, which impacts the ability of staff to “always” have pain under control.

This study does confirm findings presented by both Awad et al. (2014) and Lemmanu et al. (2013) of statistically significant shorter stays in bariatric patients who are managed postoperatively via the enhanced recovery protocol. In the traditional recovery patients, higher levels of pain were present as were longer lengths of stay, supporting that successful pain management is often times utilized as a marker of patient readiness for discharge. Poorly controlled pain is often associated with increased rates of postoperative complications as well as overall longer patient stays. It is also believed to be associated with increased use of postoperative opiates in this population (Rabel et al, 2013). Length of stay analysis is critical because it points to another potential benefit of enhanced recovery in reduced patient care costs. Shorter stays, coupled with a demonstrated reduced rate of complications, results in lower overall costs of care, not only for the patient, but also for health systems and insurance agencies. Awad et al. (2014) noted fewer rehospitalizations for enhanced recovery patients. This is especially critical in this patient population, given the number of patients that are covered with insurance by Medicare and Medicaid which will not cover 30 day readmissions in patients. Therefore, the enhanced recovery protocol could potentially be more cost effective, as well as improve bed availability in acute care.

As previously noted, there was a meaningful difference in the patient perceptions of the nurse helping with their pain between the traditional recovery group and enhanced recovery group. A limitation of the current study is the lack of understanding of this relationship. Without further study into all methods utilized by nursing staff to help with

pain, including non-pharmacologic methods, it is hard to determine if it was a process change or a change in behavior of staff that impacted this perception. It does though emphasize the relationship between these two factors and the importance of nursing practice. Therefore, it is critical for nurses to continue to provide the best care for their patients and to continue to request the usage of multimodal pain management protocols in their patients.

The enhanced recovery protocol presents a paradigm shift in postoperative nursing care because of its focus on non-opiates and multimodal medication protocols. One of the noted difficulties with initiating the protocol was the lack of scheduled protocol medications being given on a specific schedule. This resulted in inconsistent dosing, potentially resulting in poorer pain control. Another limitation to enacting the enhanced protocol was possible insufficient education of patients on when the next dose of pain medication could be given. The shift from strict opiates, such as dilaudid in the traditional protocol, to opiate agonist/antagonist medications, such as buprenex in the enhanced recovery protocol, also resulted in different dosing patterns for medications. Buprenex is only able to be given every four hours in comparison with dilaudid which can be given every two hours or in patient controlled analgesia. A third factor impacting patient care could have been turnover in nursing staff which could have further compromised patient education.

Another limitation of this study is the fact that the enhanced recovery protocol was instituted with limited staff training. Since pain management is predominately a nursing responsibility, it is quite possible that the lack of nursing experience with the new protocol played a role in the level of pain perceived by patients, especially in the first few

months of the enhanced recovery protocol. Perhaps, the enhanced recovery pain scores would have been more significantly lower compared to the traditional recovery patients' scores had the nurses had more experience with the enhanced recovery protocol.

This study was also limited by the researcher's ability to study the HCAHPS data in relationship to the pain scores. Currently, due to the nature of the chart data, there is limited ability to do statistical analysis on the comparison between the pain scores and HCAHPS data. Further analysis of these relationships is a must.

In conclusion, the enhanced recovery protocol demonstrated a reduction of length of stay in laparoscopic bariatric surgery populations in comparison to patients in the traditional recovery group. Patients treated using the enhanced recovery protocol demonstrate a trend of lower averaged pain scores, but the trend is not statistically significant when compared to the traditional recovery protocol. Even though Thompson et al., (2012) noted in their review of pain in patients with unspecified abdominal surgery, that the pain scores significantly lowered when an enhanced recovery was used, currently there is a lack of research on this subject in bariatric patients. It is critical for further research to be performed with a larger sample of bariatric surgery patients to further understand the relationship between pain, age, BMI, gender, length of stay, surgery type, and patient satisfaction using enhanced recovery protocols. In the future, this research should be designed to overcome the limitations noted in this study with improvement in staff and patient education, thus limiting confounding variables.

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Appendix A: Process of Literature Search

PICO Question:

Does the utilization of the enhanced recovery protocol in laparoscopic bariatric surgery patients reduce pain scores and improve patient perception of pain control in the immediate postoperative period in comparison to those utilizing traditional pain management techniques?

Search strategies:

In order to search, the researcher focused on looking at terms within the PICO question as well as similar terms (i.e. abdominal surgery) to try to identify potential articles. From there the researcher started to combine terms to help filter out articles. In order to include articles, the research looked for articles that had elements of pain management, bariatric surgery, both with and without enhanced recovery. Inclusion was based on analysis of abstracts.

