Evaluating the Impact of Perioperative Intravenous Acetaminophen Administration among Bariatric Patients from Post Anesthesia Care Unit (PACU) Nurses' Perspective.

Final DNP Scholarly Project Paper

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DEDICATION

I am dedicating this project to my Parents,

My father: Late Mr. Raymond Nwokolo Onyekelu (Bishop) for his early investment in my academic future. My mother: Mrs. Augustina Chibumma Onyekelu (Achara Ugo) for her unwavering support both through prayers and encouragement.

Abstract

Background: The Centers for Disease Control and Prevention reported that the prevalence of obesity among US adults in 2015 to 2016 was 39.8% and affected an estimated 93.3 million US adults, and 42.4% between 2017 and 2018 (Hales et al., 2020).

Problem: Changes in cardiovascular and respiratory physiology predispose morbidly obese patients to increased risk when treating them with opioids as a result of drug-induced respiratory depression and upper airway obstruction (Rodriguez, 2018, Domi & Laho, 2012). Intravenous Acetaminophen administration in the perioperative period has been shown to help with pain control, reduced opioid requirements and the associated respiratory depression in the post-operative phase (Wang et al., 2015). The aim of this project is to evaluate the impact of perioperative intravenous acetaminophen administration among morbidly obese patients for bariatric procedures from post-anesthesia care unit (PACU) nurses' perspective after at least 6 months of its implementation.

Method: Post-implementation survey conducted among PACU nurses regarding firstly, the quality of the implementation process of the evidence-based practice (EBP) to assess for areas in need of reinforcement and secondly, the survey measured the overall impression of PACU nurses about the effect of perioperative intravenous acetaminophen in the post-operative phase among bariatric patients. The PACU nurses' impressions were guided by data from postoperative pain assessment tools, post-operative opioid requirement after perioperative IV acetaminophen administration and length of stay in the recovery area. It also took into consideration the frequency of interventions for opioid related respiratory distress/airway obstruction such as chin lifts or insertion of airway to maintain spontaneous respiration. Data from questionnaires were analyzed to determine impact.

I**nterventions**: Intervention was the administration of appropriate dosage of intravenous acetaminophen in the perioperative period and evaluating the effect postoperatively. Pain level assessed with numerical rating pain scale for verbal patients and Wong-baker faces pain rating scale for non-verbal patients during initial assessment in PACU.

Result: Post implementation survey of PACU nurses showed that 85.7% of Participants believe that perioperative intravenous acetaminophen is effective in postoperative comfort after bariatric surgery (moderately helpful 28.6% & very helpful 57.1%). 14.2% of participants believe that it is not helpful at all. It also showed a correlation between dissatisfaction with the implementation process and the belief that EBP is not effective.

Conclusion: The impact of pain medications/interventions on postoperative pain control has been measured mostly from responses elicited from individual patients either in their conscious or unconscious states. The PACU nurses are in a unique position to credibly evaluate the effectiveness of pain interventions affecting this patient population from their day to day experiences. Their initial postoperative assessment provides valuable information about the efficacy of pain control measures given preoperatively and intraoperatively prior to the patients' arrival in PACU, and was very relevant for this evaluation.

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Introduction

Bariatrics is a specialty that focuses on healthcare provision for extremely obese patients (Muir, M. & Archer-Heese, G., 2009). Bariatric programs are aimed at weight control, enhancement of weight loss and often to reduce co-morbidities and mortality associated with extreme weight. WHO (2019) defined overweight as body mass index (BMI) of 25 or more, and obesity as BMI of 30 or more as a result of unhealthy excessive fat accumulation. BMI of 40 or higher is categorized as "extreme" or "severe" obesity (CDC, 2017). Morbid obesity is associated with chronic illnesses such as hypertension, respiratory diseases, diabetes, hyperlipidemia, obstructive sleep apnea, low self-esteem, depression, cardiac diseases and more (Muir, M. & Archer-Heese, G., 2009).

Anesthesia for morbidly obese patients can be very challenging because morbid obesity impacts most vital organs (American Society of Anesthesiologists, n.d., Domi & Laho, 2012). A preoperative evaluation of these impacts on cardiac, respiratory, metabolic systems, airway management is necessary for suitable perioperative anesthesia planning for surgical procedures involving morbidly obese patients (Domi & Laho, 2012). One of the major anesthesia concerns is sleep apnea which makes general anesthesia more dangerous due to loss of consciousness (American Society of Anesthesiologists, n.d.). Opioids can make sleep apnea worse, impaired sleep on the other hand increases pain and the need for more pain medications (Avidan, 2014). Intravenous Acetaminophen administration in the perioperative period has been shown to help with pain control, reduced opioid requirements and the associated respiratory depression in the post-operative phase (Wang et al., 2015). The aim of this project is to evaluate the impact of

perioperative intravenous acetaminophen administration among morbidly obese patients for bariatric procedures from the post-anesthesia care unit (PACU) nurses' perspective after more than 6 months of its implementation. Minimizing opioid related respiratory complications postoperatively while enhancing patients' comfort is in the interest of morbidly obese patients.

This project is merely an evaluation of the impact of perioperative intravenous acetaminophen administered per protocol among morbidly obese patients undergoing bariatric procedures relative to the patients who did not receive it from the post anesthesia care unit (PACU) nurses' perspective. This is a quality improvement project and did not have direct involvement of individual patients. It evaluated the implementation process of this evidence-based practice, and the nurses' beliefs about the outcome to determine the impact of this intervention.

