Supplemental Intraoperative Intravenous Fluid Administration among Patients Undergoing Surgical Procedures and General Anesthesia for the Prevention of Postoperative Nausea and Vomiting: A Retrospective Chart Review

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Abstract

Background and Review of Literature: Postoperative nausea and vomiting (PONV) is one of the most common patient complications following general anesthesia. Recent literature supports the practice of supplemental intravenous fluid administration to patients receiving general anesthesia with no risk of fluid volume overload.

Purpose: The purpose of this DNP project was to assess the overall occurrence of PONV and to determine if patients who experienced PONV after receiving general anesthesia, were administered supplemental intravenous fluids during the intraoperative period.

Methods: The project consisted of a retrospective chart review. A total of 342 electronic health records (EHRs) were reviewed and 57 patients were included in the DNP project.

Implementation Plan: A project site was identified; a retrospective chart review was conducted, examining one month of patient EHRs who underwent general anesthesia. Data was collected and analyzed via Microsoft Excel, which included the amount of intravenous fluids received during the intraoperative period, weight, gender, surgical procedure, and ASA physical status.

Implications/Conclusions: At the completion of the retrospective chart review, it was discovered that 57 (17%) out of 342 patients who underwent general anesthesia were treated for PONV. Of the 57 patients, 50 (88%) did not receive intraoperative supplemental intravenous fluids. Only 7 (12%) patients received greater than 15mL/kg of intravenous fluid during the intraoperative period.

Keywords: Intraoperative supplemental intravenous fluids, postoperative nausea and vomiting

Supplemental Intraoperative Intravenous Fluid Administration among Patients Undergoing Surgical Procedures and General Anesthesia for the Prevention of Postoperative Nausea and Vomiting: A Retrospective Chart Review

Postoperative nausea and vomiting (PONV) is a common patient complication following surgery and anesthesia (Cao, White, & Ma, 2017). Postoperative nausea and vomiting can lead to patient dissatisfaction, prolonged hospital stays, increased costs and further medical complications (Cao et al., 2017). Regardless of medical and surgical advances, PONV continues to affect 20-40% of surgical patients (Cao et al., 2017).

Background

Nausea can be defined as the feeling of needing to vomit while vomiting is defined as the instinctive reflex that involves the ejection of gastric contents (Squire & Spencer, 2018). Physiologically, the occurrence of PONV is complicated and involves both central and peripheral receptor mechanisms of the nervous system (Cao et al., 2017). The vomiting center in the brain is in the lateral reticular formation of the medulla (Jewer et al., 2019). The medulla coordinates efferent transmission to the respiratory, gastrointestinal, and abdominal musculature to generate vomiting (Jewer et al., 2019). The vomiting center receives afferent information from the pharynx, gastrointestinal tract stretch receptors, brain, aortic baroreceptors and chemoreceptor trigger zone (Jewer et al., 2019). Commonly, patients present for surgery with decreased intravascular volume due to preoperative fasting. Intravascular dehydration can lead to a decrease in gastrointestinal perfusion which can contribute to PONV (Jewer et al., 2019).

Postoperative nausea and vomiting is an ongoing complication that negatively impacts patients following surgical procedures. Management of this common complication involves risk stratification, intraoperative treatment, and modification of anesthetic technique (Squire & Spencer, 2018). Postoperative nausea and vomiting can be distressing to patients and increases healthcare costs (Squire & Spencer, 2018). Risk factors that can lead to PONV are often grouped into patient, surgical and anesthetic factors (Squire & Spencer, 2018). Common patient risk factors for PONV include female gender, non-smoker, history of PONV, history of motion sickness, dehydration, and gastric distension (Squire & Spencer, 2018). Surgeries that commonly contribute to PONV risk are gynecological surgery, ears, nose and throat surgery, strabismus procedures, intra-abdominal surgeries, and neurosurgery (Squire & Spencer, 2018). General anesthesia, volatile anesthetics, nitrous oxide, intraoperative opioids, neostigmine, and intraoperative hypotension are anesthetic factors that all increase the risk of PONV (Squire & Spencer, 2018). Majority of these risk factors cannot be modified; therefore, it is important for anesthesia providers to deliver appropriate treatment during the intraoperative period to decrease the incidence of PONV.

During the intraoperative period, adult patients receive intravenous fluids. However, anesthesia providers do not consistently administer intravenous fluids in a systematic manner during the surgical procedure. Antiemetic medications are commonly given for the prevention of PONV, but supplemental intravenous fluid administration is not consistently utilized for the prevention of PONV. The American Society of PeriAnesthesia Nurses (ASPAN, [2006]) recommends the administration of supplemental intravenous fluids for the prevention of PONV in high-risk patients with an American Society of Anesthesiologists (ASA) physical status of I or

II, with insensible losses when there is no concern of fluid volume overload. This is a Class IIa, Level A recommendation from ASPAN's clinical practice guideline for the prevention and management of PONV (ASPAN, 2006).