Database:

CINAHL:

Terms:

Bariatric Surgery: 5618
 Pain management: 79,477
 Enhanced Recovery: 296
 Weight loss surgery: 2009
 Post-operative pain management: 553
 Abdominal surgery: 3182

Post-operative pain management and bariatric surgery: 0
 Bariatric surgery and pain management: 8
 Weight loss surgery and pain management: 0
 Enhanced Recovery and bariatric surgery: 0
 Enhanced Recovery and pain management: 0
 Abdominal surgery and enhanced recovery: 3
 Abdominal surgery and pain management: 0
 Keepers: 0

Google Scholar:

Terms:

Bariatric surgery: 113,000
 Pain management: 2,350,000
 Enhanced recovery: 3,250,000
 Weight loss surgery: 1,900,000
 Postoperative pain management: 1,700,000
 Abdominal surgery: 2,440,000

Post-operative pain management and bariatric surgery: 0
 Bariatric surgery and pain management: 44200
 With limits of since 2011: 17,200
 “Bariatric Surgery” and “Enhanced Recovery”: 667
 With limits of since 2011: 523

With "Pain Management": 107

With limits to all in title: 4, 2 are duplicate, only 2 articles these 2 are keepers

Inclusion: Discuss clinical outcomes of protocol on bariatric surgery

Pub Med:

Bariatric Surgery and enhanced recovery in title/abstract: 14

Keepers after abstract review: 1

Inclusion criteria: discussed specific bariatric procedures, address clinical outcomes, discussed impact on pain, were not duplicates from previous searches

Bariatric Surgery and enhanced recovery and pain management: 0

(Note, none address pain management as an outcome)

Enhanced Recovery and pain management in title/abstract: 46

With abdominal surgery: 6

Keepers: 1

Inclusion criteria: addressed gastric surgery, most comparable and relatable to

Bariatric surgery

Article cited by systemic review: 1

Bariatric surgery and pain management: 18

Humans filter: 10

Last 5 years: 4

Keepers: 3

Inclusion criteria: address specifics to pain management in bariatrics, look at effective

Pain management or ineffective pain management techniques

Cochrane Systemic Reviews:

Bariatric surgery: 8

With pain management: 0

No keepers addressing found, none of the systemic reviews have pain management elements included

Appendix B: Tables

Table 1: Comparisons in average age, gender, BMI, and surgery type between Traditional Recovery and Enhanced Recovery Patients

	Traditional Recovery	Enhanced Recovery
Ave. Age	47.85 (17-79)	45.9 (18-74)
% Female	85.9 (113)	80.4 (123)
% Male	14.4 (19)	19.6 (30)
BMI	44.02 (18-70)	44.08 (20-69)
% Lap sleeve	37.1 (49)	37.9 (58)
% Lap Roux-en-Y	48.5 (64)	50.3 (77)
% Lap DS	14.4 (19)	11.8 (18)
N	132	153

Table 2: Comparisons of Length of stay and pain scores between Traditional and Enhanced Recovery Patients (Wilcoxon Rank Sum)

	Traditional Recovery	Enhanced Recovery	Z-score	p Value
Length of Stay (average days)	4.40	3.73	-3.312	0.001*
Pain Score (average)	4.1	3.88	-1.665	0.096

* *p* significant <0.05

Table 3: Linear Regression Relationships between Pain and Age, BMI and Length of stay for Traditional Recovery and Enhanced Recovery Patients

	Traditional <i>t</i>	Traditional <i>p</i>	Enhanced <i>t</i>	Enhanced <i>p</i>
Age	-1.063	.290	-.500	.618
BMI	-1.628	.106	-1.604	.111
Length of Stay	2.040	.043*	-.255	.799

**p* value significant < 0.05

Table 4: Difference in Patients between Pain and Gender (Mann-Whitney U test)

	Z	p value
Traditional Recovery	-0.030	0.976
Enhanced Recovery	-0.997	0.319

Table 5: Difference in Patients between Pain and Surgery Type (Kruskal-Wallis)

	R	p Value
Traditional Recovery	0.963	0.626
Enhanced Recovery	3.816	0.148

Table 6: T-test results comparing Traditional and Enhanced Recovery HCAHPs scores

	<i>T</i>	<i>p</i> Value
Overall	-1.105	.468
Pain Always Controlled	-.074	.953
RN helped with pain	-2.120	.281

Table 7: Averages for HCAHPS scores for Traditional and Enhanced Recovery patients.

	Traditional Recovery	Enhanced Recovery
Overall	70.625	76.625
Pain Always Controlled	63.75	64.935
RN helped with pain	77.5	88.31