Description of Clinical Issue

Obesity leads to systemic complications resulting to impairment of organs and tissues. The complications include mechanical changes resulting from adipose tissue buildup in the chest and abdominal regions and cytokines produced by adipocytes (Mafort et al., 2016). It impacts respiratory function extensively, and causes immense changes to the mechanics of the lungs and chest walls (Dixon & Peters, 2018). Obesity impedes respiratory function by decreasing lung volume, especially the expiratory reserve volume and functional residual capacity of the lung. By altering the effectiveness of the respiratory muscles, the resulting reduced strength and resistance gives rise to inspiratory overload which increases the work of breathing, oxygen consumption and respiratory energy (Mafort et al., 2016).

In his 2018 review article titled: Post-Operative Respiratory Complications in Morbidly Obese, what can we do? Elsersy, E. H. explained that morbidly obese patients suffer from reduced functional residual capacity, increased shunting and obstructive sleep apnea which predisposes them to postoperative pulmonary complications such atelectasis, hypoxia, hypercarbia and increases their sensitivity to opioid-induced respiratory depression.

Prevalence and Significance

Recent data from CDC showed that the prevalence of obesity was 39.8% and affected about 93.3 million of US adults between 2015 and 2016 (Hales et al., 2017), and 42.4% between 2017 and 2018 (Hales et al., 2020). Morbid obesity has been noted to be on the rise in the United States; between 2000 and 2010, the prevalence of Body Mass Index (BMI) over 40 calculated from self-reported height and weight presented an increase of 70 percent, while BMI over 50 grew even at a faster rate. Although higher rates were noted among Hispanics and Blacks, the differences in trends between them or to the Non-Hispanic Whites were not significant (Sturm & Hattori, 2013).

The significance of the increased prevalence of morbid obesity is the need to develop effective postoperative pain management that takes into considerations the physiological changes caused by morbid obesity, that enhances patients' comfort while minimizing complications after surgical procedures.

Purpose and Overall Aims

The purpose of this project is to evaluate the impact of intravenous acetaminophen given in the perioperative period (preoperatively, intraoperatively and postoperatively) to morbidly obese patients undergoing bariatric procedures as perceived by the Post Anesthesia Care Unit

(PACU) nurses. Evidence supports that perioperative acetaminophen given at this phase is beneficial to morbidly obese patients, it enhances pain control and reduces opioid requirements and the associated respiratory depression postoperatively (Wang et al., 2015).

This project is unique in nature because unlike other numerous studies that focused on patient responses about the effectiveness of their pain control and satisfaction with their surgery experiences, this project engaged the PACU nurses who take care of these patients through their recovery phase in PACU until stabilized for discharge to the medical surgical floors. It evaluated the impact of this medication on the care they provide for patients in this phase. It assessed the PACU nurses' impression about this medication based on their day to day experience in the recovery room.

Evidence-Based Practice Model/Framework Guiding the Practice

Advancing Research and Clinical Practice through Close Collaboration (ARCC) Model is the model selected for this project. ARCC model is unique in its design and is intended to serve as a guide for implementation and sustainability of evidence-based practice with the aim of achieving quality outcomes in healthcare institutions and clinical settings (Dang, Melnyk, Fineout-Overholt, Yost, Cullen, Cvach, Larabee, Rycroft-Malone, Schultz, Stetler & Stevens, 2019). It provides tools and strategy for sustainable and comprehensive evidence-based practice implementation for individual and organizational transition to best care practices (Dang et al., 2019). The ARCC model emphasizes system-wide implementation and sustainability of evidence-based practice (EBP). At the model's development stage it was determined that the use of mentors improves EBP beliefs and implementation ability among clinicians. The model was therefore strategically based on development of mentors to support point of care staff members,

and to strengthen EBP culture within an organization which is necessary for sustaining EBP and delivering improved outcomes (Melnyk, Fineout-Overholt, Giggleman, & Choy, 2017).

Among other models, the ARCC model was selected for this project because its concepts addressed the major hindrances to EBP implementation identified through multiple surveys which include: Inadequate EBP knowledge/skills, and lack for support, lack of mentors and lack of belief that EBP will lead to outcome improvement (Fineout-Overholt, Levin & Melnyk, 2005, Dang et al., 2019). Lack of support in face of inadequate knowledge and skills leads to frustration and loss of interest often reflected in the process and outcome. Another fascinating fact about ARCC model is that it goes beyond the proposal for all-encompassing (system-wide) EBP implementation to strategies that promote EBP culture, growth and sustainability.

ARCC Model was formed with the primary aim of integrating research and clinical practice in hospitals and community healthcare settings in order to improve patient outcomes (Fineout-Overholt et al., 2005). As contained in its nomenclature, it proposes close collaboration, cohesion among staff members and the use of trained mentors or champions to guide, support, educate and strengthen the belief of nurses in EBP at the point of care. Through the mentorship program, interactive EBP skill-building, EBP rounding and journal clubs, EBP culture necessary for EBP sustenance and system-wide implementation is developed (Dang et al., 2019). ARCC model has been tested and supported by about eight studies, it has been used successfully in hospitals over the years for EBP implementation (Dang et al., 2019). It uses reliable tools to assess preparedness, determine barriers/ facilitators to EBP implementation, and applies strategies to address the identified barriers in order to guide clinicians to their practice goals through a systematic implementation process.