Problem Statement

The use of supplemental intravenous fluids during the intraoperative period is not consistently utilized in the clinical setting. Since PONV is one of the most common patient complications following general anesthesia, a multimodal approach should be considered to successfully prevent this adverse effect. Intraoperative intravenous fluids are given to every adult patient during general anesthesia. However, the amount of fluids a patient receives is determined by the anesthesia provider. Dehydration alone is a risk factor for PONV, and current literature indicates supplemental fluid administration during the intraoperative period can aid in preventing PONV (Squire & Spencer, 2018). This DNP projects aims to identify the overall occurrence of PONV at the project site and if anesthesia providers are currently using supplemental fluid administration practices for the prevention of PONV. The clinical question remains, are adult patients undergoing surgical procedures with general anesthesia who experienced PONV, receiving supplemental intravenous fluid practices during the intraoperative period for the prevention of PONV?

Organizational "Gap" Analysis of Project Site

The project site for this DNP project does not currently utilize supplemental fluid administration practices for the prevention of PONV, nor is a protocol in place recommending this practice. After observation, the organization appears to be consistent with administering

medications for the prevention of PONV, both preoperatively and intraoperatively. However, based on personal observations within the site, fluid administration practices are commonly restrictive at this facility and not often considered for the prevention of PONV. When discussing with anesthesia providers at this facility, the majority describe a culture in the organization that supports restrictive fluid administration practices intraoperatively. Although, opinions differ among anesthesia providers at the project site.

Review of the Literature

A review of current literature was conducted in September 2019. Search terms utilized in the search included supplemental intraoperative intravenous fluids and postoperative nausea and vomiting. Databases used for the literature search included Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, the Cochrane Library, and Google Scholar. Inclusion criteria for articles within the literature review were systematic reviews, meta-analyses or randomized control trials that involved the comparison of supplemental intravenous fluids, standard or restrictive fluid administration practices during the intraoperative period among adult patients undergoing general anesthesia. The articles must have been published after 2009. A limited number of articles were identified that met inclusion criteria. When searching via PubMed database a total of 36 articles were yielded. Six articles were included in the literature review, two of the articles were systematic reviews and the remainder randomized control trials. Articles excluded were those studying children and those with no comparison of supplemental fluid administration with restrictive or standard fluid practices.

Postoperative nausea and vomiting continues to be a major complication following general anesthesia. The incidence of PONV can be as high as 80% among patients who are considered high risk (Apfel et al, 2012). The occurrence of PONV not only negatively impacts patients, but also increases healthcare costs by delaying discharge and causing readmission to the hospital (Apfel et al., 2012). There are several antiemetic medications available for the prevention of PONV. However, the use of these medications can be costly and cause unwanted side effects (Apfel et al., 2012). It is believed that dehydration is a major contributor to PONV. Supplemental intravenous fluid administration may be an inexpensive solution to prevent PONV and limit medication use that leads to unwanted side effects. However, fluid administration practices differ greatly among anesthesia providers. In addition, there are several factors that must be considered when choosing how much intravenous fluids a patient receives during the intraoperative period, including type of surgical procedure and patient medical history.

Within the literature the definition of supplemental fluid administration differs. Supplemental intravenous fluid administration practices among studies within the literature review for the prevention of PONV ranged between 10mL/kg and 30mL/kg during the preoperative or intraoperative period. One study compared the administration of 10mL/kg with 30mL/kg of intravenous fluids during the intraoperative period among patients receiving diagnostic laparoscopic gynecological surgery (Chauhan et al., 2013). This study found that 66% of patients who received 10mL/kg of intravenous fluid experienced PONV in the first four hours after surgery, while only 40% of the patients in the group who received 30mL/kg of intravenous fluids experienced PONV (Chauhan et al., 2013). A second study compared the effects of 30mL/kg of intravenous fluids plus 5mg of dexamethasone with the administration of 5mg of

dexamethasone alone for female patients undergoing laparoscopic cholecystectomy (Ismail et al., 2017). This study found the overall occurrence of PONV during the first 24 hours postoperatively was significantly reduced (22%) among the group of patients who received the 30mL/kg of intravenous fluids plus dexamethasone than the comparison group (44%) who received dexamethasone only (Ismail et al., 2017). Another randomized double-blind study included and compared three separate patient groups. One patient group received 10mL/kg of lactated ringers, the second group received 20mL/kg and the third group 30mL/kg (Sharma et al., 2010). This study discovered the mean score of the visual analogue scale (VAS) for nausea and vomiting was significantly higher in patients who only received 10mL/kg of lactated ringers when compared to the groups of patients who received 20mL/kg or 30mL/kg of lactated ringers (Sharma et al., 2010). The final study also compared three different patient groups, one group received routine hydration alone, defined as 1.5mL/kg/h of normal saline, the second group received routine hydration plus 5mL/kg of lactated ringers 80 to 90 minutes prior to surgery and the third group received routine hydration plus 5mL/kg intraoperatively (Soleimani et al., 2018). Soleimani et al. (2018) found patients who received additional intravenous fluids preoperatively had significantly lower PONV when compared to the patient groups who received routine hydration and those who received routine hydration plus additional fluids intraoperatively (Soleimani et al., 2018). In addition, this study found patients who received additional intraoperative fluids had an overall decrease number of incidences of PONV when compared to the group of patients who received routine hydration only (Soleimani et al., 2018). Two systematic reviews were also discovered while reviewing the literature. Both systematic reviews included studies that examined the administration of supplemental intravenous fluid

administration greater than that received from the comparison group (Apfel et al., 2012, Jewer et al., 2019). One systematic review included 15 studies and found supplemental fluid administration significantly reduces the overall incidence of PONV (Apfel et al., 2012). The systematic review completed by Jewer et al. (2019) included 41 studies and found with moderate certainty, supplemental intraoperative intravenous fluids reduces the incidence PONV during the overall postoperative period. Regardless of the differing volumes received, all studies within the literature review found the use of supplemental fluid administration practices reduced the overall incidence of PONV when compared to patients who received lesser volumes of intravenous fluid (Apfel, 2012; Chauhan et al., 2013; Ismail, Bakri, & Abd-Elshafy, 2017, Jewer et al, 2019, Sharma, 2010, Soleimani et al., 2018). In addition, the review of literature also revealed patients who received supplemental fluid administration had an overall reduction in the use of antiemetics during the postoperative period (Apfel, 2012; Chauhan et al., 2013; Ismail, Bakri, & Abd-Elshafy, 2017, Jewer et al, 2019, Sharma, 2010, Soleimani et al., 2018). See Appendix A for literature matrix.

Several studies identified within the literature review examined the occurrence of PONV over an extended period of time and examined postoperative nausea and postoperative vomiting separately. Apfel et al. (2012) and Jewer et al. (2019) both reported a reduction in postoperative nausea during the early postoperative period in patients who received supplemental intravenous fluid. Apfel et al. (2012) found no reduction in early or late postoperative vomiting, but Jewer et al. (2019) reported a decrease in early and late postoperative vomiting in patients who received supplemental intravenous fluids. Ismail et al. (2017) did not find any significant difference in early or late PONV among patients who received supplemental intravenous fluid. While some of

the studies differ slightly in their results, all studies within the literature review found an overall reduction in PONV among patients who received supplemental intravenous fluids (Apfel, 2012; Chauhan et al., 2013; Ismail, Bakri, & Abd-Elshafy, 2017, Jewer et al, 2019, Sharma, 2010, Soleimani et al., 2018).

Two studies within the literature review also examined the effects of postoperative pain following the administration of supplemental fluid administration. Both studies found a significant reduction of pain scores in patients who were treated with supplemental fluid compared to those who received a lower volume of intravenous fluids during the intraoperative period (Ismail, Bakri, & Abd-Elshafy, 2017, Soleimani et al., 2018). Soleimani et al. (2018) found that pain scores were significantly lower among patients who received supplemental fluid during the preoperative period. Ismail, Bakri and Abd-Elshafy, (2017) found the mean VAS pain score during the first 24 hours postoperatively was lower among patients who received supplemental fluid administration compared to those who did not.

Current literature suggests there are advantages to the use of supplemental fluid administration practices during the intraoperative period among ASA physical status I and II patients undergoing general anesthesia for the prevention of PONV. However, after completing the literature review there are some limitations. Majority of the studies only included women and ASA physical status I or II patients. In addition, the definition of supplemental intravenous fluids differed among the studies and is not clearly defined at the conclusion of the review. Very few studies mentioned adverse events related to supplemental fluid administration practices. Additional studies are needed to examine potential adverse side effects of supplemental fluid

administration practices and to establish a clear definition of how much fluid is necessary to prevent PONV.

Evidence Based Practice: Verification of Chosen Option

According to the clinical practice guideline created by the American Society of PeriAnesthesia Nurses (ASPAN), adequate hydration is one intervention that can be used for the prevention and treatment of PONV (ASPAN, 2006). Specifically, ASPAN recommends patients who are at risk for PONV who have an ASA physical status I or II should receive supplemental intravenous fluids (ASPAN, 2006). The clinical practice guideline recommends the use of 15 to 40mL/kg of lactated ringers to patients who are not at risk for fluid volume overload (ASPAN, 2006).

After a review of current literature related to supplemental intraoperative intravenous fluid administration, several studies have found supplemental intravenous fluid administration of 20 to 30mL/kg during the intraoperative period can lower the incidence of PONV (Apfel, 2012; Chauhan et al., 2013; Ismail, Bakri, & Abd-Elshafy, 2017, Jewer et al, 2019, Sharma, 2010, Soleimani et al., 2018). This DNP project will evaluate the overall occurrence of PONV at the project site and if anesthesia providers are utilizing this current recommendation within their practice at the project site.