Review of the Literature

The literature for this project first of all explored the advantages of Intravenous route of administration of acetaminophen relative to oral or rectal routes of administration. Jibril et al. explained that a major advantage of intravenous route is that it can be used when the other routes are not suitable such as during diarrhea or vomiting episodes. Other advantages include faster onset of analgesia relative to an equivalent oral dose, may reduce the need for other analgesics such as opioids making it the route of choice in inpatient and postoperative settings. The pharmacokinetic and pharmacodynamic behaviors of acetaminophen administered via the IV route is more predictable than the other routes. Also, it avoids hepatic first-pass which may reduce the potential for hepatic injury. (Jibril, Sharaby, Mohamed & Wilby, 2015). Another study found that IV acetaminophen had a slightly more opioid sparing effect compared to oral administration without an accompanying reduction in postoperative nausea and vomiting (PONV) incidence (Pettersson, Jakobsson, & Owall, 2005). On the other hand, Hickman et al., 2018, found from their randomized controlled trial that there was no difference in pain control outcome between IV and oral acetaminophen, including other variables like nausea and vomiting, treatment duration and length of PACU stay or time to first dose of as-needed pain medication among patients undergoing hip or knee arthroplasty.

A study looking at IV acetaminophen use (1 g every 6 h) showed a significant decrease in morphine consumption by 46% ($p = 0.0003$) on the first day postoperatively after total hip replacement or total knee replacement and an increased time to require rescue morphine (hip replacement, 3.9 h and knee replacement, 2.1 h) compared with placebo (0.8 h)(Sinatra, Jahr, Reynolds, Groudine, Royal, Breitmeyer et al., 2012). Comparing the postoperative pain scores and rescue analgesic use in patients who received acetaminophen preoperatively or during skin

closure versus those who received a placebo in patients undergoing lower extremity surgery with spinal anesthesia, showed that both preventive and preemptive acetaminophen enhanced analgesia and decreased postoperative analgesic consumption. There was no significant difference in results between the preventive and preemptive groups (Khalili, Janghorbani, Saryazdi, & Emaminejad, 2013).

In 2018, Lange, M., Lee, C. W., Knisely, T., Perla, S., Barber, K., & Kia, M. conducted a study to determine the efficacy of intravenous Acetaminophen on length of stay after laparoscopic Roux-en-Y gastric bypass (LRYGB) surgery. The study was designed from a pain management perspective to reduce opiate-related adverse effects after bariatric procedures. This study involved a total of eighty nine patients in a randomized controlled double blind method from 2011 to 2014. The patients in the treatment group received 1000mg of IV acetaminophen every 6 hours for a total of four doses. The result showed that length of stay was significantly reduced among patients that got the medication versus the control group (2.72 days vs. 3.18 days; $p = 0.03$). Time to return of flatus was also significantly reduced among the treatment group (1.87 days vs. 2.24 days; $p = 0.04$). The result also showed a significant decrease in pain in the first 2 hours postoperatively among the treatment group compared to the control group ($p = 0.02$), but did not show any difference in total opioid consumption, postoperative nausea scores, and use of rescue pain medications (Lange, Lee, Knisely, Perla, Barber & Kia, 2018).

Saurabh, S., Smith, J. K., Pedersen, M., Jose, P., Nau, P., & Samuel, I. in 2015 conducted a retrospective study by reviewing electronic medical records of laparoscopic Roux-en-Y gastric bypass of morbidly obese patients between 2011 and 2013 was aimed at finding out the opioid-sparing effects of accompanying IV acetaminophen in bariatric surgery. 183 patients who received IV acetaminophen in addition to morphine sulfate patient-controlled analgesia

(PCA) were selected, also a cohort of 229 patients from previous 2 years that received morphine sulfate patient-controlled analgesia (PCA) without IV acetaminophen were selected as control. Patients' demographic information and data showing narcotic use were retrieved from electronic medical records and analyzed using student's t test or linear regression. The result showed that narcotic analgesic demand within the first 24hours postoperatively which included a total PCA demand counting the non-delivery due to lock-out, was reduced by 25 percent among those that received IV acetaminophen as well (40.5 versus 30.9 average pushes; P<.05). and the dosage requirement for narcotic analgesic was reduced by 20% in the study group (average of 29.9 versus 24.1 mg of MSO4; P<.05) independent of age, gender, BMI or Diabetes mellitus type 2 as confirmed by linear regression analysis (Saurabh et al., 2015).

In a double blind, prospective randomized study in 2016 by Chaar, M., Stoltzfus, J., Claros, L., & Wasylik, T. investigated the economic impact of intravenous acetaminophen following bariatric surgeries. The study involved 2 group of bariatric patients of 100 participants split in half into groups of 50 participants in each group. The first group known as the treatment group received IV acetaminophen in addition to IV narcotics 30 minutes before surgery, followed by IV narcotics/Po narcotics for the remain18 hours. The second group (control group) received normal saline in addition to IV/Po narcotics. The two bariatric procedures undergone by participants are laparoscopic gastric bypass (LRYGB) or laparoscopic sleeve gastrectomy (SG) and the primary outcomes they measured were hospital costs, length of stay, postoperative pain and patient satisfaction, they also weighed the indirect costs, dosage of rescue narcotics and 30 day limited outcome. The result showed that average direct hospital cost was slightly lower for the treatment group than for the control group (p> 0.05), no significant difference in pain score (P= 0.61), no significant difference in length of stay (p=0.95), but patients in the control group

incurred more indirect costs ($p< 0.05$), and presented more to the Emergency Department for abdominal pain than individuals in the treatment group (5/50 versus 1/50) and ($39,293 versus $13,185). The authors believed that some of non-significant finding results could be as a result of decreased statistical power (Chaar et al., 2016).