Theoretical (Conceptual) Framework

The purpose of the project is to identify the overall PONV occurrence and if patients who experienced PONV received supplemental intravenous fluids during the intraoperative period for the prevention of PONV. This project will examine and identify if anesthesia providers are

utilizing fluid management practices for the prevention of PONV to improve patient outcomes. Adult patients undergoing surgical procedures and general anesthesia receive intravascular fluids during the intraoperative period. The amount of intravascular fluids a patient receives is determined by the actions and decisions of the anesthesia provider. Reflecting upon current and previous fluid administration practices can aid in improving patient outcomes and reducing PONV in patients undergoing surgical procedures. Utilizing the Theory of Reflective Practice in Nursing can help guide the practice of nurses and advanced practice nurses to lead a fully reflective clinical nursing practice.

Reflection in nursing practice is considered a vital component to providing high quality patient care. Originally, reflective practice was discussed by Schon within both nursing practice and nursing education (Choperena, Oroviogoicoechea, Salcedo, Moreno, & Jones, 2019). Reflective practice suggests professional practice involves an evolving process of utilizing knowledge, experience, and intuition in the clinical setting (Choperena et al., 2019). The Theory of Reflective Practice in Nursing is a middle range nursing theory (Galutira, 2018). This theory suggests nurses need to reflect upon their nursing practice including reflection-before-action, reflection-in-action, and reflection-beyond-action (Galutira, 2018). Nurses who practice reflection when providing care can improve quality of care, impact professional development, and improve care outcomes (Galutira, 2018).

There are five key concepts within The Theory of Reflective Practice in Nursing: reflection, clinical situation or experience, promoting factors, hindering factors, and outcomes (Galutira, 2018). A diagram reflecting the relationship of the five key concepts can be found in

Appendix B. Reflection is an active evolving process that consists of exploration of personal feelings, thoughts, and actions (Galutira, 2018). Reflection-before-action consists of reflecting before emerging into a clinical practice situation (Galutira, 2018). Reflection-in-action entails reflective thinking during the clinical situation, and involves the immediate decision making of nurses while at the bedside (Galutira, 2018). Reflection-beyond-action is the critical analysis that occurs after the clinical situation (Galutira, 2018). Reflection-beyond-action also occurs after the clinical situation but involves utilizing a nurse's experience in clinical practice to improve upon professional practice (Galutira, 2018). The clinical situation or experience is described as an event that involves the patient, family, group or community and the nurse, that requires a solution to a clinical practice problem (Galutira, 2018). Promoting factors are factors that support the nurse in leading a reflective practice (Galutira, 2018). For example, these factors can include supportive workplace culture, positive attitudes, adequate time, and developed cognitive skills (Galutira, 2018). Hindering factors are the opposite of promoting factors and cause a hinderance to a nurse's ability to reflect in practice (Galutira, 2018). Lastly, outcomes are the positive results that occur due to reflection (Galutira, 2018). These results can include improved patient care outcomes, improved quality of nursing care, personal development, and professional growth (Galutira, 2018). There are many patient factors that can be considered when determining fluid management in a patient undergoing general anesthesia and a surgical procedure. A retrospective chart review is one example of how one may reflect-beyond-action. This involves reviewing and collecting data to aid in discovering a problem within clinical practice. Applying The Theory of Reflective Practice in Nursing within this aspect of anesthesia care can encourage certified

registered nurse anesthetists (CRNAs) to utilize reflection to improve upon all aspects of patient care.

Goals, Objectives, and Expected Outcomes

The main objective of the project is to discover the overall occurrence of PONV at the project site and if supplemental fluid administration practices of greater than 15mL/kg are being utilized within the clinical setting for the prevention of PONV. My goals for the project are listed below.

1. Discover current recommendations and literature for fluid management practices related to the prevention of PONV by November 2019.
2. Identify the overall occurrence and number of patients who experienced and were treated for PONV at the project site during a one-month timeframe by March of 2020.
3. Identify the percentage of patients who experienced PONV that did not receive supplemental fluid administration during the intraoperative period during the month of March 2020.
4. Identify areas for quality improvement or protocol development within the project site at the completion of the project in August 2020.

The purpose is to identify care patterns among anesthesia providers and gaps in practice, which will ultimately lead to recommendations for future improvement for the management and prevention of PONV. It is expected to find that most patients at the project site who underwent

general anesthesia and experienced PONV during the month of January 2020 did not receive supplemental intravenous fluid greater than 15mL/kg during the intraoperative period.

Project Design

This DNP quality improvement project will utilize a retrospective chart audit using previously recorded data. The project will utilize a quantitative descriptive approach to obtain data to evaluate if supplemental fluid administration practices are currently being utilized in clinical practice at the project site for the prevention of PONV. The project will be a retrospective convenience sample of adult patients who underwent a surgical procedure during the month of January 2020. The goal of the project is to reach a sample size of 50 patients. Upon the review of patient charts, the marker for further inclusion into the project is patients medicinally treated for PONV during phase one or phase two of the postoperative period who received general anesthesia. The EHRs of patients who received general anesthesia during this timeframe and were medicinally treated for PONV will be further reviewed to assess the intraoperative anesthesia record. Additional data collected will include ASA physical status, age, gender, amount of intravenous fluids received during the intraoperative period, weight, and surgical procedure. After data collection, data analysis will be performed to identify if patients who experienced PONV received the recommended fluid administration for the prevention of PONV. The data collected will provide insight on current fluid administration practices at the clinical site and the overall occurrence of PONV.

Project Site and Population

The DNP project will be implemented at a Midwestern hospital. This facility is a private, non-profit, Level III Trauma Center with 191-beds and Magnet Designation located in the Midwest (Indiana University Health, 2019). The county in which this facility is located is a predominately white community that has a population of 195,732 (Unites States Census Bureau, n.d.) See Strengths Weakness Opportunities (SWOT) Analysis Appendix F.

The patient population that will be included in the retrospective chart review are adult patients 18 years of age and older who underwent a surgical procedure and general anesthesia during the selected timeframe. Excluded were children 17 years of age and younger and patients who received other primary anesthesia techniques not considered general anesthesia as documented in the intraoperative anesthesia record, such as monitored anesthesia care (MAC) or a regional anesthetic.

Setting Facilitators and Barriers

This project site is affiliated with an academic institution and has current evidence-based protocols in place. This may facilitate the DNP project and professionals may be more accepting of recommendations following the completion of the project. However, the anesthesia department at the project site is staffed by both physician anesthesiologists and CRNAs. The two varying anesthesia backgrounds within the project site may be a barrier to producing practice changes at the facility.

Methods

The project is intended to identify a gap in clinical practice and evidence-based guidelines related to supplemental intravenous fluids for the prevention of PONV. The project

will be completed by utilizing a retrospective chart review. A project site has been selected and a project mentor has agreed to provide access to EHRs to complete the chart audit. Since data collected is from human subjects, an application for exemption from Marian University's Institutional Review Board (IRB) will be completed before data collection begins. Once an exemption is granted from the IRB, the retrospective chart review may begin. No informed consent is needed, as only previously recorded data will be reviewed. A systematic process has been created to collect data once individual patient charts are accessed. Patients older than 18 years of age who underwent surgical procedures during the selected timeframe will be included in the review. Once patients who were treated for PONV and received general anesthesia are identified during the selected timeframe, data related to the amount of intravenous fluids received during the intraoperative period, ASA physical status, age, gender, and surgical procedure will also be collected. This data will be analyzed to determine the number of patients who experienced PONV and received ASPAN's recommended amount of intraoperative fluids of at least 15mL/kg for the prevention and management of PONV. Once data is analyzed recommendations will be made regarding supplemental fluid administration practices for the prevention of PONV.

Measurement Instrument

All information collected for this DNP project will be obtained from patient EHRs. Data collected will be placed into a Microsoft Excel spreadsheet. Data analysis will also be completed using Microsoft Excel. The weight of the patient and the amount of intravenous fluids received during the intraoperative period will be recorded to calculate milliliters per kilogram of

intravenous fluids each patient received. Additional variables will be collected during the retrospective chart review to allow for a better understanding of the patient population experiencing PONV. The gender of each patient included in the study will be identified to determine if one gender is more impacted from PONV. The age of each patient will also be recorded to better describe the population within the project. The ASA physical status will be collected to further provide information on the patient population and help identify patients who may qualify for supplemental fluid administration practices. The type of surgical procedures patients underwent will also be collected to identify if certain surgical procedures were commonly recorded among the patients who experienced PONV. All these data points will be obtained from the medication administration record (MAR) and the anesthesia record located in patient EHRs.

The weight of each patient who had experienced PONV will be obtained from the anesthesia record within the EHR. Since the project is a retrospective chart review the reliability and validity of the measurement devices are not able to be determined. The measurement of PONV during the postoperative period will be determined by patient medicinal treatment for nausea or vomiting during phase one or phase two of the postoperative period. After speaking with post-anesthesia care unit (PACU) registered nurses at the project site, many stated they do not consistently chart the occurrence of nausea or vomiting within the patient's physical assessment. The nurses stated they will treat a patient for PONV with medications ordered for the postoperative period by the anesthesia provider. Therefore, assessing the administration of medications for the treatment of PONV will be a more accurate evaluation for occurrence of PONV.

There are several medicinal options that an anesthesia provider may order for the treatment of PONV. At the project site, the medications ordered for PONV are specified to be given as needed for nausea or vomiting only. The medication administration record (MAR) of each patient will be examined to identify if the patient was given medication ordered by the anesthesia provider to treat PONV. The accuracy of the collected data is dependent on the quality of the data originally entered into the chart.

Data Collection Procedures

Data for this project will be manually and systematically collected via a retrospective patient chart review utilizing EHRs. The project mentor will aid in giving access to patient EHRs for the collection of data. Patient charts will be reviewed for the entire month of January 2020. Patients charts who are over the age of 18 who underwent a surgical procedure during January 2020 will be included in the review.