A recent study in 2019 by Lee, Y., Yu, J., Doumouras, A. G., Ashoorion, V., Gmora, S., Anvari, M., & Hong, D. explored the role of intravenous acetaminophen in multimodal analgesic therapy. The study used randomized controlled trials involving 349 patients to compare the effect of IV acetaminophen to placebo in postoperative pain management after bariatric procedures as part of a multimodal pain management. The outcomes were analyzed using random effect meta-analysis and the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) to assess the certainty of evidence. Out of the 349 patients that were selected, 175 received IV acetaminophen while 174 received placebo. The group that received IV acetaminophen demonstrated a lower pain score postoperatively with a mean difference (MD) − 0.66, 95% CI − 1.03 to − 0.28, $P < 0.001$) 24 hours after surgery and lower postoperative opioid use (MD − 6.44, 95% CI − 9.26 to − 3.61, $P < 0.001$; $I 2 = 0$) in morphine equivalent doses compared to the placebo group. The result also did not show any significant difference in length of stay (MD − 0.26, 95% CI − 0.55 to 0.03, $P = 0.08$) (Lee et al., 2019).

A majority of the randomized controlled studies reviewed, including placebo controlled and retrospective studies of patient controlled analgesia (PCA) records among bariatric patients showed a significant decrease in pain scores, opioid consumption and also an increased time to require rescue opioids postoperatively among the participants that received intravenous acetaminophen versus the participants that received placebo (Sinatra et al., 2012, Lee et al., 2019, Saurabh et al., 2015, Song et al., 2014, Gonzalez et al., 2015).

Other randomized controlled studies among which are double-blind designed studies showed that perioperative intravenous acetaminophen administration for bariatric surgery significantly improved pain postoperatively with variations from less opioid requirement to no difference in opioid consumption (Lange et al., 2018). Some of the studies also demonstrated decreased length of stay, faster return of flatus or decrease in hospital costs and emergency room visits (Lange et al., 2018, Chaar et al., 2016).

There were a few selected randomized controlled studies, among which are double-blind, placebo-controlled trial of intravenous acetaminophen that demonstrated no significant changes in pain score, narcotic consumption, hospital cost, quality of recovery score and antiemetic requirement between the patients that received intravenous acetaminophen combined with opiates and patients that received opiates alone (Cooke et al. 2018, Chaar et al., 2016). There was an outlier study by Wang et al. that showed what they described as "paradoxical result" which means that the patients that received both acetaminophen and opiates required significantly more opiates than the patients that received opiates alone (Wang et al. in 2015). Some other studies did not demonstrate any significant difference in length of stay (Lee et al., 2019, Chaar et al., 2016). Shaffer et al., 2016 study demonstrated that decreasing opioid use while adding intravenous acetaminophen, helps to decrease length of stay and opioid related complications after bariatric procedures.

Search Strategies

Keyword searches used to search the literature were: *Intravenous acetaminophen, Bariatric patients, Morbidly Obese patients, Postoperative effect, and PACU nurses perspectives.* The basic search on EBSCO discovery connect was limited to full text, scholarly (peer-reviewed) journals from 2015 to 2020. The search yielded most of the applicable articles

that were relevant to my topic and used in the literature review. Out of the 598 articles yielded from the search, a total of 42 articles from all the listed databases were reviewed and 14 relevant articles were selected for synthesis and analysis. Same keywords on CINHAL alone yielded only 5 articles that were part of the result form the initial search. Other keyword searches: *Perioperative intravenous acetaminophen* and 2 Boolean/phrase connections of *AND Bariatric patients, morbidly obese patients,* AND *Post-operative pain control* respectively did not yield any results. However, after it was modified from "Boolean/phrase" to "Find all my search terms" 348 articles were found. Additional keywords searches that included *Post anesthesia care unit (PACU) nurses' perspective* yielded 102 articles that were not helpful. The results were related to patients' post-operative pain assessment tools and nurses' attitudes (see table 1). Other helpful articles from 2005 to 2018 were selected from Ohio link and PubMed.

Critical Appraisal and Synthesis of the Body of Evidence

The evidence from the 14 studies selected for review and synthesis were systematically examined for validity, reliability and applicability using the rapid critical appraisal questions for randomized clinical trial (RCTS)(Fineout-Overholt & Melnyk, 2005). Johns Hopkins critical appraisal tool (Nursing Evidence-Based Practice: Evidence level and quality guide) was also used to critically appraise the level and quality of evidence of the 14 selected studies. The level of evidence of the studies ranged from level 1 to level 2, and the quality of evidence were either ranked high or good in support of the evidence-based practice being evaluated; the effectiveness of perioperative intravenous acetaminophen administration among bariatric patients (see table 2).