The chart review was completed in March of 2020. Data collected was entered into a Microsoft Excel spreadsheet throughout the data collection process. Data collected via Microsoft Excel file contained no identifying patient health information. The data collection file was saved within the password protected secure One Drive-Marian University cloud.

The surgical schedule from January 1, 2020 to January 31, 2020 at the project site was identified. The EHRs of adult patients who underwent a surgical procedure that required general anesthesia during this timeframe were accessed. Upon access to individual patient EHRs, the anesthesia record was reviewed to determine if the patient underwent a general anesthetic. Next, the patient's MAR was evaluated to determine if the patient was medicinally treated for PONV

during phase one or phase two of the postoperative period. If the patient received general anesthesia and was treated for PONV, additional data was collected from the anesthesia record including age, gender, weight, surgical procedure, ASA physical status, and amount of intraoperative intravenous fluids received. The EHRs of patients who were under the age of 18, underwent a surgical procedure where they would not be receiving care in the PACU, or underwent a procedure that did not require general anesthesia were not accessed.

Data Analysis

The aim of the project is to identify the overall occurrence of PONV, and the amount of intraoperative intravenous fluids patients received who were treated for PONV. Data analysis via Microsoft Excel will include descriptive statistics. Nominal variables will be measured via count, such as gender and ASA physical status. Continuous variables of mean, median and range, will be calculated for age and amount of intravenous fluids received in milliliters per kilogram via Microsoft Excel. The amount of intravenous fluids received in milliliters will be divided by the weight of the patient in kilograms to determine how many milliliters per kilogram each patient received during the intraoperative period. Once milliliters per kilogram of intravenous fluids received among patients who experienced PONV is determined, data analysis will be completed to determine the number of patients that received greater than or less than 15mL/kg. This data will then be compared to current guidelines and recommendations in literature to detect areas for quality improvement for the prevention of PONV at the project site.

Results

During the month of January 2020, 342 patient EMRs were reviewed to determine if adult patients who received general anesthesia were treated for PONV during the postoperative period. Of those 342 patients, 57 (17%) patients were identified to be treated for PONV during phase one or phase two of the postoperative period and included for further data collection. Forty-four of the patients were female and the remaining 13 were male. Two patients were given ASA physical status of I, 26 patients were considered ASA physical status II, 28 were ASA physical status III and one patient was classified as ASA physical status IV. The mean age of the included patients was 50 years old, median age 48, lowest age 19 and highest age 86 (See graphs and tables of demographic data Appendix D). The mean amount of intravenous fluids received was 10mL/kg the median was 9.2mL/kg, the minimum was 3mL/kg, the maximum was 34.8 mL/kg and the standard deviation was 6.1mL/kg. Fifty (88%) patients out of the 57, received less than 15mL/kg of intravenous fluid during the intraoperative period, four (7%) patients received between 15 and 20mL/kg of intravenous fluid, one (2%) patient received between 20.1 and 30mL/kg and two (3%) patients received greater than 30mL/kg of intravenous fluid. Of the 57 patients included in the review, 28 were classified as ASA physical status I or II. When only considering ASA physical status I or II patients in the project, 24 (86%) did not receive greater than 15mL/kg of intravenous fluid during the intraoperative period while the remaining four (14%) patients received greater than 15mL/kg of intravenous fluid (See graphs representing data Appendix E). Twenty-eight (48%) of the surgical procedures were intra-abdominal with 22 of these utilizing a laparoscopic technique.

Interpretation/Discussion

The results from the DNP project discovered that supplemental fluid administration practices are not being utilized for the prevention of PONV at the project site. According the clinical practice guideline created by ASPAN, administration of supplemental intravenous fluids in ASA I or II patients if there is no risk for fluid volume overload should be considered for the prevention of PONV (ASPAN, 2006). This guideline explains that the administration of 15 to 40mL/kg of lactated ringers has been shown to decrease PONV in this patient population (ASPAN, 2006). Of all the patients who experienced PONV included in the project, 88% received less than the recommended intravenous fluids of 15mL/kg, only 7% of the patients received between 15 and 20mL/kg, 2% received between 20.1 and 30mL/kg and 3% received greater than 30mL/kg. When only considering ASA physical status I and II patients, 86% received less than 15mL/kg of intravenous fluids during the intraoperative period. This data suggests that there is room for improvement for prevention PONV at this project site utilizing supplemental fluid administration practices.

Cost-Benefit Analysis/Budget

There was no cost for the implementation of this DNP project to the organization where it was performed. The DNP student utilized practicum hours to complete the implementation and evaluation of the project. If the project were to be implemented at the project site facility the cost would be the salary of the individual completing the retrospective chart review.

Timeline

The proposed project is expected to take a total of one year to complete. The project first began in August 2019 and the goal is to complete the project by August 2020 (See GANTT chart Appendix C).