Methods: Implementation and Evaluation plan

Qualitative, uncontrolled, post-implementation study design was used in this study. The method was convenience sampling from PACU nurses with pre-implementation & post-

implementation experience of perioperative IV acetaminophen administration among bariatric patients. The survey tool constitutes 8-question modified questionnaire to evaluate the implementation process (questions 1-6), and to assess PACU nurses' belief about the effectiveness and the degree of effectiveness of the evidence-based practice (questions 7&8) (see appendix 2).

Project Setting and Population

The target hospital is a 196-bed acute care community hospital with 10 operating rooms including endoscopy rooms and a cystoscopy room, 19 preoperative rooms and 10 PACU units. This hospital is certified as bariatric center of excellence, multiple and varieties of bariatric procedures are performed at this location weekly. An average of 10 scheduled bariatric procedures are performed by the bariatric surgeon on a weekly basis. Typical bariatric cases performed here include: laparoscopic gastric bypass, laparoscopic sleeve gastrectomy, laparoscopic gastric banding, duodenal switch and more.

Action Plan/Implementation Process

The target hospital strives to maintain certification of excellence for an ongoing bariatric program, this includes maintaining evidence-based practices that improve the quality of care and recovery of morbidly obese patients presenting for bariatric procedures. The program has reviewed and adopted this new practice of perioperative intravenous acetaminophen administration to enhance pain control and decrease opioid related complications in the postoperative period. Since this practice has already been adopted at the facility based on the above stated evidence, the project plan is to firstly, review the newly adopted practice, ensure

that it is implemented appropriately following the guide of the chosen ARCC model. Secondly, qualitatively evaluate the effectiveness of this practice from the PACU nurses perspective.

The plan for this study started with the completion of the Institutional Review Board (IRB) application forms. This study required the full application for research involving human subjects and agency authorization form completion to authorize the study at the intended facility. This was followed by the selection of eligible PACU nurses that have pre-implementation and post-implementation experiences with this evidence-based practice in the care of morbidly obese patients undergoing bariatric procedures. Their consent to participate was obtained and questionnaires distributed among them for completion. The completed questionnaires were collected at a set deadline – an interval of one week. The collected questionnaires were analyzed for results.

Ethical and Legal Considerations

The first ethical consideration is the principle of "nonmaleficence" - Do no harm to patients (O'Mathuna, 2019). This principle is particularly important with the patient selection for the administration of intravenous acetaminophen. It is contraindicated for patients with advanced liver disease, so patients should be evaluated to ensure that they are eligible for acetaminophen usage to avoid doing more harm to them than the good of better pain management. Egalitarian is a principle of fairness and equality, this rising patient population deserves a good pain management process that works for them just like other patient populations.

Another ethical and legal consideration is to ensure that proper informed consent is obtained from participants and to have a full disclosure of any applicable risks. A full institutional review board (IRB) application was completed and approval obtained prior to the

commencement of the study. Preventing fatality in the pain management of morbidly obese by using IV acetaminophen to reduce the amount of opioids given to bariatric patients helps to decrease complications and the legal issues that could result from them.

Stakeholders and facilitators to implementation

The stakeholders for this program are: the county hospital- the center for this project, the anesthesia department, the entire surgery department (the perioperative staff and surgeons at the hospital), the hospital administrative team and most importantly, the morbidly obese patients who directly benefit from this pain management protocol.

One of the major facilitators is that Wood County hospital believes in the pursuit of excellence in the care of morbidly obese patients. The facility and bariatric program displayed openness to suggestions and willingness to adopt evidence-based practices and improvements.

Another factor is that this practices was already adopted and implemented providing the ground for the evaluation of this evidence-based practice as experienced by the PACU nurses.

Administration agrees that this practice will benefit patients and improve their quality of care.

Another facilitator is the months of experience the recovery nurse participants have with IV acetaminophen among bariatric patients, it also added to the validity of this study.

Anticipated barriers to implementation

The anticipated barriers associated with implementation of this evidence-based practice are: Program cost which includes education of staff in preparation for the evidence-based practice implementation, Pushbacks from the surgeons and perioperative staff members. However, since this practice has already been adopted by the bariatric program team, the initial

barriers of cost and getting approval from the bariatric surgeon and administration to initiate a new practice were already taken care of. It also eliminated some of the initial steps such as presentation of evidence-based practice to administration in order to initiate the process. It steered the focus of the project towards evaluation of the implementation process that was already adopted from the lens of the implementation model/framework, evaluating it for areas in need of reinforcement, and weighing the effectiveness of the practice as perceived by the PACU nurses.

Economic Evaluation

The more significant cost of this program lies with its implementation. And that process having been done already by the bariatric program at Wood County Hospital, this aspect of the project; evaluation of the implementation process and outcome is budget neutral.

Outcomes of Project

The outcomes of this project relate to evaluating the implementation process of this evidence-based practice and the effect of perioperative intravenous acetaminophen administered to bariatric patients as perceived by the PACU nurses. The outcomes were identified based on the perception of PACU nurses regarding 1. Effectiveness of EBP, 2. Involvement in the planning, 3. Adequate preparation and support. These outcomes could be divided into primary and secondary effects.