Ethical Considerations/Protection of Human Subjects

The overall objective of this project was to implement an evaluation to determine if practice changes are needed to improve patient quality of care and outcomes. Before beginning the implementation phase of the project, the Institutional Review Board at Marian University granted an exemption on February 2020 for this DNP project. Throughout the duration of the project, no patient identifying health information was collected and the Health Insurance Portability and Accountability Act (HIPAA) standards were maintained. Also, this DNP project upheld the Marian University values throughout its duration. Specifically, the Marian University value dignity of the individual was upheld by keeping patient information private and respecting each human that was included in the project.

Conclusion

Postoperative nausea and vomiting is an unpleasant complication that can occur after receiving general anesthesia. This common complication can negatively impact both patient satisfaction and healthcare costs (Cao et al., 2017). Supplemental intravenous fluid administration during the intraoperative period is currently recommended by ASPAN for the prevention of PONV (ASPAN, 2006). However, it appears supplemental fluid administration practices are not consistently used in the practice setting.

This DNP project involved a retrospective chart review to determine the overall incidence of PONV and to evaluate if current anesthesia practices related to supplemental fluid administration for the prevention of PONV is currently being utilized within the project site. The retrospective chart review found a total of 57 patients were treated for PONV during phase one or phase two of the postoperative period during the month of January 2020. Of the 57 patients who experienced PONV, only seven patients received greater than 15mL/kg of intravenous fluid during the intraoperative period, four patients received between 15 and 20mL/kg and of intravenous fluid, one patient received between 20.1 and 30 mL/kg of intravenous fluid and two patients received greater than 30mL/kg. Of the 57 patients who experience PONV, 28 of the patients were ASA physical status I or II. Of those 28 patients, only 4 patients received greater than 15mL/kg during the intraoperative period. Current recommendations from the clinical practice guideline written by ASPAN (2006) states that patients who are at high risk for PONV, who have an ASA physical status of I or II and are not at risk for fluid volume overload should receive supplemental fluid administration of 15 to 40mL/kg for the prevention of PONV. In addition, the review of literature also identified supportive current research related to the use of supplemental fluid administration for the prevention of PONV. Following the data analysis, this project site could benefit from utilizing supplemental intravenous fluid administration practices for the prevention of PONV for patients undergoing general anesthesia.

While not all patients are candidates for supplemental fluid administration practices, it appears this project site has the population in which this practice could be utilized. Nearly half of the patients who experienced PONV during the month of January 2020 were ASA physical status I or II. Protocols or recommendations for the consideration of utilizing supplemental fluid

administration practices for the prevention of PONV for specific surgical procedures and patient populations may be beneficial to both patients and the project site.

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Jewer, J., Wong, M., Bird, S., Habib, A., Parker, R., & George, R. (2019). Supplemental perioperative intravenous crystalloids for postoperative nausea and vomiting. *The Cochrane Database of Systematic Reviews, 3*. doi: 10.1002/14651858.CD012212.pub2

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Appendix A

Citation	Purpose/ Variables of Interests (Keywords)	Literature Type & Research Tools	Theoretical Foundation	# of References	Key Findings

Apfel, C., Meyer, A., Orhan-Sungur, M., Jalota, L., Whelan, R., & Jukar-Rao, S. (2012). Supplemental intravenous crystalloids for the prevention of postoperative nausea and vomiting: Quantitative review. *British Journal of Anaesthesia, 108*(6), 893-902. doi:10.1093/bja/aes138	Purpose: Systematic review examining the effect of intraoperative intravenous crystalloid administration on reducing PONV. Keywords: fluid therapy, hypotension/ prevention and control, infusions, IV, isotonic solutions/ administration and dosage, postoperative nausea and vomiting/ prevention and control	Systematic Quantitative Review 15 studies N=1570	None	64 references	1. Supplemental crystalloids significantly reduced early postoperative nausea (RR 0.73, 95% CI 0.59-0.89; p=.003) 2. Supplemental IV crystalloids did not reduce the risk of early (0.66, 0.37-1.16; p = .15) or late (0.52, 0.25-1.11; p= .09) postoperative vomiting. However, supplemental crystalloid did reduce the overall POV (0.48, 0.29-0.79; p= .004) 3. Supplemental crystalloid administration did not lower the risk of early PONV (0.74, 0.49-1.12; p= .16), but did lower the risk for late PONV

Chauhan, G., Madan, D., Gupta, K., Kashyap, C., Maan, P., & Nayar, P. (2013). Effect of intraoperative intravenous crystalloid infusion on post-operative nausea and vomiting after diagnostic gynaecological laparoscopy: Comparison of 30 ml/kg and 10 ml/kg and to report the effect of the menstrual cycle on the incidence of post-operative nausea and vomiting. *Anesthesia, Essays and Researches,* *7*(1), 100-4. doi:10.4103/0259-1162.114013	Purpose: Compare the effect related to 30 ml/kg and 10 ml/kg of crystalloid intravenous infusion to PONV in patients undergoing diagnostic laparoscopic gynecological surgery. Also, to correlate the incidence of PONV with different phases of the menstrual cycle. Keywords: ambulatory surgery, fluids, menstrual cycle, nausea and vomiting, IV crystalloid	Randomized double-blind control trial N=200	None	21 References	1. The first four hours after anesthesia the control group has a total incidence of nausea and vomiting of 66% as compared to the intervention group of 40% (p = .036) 2.Usage of anti-emetics was less in the intervention group compared to the control group p = .04) 3. Female patients who were in the menstrual phase of their menstrual cycle experienced nausea and vomiting in 89.48% of cases compared to 58.33% of patients in the proliferative phase and 24.24% of patients in the secretory phase of their