The primary outcome relates to the effectiveness of the EBP. Overall most PACU nurse participants believed that the EBP is effective postoperatively. This belief supports the sustenance of the practice in the care of morbidly obese patients undergoing bariatric procedures. The secondary outcomes relate to the process on the EBP implementation. The goal of this part

of the evaluation is to identify areas in need of reinforcement to ensure high quality and adequate performance of the program. Majority of the PACU nurses agreed that they were involved in the planning and implementation process, majority also agreed that there was adequate preparation, education and support during the implementation process and this ties into the satisfaction of the PACU nurses with the implementation process. The ARCC model is strategically based on development of mentors to support point of care staff members, and to strengthen EBP culture within an organization which is necessary for sustaining EBP and delivering improved outcomes (Melnyk, Fineout-Overholt, Giggleman, & Choy, 2017).

Presentation of Findings

PACU nurses at the target hospital were surveyed using a non-experimental approach to evaluate their belief in the effectiveness of perioperative intravenous acetaminophen among bariatric patients in the postoperative phase. And also, to assess the adequacy of the implementation process parallel to ARCC model of EBP implementation. Survey participation was voluntary, there were about 20 eligible PACU nurses at this target site. Two nurses were absent on leave of absence and two other nurses were newly hired and not eligible to participate. A total of 16 (n=16) questionnaires were distributed among the nurses that were available at work during this interval with the informed consent/introductory documents attached. A total of 14 questionnaires (n=14) were returned by the deadline and this constituted about 87.5% of the committed schedule. This study was designed to be anonymous; to maintain the privacy of participants, a petition to waive signatures on the informed consent forms was applied for and approved by the Institutional Review Board (IRB). The questionnaires were not marked and there was no provision for names or other identifications included. It was distributed by a

designated PACU representative and returned in an envelope provided for the collection at the nurses' station.

There were a total of eight items on the questionnaire. Questions 1, 2, 3, 4, 5, and 6 were focused on the implementation process evaluation: Question #1 assesses the perception of the nurses about their involvement in the implementation planning and the discussions about this EBP. A total of 11 (n=11) participants agreed to question #1 and among these, (n=6) strongly agree. On the other hand, (n=3) disagreed with (n=2) strongly disagreeing. Questions #2 and #3 assessed mentorship or support and timely/effective communication of project information respectively, (n=12) each agreed while (n=2) each strongly disagreed. Questions #4 assessed the preparation in terms of education and provision of information about the indications, dosage, contraindications, side effects of IV acetaminophen, and even demonstrations to adequately prepare the nurses before the implementation. Majority of participants (n=12) agreed, with (n=8) strongly agreeing, (n=2) strongly disagreed. Questions #5 assessed optimism about the outcome of the EBP implementation. The survey showed that 85.7% (n=12) of participants agreed with 57.1% (n=8) strongly agreeing, and 14.2% (n=2) strongly disagreeing. Question #6 weighed the success of the project implementation process and tools towards the set goal as perceived by the PACU nurses. Significantly, a greater number of participants (n=9) strongly agree among the (n=12) participants that agreed, and (n=2) strongly disagreed. Questions #7 and #8 investigated the nurses' belief in the effectiveness of the evidence-based practice and degree of its helpfulness respectively from the participants' experience. Similarly, for question #7, 85.7% (n=12) agreed with 64.2% (n=9) strongly agreeing and 14.2% (n=2) strongly disagreeing.

Question #8 is intended to be the summary of the PACU nurses' belief about the helpfulness of this evidence-based practice. Based on the returned questionnaires, approximately

86 percent (n=12) of participants agree that perioperative intravenous acetaminophen is helpful postoperatively among bariatric patients; (57.1 percent, n=8) of participants strongly agree that it is very helpful while 28.6 percent (n=4) agree that it is moderately helpful. On the other hand, only 14.2 percent (n-2) of participants disagree that this evidence-based practice is helpful. These two participants did not merely disagree, they strongly disagreed that the implemented evidence-based practice is effective at all.

There is a co-relation noted between the participants who disagree that the implementation process was adequate from their responses to questions #1 to #6, and the participants that believe that the evidence-based practice is not helpful at all (questions #7& #8). Only one participant merely disagreed that nurses were involved in the implementation planning of the evidence-based practice but still believed that the practice is helpful. The participants (14.2%, n=2) who strongly disagreed across the board selected that the evidence-based practice is not helpful at all (see appendix 3).

Discussion of Future Recommendations and Conclusions

The demographic data of the PACU nurses that were eligible to participate in the survey showed a majority of women 85.7% (n=12) and only 14.2% (n=2) were men. All the participants 100% (n=14) have greater than 5 years of RN nursing experience, and about 50% (n=7) has greater than 10 years of RN nursing experience. All the participants were Caucasians, and were PACU employees during the planning and implementation period of the evidence-based practice through the period of this evaluation.

Based on the survey data, an overwhelming majority of the PACU nurse participants believe that this evidence-based practice is either “helpful or very helpful” postoperatively after

bariatric procedures . The PACU nurses belief in the effectiveness of this EBP is essential for the sustenance and promotion of this EBP. Furthermore, based on the correlation between the respondents who disagreed that the implementation process (planning, nurses involvement and preparation) was adequate, and the respondents that strongly disagreed that the evidence-based practice is helpful at all, there is need to further investigate if there is a direct relationship between satisfaction of participants with implementation process of EBP and their belief in its efficacy. Same pattern was noted on the affirmative side; all but one participants that selected "agree and strongly agree" to questions #7 and #8 also agreed that the implementation process was adequate and effective. Recommendation for future change projects of this nature is to use an EBP model from the beginning to help guide the plan for execution and implementation rather than looking backwards to see if the process fits any particular model.

Strengths and Limitations

The major strength of this study is the unique approach; the approach to evaluate the impact of adding this medication to the pain management plan of bariatric patients from the PACU nurses' perspective. Most studies in the past as revealed from the literature review were feedbacks from individual patient recipients or retrogressive data collected from past years of postoperative pain management. The incentive for this approach is that PACU nurses take care of morbidly obese patients that have received this medication and those that did not. They are in the unique position to evaluate how comfortable the patients that received IV acetaminophen are in recovery relative to those that did not, even when patients were still unconscious or waking up from the anesthetic. In other words, if it is effective enough to justify its continued usage or administration among this patient population.

Another strength is that this study was carried out in a bariatric center of excellence, where up to 12 bariatric cases are carried out on a weekly basis. The PACU nurses have enough experiences with the care of bariatric patients to make this EBP impact evaluation significant. Another strength stems from the institutional support and disposition to ameliorate postoperative comfort and to prevent complications among bariatric patients through evidence-based practice, which led to the adoption and implementation of the pain management practice. The supportive environment and staff disposition to participate objectively in this study without any direct compensation to them is also a strength that cannot be left out.

The major limitation of this study is that the number of participants (sample size) is not large. It is conducted in a small hospital with very few number of PACU nurses. There was a plan to expand the study to other nearby hospitals with bariatric programs but the plan was derailed by COVID 19 pandemic. Other limitations are attributable to the Pandemic, there was a major interruption and timeline adjustments in the process of conducting this study due to the lockdown and the Ohio State mandate to stop all elective procedures which bariatric procedures are part of.

Implications for Practice

Perioperative administration of intravenous acetaminophen among morbidly obese patients undergoing bariatric procedures is aimed at benefiting them postoperatively in the recovery area. The aim is to enhance patients' comfort by decreasing pain severity, and reducing opioid requirements for breakthrough pain in PACU. Combining intravenous acetaminophen with opioids in the pain control regimen helps to reduce opioid usage thereby reducing opioid induced airway obstruction, respiratory depression and other adverse effects of opioids that can complicate the recovery of morbidly obese patients (Rodriguez, 2018). The outcome of this

study showed that an overwhelming percentage (85.7%) of participants believe that perioperative intravenous acetaminophen administration among bariatric patients is effective in postoperative pain control. It reinforces confidence in the already implemented evidence-based practice, and this belief is reflected in the nurses' attitude towards the practice and leads to its sustenance.

The evidence also supports the expansion of EBP to other surgery specialties involving morbidly obese patients at the facility, recommendations will be made to other surgeons performing other procedures on morbidly obese patients to consider this option for improved quality of pain management in the postoperative period. The study result also highlights the importance of staff preparation during implementation process. When staff engagement is maintained and they are adequately prepared, educated and assisted with the implementation process, they are more likely to assist in bringing out the best outcomes as intended from the project. The nurses will carry out this evidence-base practice with conviction rather than perfunctorily and this leads to both patient and staff satisfaction.

Conclusion

One of the significant challenges engendered by the increasing prevalence of morbid obesity is the need to develop effective postoperative pain management that takes into considerations the physiological changes caused by morbid obesity. There is a great need to find and to adopt uncomplicated pain management practices that adequately enhance postoperative comfort among this patient population while minimizing opioid related complications after surgical procedures. The evaluation of the impact of perioperative intravenous acetaminophen administration among bariatric patients measured from the perspective of experienced PACU nurses at Wood County Hospital in Bowling Green, Ohio has shown that there is a significant belief in the effectiveness of this evidence-based practice. Although the sample size was small,

the validity of the study result is augmented by its setting (Bariatric Center of Excellence), and the experience of the participants with the use of this intervention among bariatric patients for postoperative pain control.

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Table 1

Search Strategies for Review of the Literature

Databases	Keywords	Results
• EBSCO Discovery Connect • Cumulative Index to Nursing and Allied Health Literature (CINAHL) • United States National Library of Medicine (PubMed)	• Intravenous Acetaminophen • Bariatric surgery • Postoperative Pain control • Morbid obesity • Perioperative IV acetaminophen • Postoperative effect • PACU nurses' Perspective	• 1398 articles • 598 peer-reviewed (2015-2020) • 42 reviewed • 14 keeper articles for analysis and synthesis

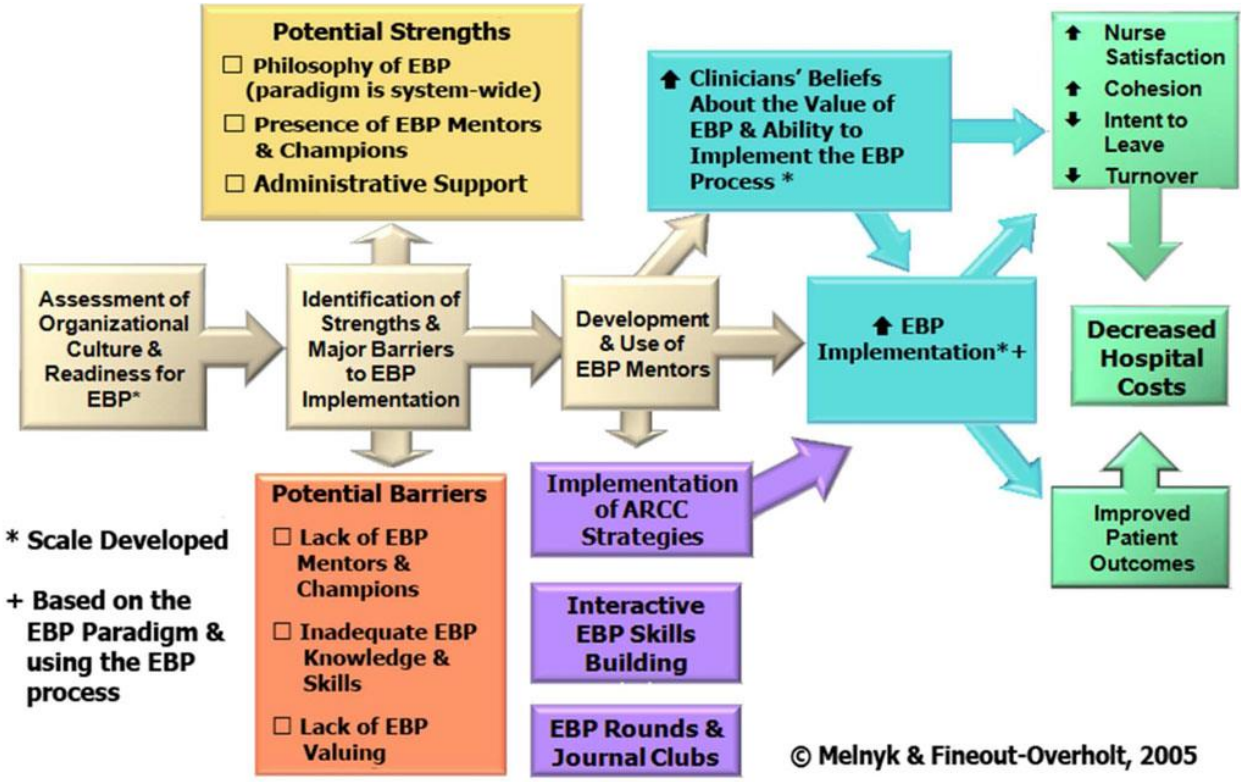
Table 2

Keeper Studies for Inclusion Examining Level of Evidence and Quality of Evidence

			Level of Evidence							Quality of Evidence		
Author(s)	**Year**	**#**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**High**	**Good**	**Low**
Sinatra et al.	2012	1		X							X	
Khalili et al.	2013	2		X							X	
Lange et al.	2018	3		X						X		
Saurabh et al.	2015	4		X						X		
Chaar et al.	2016	5		X						X		
Lee et al.	2019	6	X							X		
Gonzalez et al.	2015	7		X							X	
Peterson et al.	2005	8		X							X	
Jubril et al.	2015	9		X							X	
Song et al.	2014	10		X						X		
Hickman et al.	2018	11		X							X	
Shaffer et al.	2017	12		X							X	
Wang et al.	2015	13		X							X	
Cooke et al.	2018	14		X							X	

Appendix 1

The Advancing Research and Clinical Practice through Close Collaboration (ARCC) Model



Appendix 2

Perioperative Intravenous Acetaminophen Administration among Bariatric Patients

Evaluation of Evidence-based Practice (EBP) implementation and outcomes.

Questionnaire

Questions:	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Nurses were involved in the implementation planning of the EBP				
2. There were mentors available to help with practice implementation processes				
3. Project information communicated in a timely and effective manner				
4. Enough demonstrations /in-services on ofirmev use, dosage and contraindications prior to implementation				
5. The project achieved the desired outcomes and benefits as set out in the benefits realization plan.				
6. Project implementation was effective based on established best practices, processes and tools				
7. Perioperative intravenous Tylenol administration among bariatric patients is effective in postoperative pain control				
8. How helpful is this practice based on your experience in PACU? Circle one (0 = not helpful, 1 = minimally helpful, 2= moderately helpful, 3= very helpful)	0	1	2	3

Appendix 3

Survey Results from PACU Nurses (Tally)

Question: #s	No of Participants that Strongly Disagree	%	No of Participants that Disagree	No of participants that Agree	%	No of participants that Strongly Agree	%	N=14 check
1.	1+1 =2	14.2	1 (7.1%)	1+1+1+1+1 = 5	35.7	1+1+1+1+1+1 = 6	42.9	14
2.	1+1 =2	14.2		1+1+1+1+1+1= 6	42.9	1+1+1+1+1+1 = 6	42.9	14
3.	1+1 =2	14.2		1+1+1+1+1 = 5	35.7	1+1+1+1+1+1+1= 7	50	14
4.	1+1 =2	14.2		1+1+1+1 = 4	28.6	1+1+1+1+1+1+1+1 = 8	57.1	14
5.	1+1 =2	14.2		1+1+1+1 = 4	28.6	1+1+1+1+1+1+1+1 = 8	57.1	14
6.	1+1 =2	14.2		1+1+1 = 3	21.4	1+1+1+1+1+1+1+1+1 = 9	64.2	14
7.	1+1 =2	14.2		1+1+1 = 3	21.4	1+1+1+1+1+1+1+1+1 = 9	64.2	14
8.	1+1 =2	14.2		1+1+1+1 =4	28.6	1 +1+1+1+1+1+1+1 = 8	57.1	14