Ismail, E., Bakri, M., & Abd-Elshafy, S. (2017). Dexamethasone alone versus in combination with intra-operative super-hydration for postoperative nausea and vomiting prophylaxis in female patients undergoing laparoscopic cholecystectomy: A randomized clinical trial. Korean *Journal of Anesthesiology, 70*(5), 535-541. doi:10.4097/kjae.2017.70.5.535	Purpose: To examine the combined effects of pre-induction dexamethasone with super-hydration on PONV and pain in patients undergoing laparoscopic cholecystectomy. Keywords: cholecystectomy, dexamethasone, laparoscopy, pain, postoperative nausea and vomiting, super-hydration	Prospective randomized double-blind clinical trial N=100 Visual Analogue Scale (pain) Verbal Descriptive Scale (VDS) (nausea/vomiting)	None	29 references	1. The overall occurrence of PONV was significantly decreased in Group DF who received both the dexamethasone 5 mg and intraoperative fluids of 30 ml/kg with a p value of .03. 2. No statistically significantly differences among the two groups for the occurrence of nausea, retching or vomiting during the early and late postoperative periods. 3. The number of patients who reported no incidences of nausea, retching or vomiting was significantly increased in the group who received dexamethasone and supplemental fluids

Jewer, J., Wong, M., Bird, S., Habib, A., Parker, R., & George, R. (2019). Supplemental perioperative intravenous crystalloids for postoperative nausea and vomiting. *The Cochrane Database of Systematic Reviews*, 3. doi:10.1002/14651858.CD012212.pub2	Purpose: A Cochrane systematic review examining the effect of supplemental intraoperative intravenous crystalloid administration on PONV in patients undergoing surgical procedures under general anesthesia. Keywords: perioperative period, nausea and vomiting, intravenous administration, and crystalloid fluids	Systematic Review 41 studies 4224 participants	None	69 references	1. Supplemental intravenous crystalloid administration probably reduces the overall risk of postoperative nausea (PON) (RR 0.62, 95% CI 0.51 to 0.75), precisely during the early (RR 0.67, 95% CI 0.58 to 0.78) and late (RR 0.47, 95% CI 0.32 to 0.69) postoperative time points. 2. Supplemental intravenous crystalloid administration probably reduces the overall risk of postoperative vomiting (POV) (RR 0.50, 95% CI 0.40 to 0.63). Supplemental fluid administration reduced both early POV (RR 0.56, 95% CI 0.41 to 0.76)

Sharma, C., Sadhu, S., Joshi, N., Gupta, V., & Dixi, M. (2010). Effect of perioperative intravenous crystalloid infusion on postoperative nausea and vomiting after laparoscopic cholecystectomy. *Journal of Anaesthesiology Clinical Pharmacology*, 26(3), 383-386.	Purpose: To evaluate and compare the effects of intravenous crystalloid at differing volumes during the perioperative period on PONV. Keywords: crystalloid, nausea, vomiting, visual analogue scale	Prospective randomized double-blind study N=90 female participants Visual analogue scale	None	16 references	1. Visual analogue scale (VAS) score for nausea in the early postoperative period was higher within the group of patients who received 10mL/kg of crystalloid fluid than the groups of patients who received 20mL/kg of fluid and 30mL/kg of fluid. 2. Patients who received the lowest amount of fluid (10mL/kg) experienced more vomiting and rescue antiemetic requirement when compared to the other groups of patients in the study who received 20mL/kg or 30mL/kg of crystalloid fluids. 3. Minor

Soleimani, M., Mohammadi, M., Teymourian, H., Gholizadeh, N., Khazaei, Y., & Safari, F. (2018). The effect of fluid therapy in acute post-operative complications of breast cancer; pain and post-operative nausea and vomiting. *International Journal of Cancer Management, 11*(6). doi:10.5812/ijcm.67047	Purpose: The aim of the study is to examine the effects of preoperative and supplemental intraoperative fluid administration when compared to standard fluid administration on PONV in patients undergoing breast cancer surgery. Keywords: postoperative nausea vomiting, pain, crystalloid	Double-blind randomized control trial N=105 Visual analogue scale for pain and nausea	None	15 references	1. Nausea, vomiting and postoperative pain were found to be significantly lower in the group of patients who received excessive intravenous fluids preoperatively ($p < .05$) 2. Patients who received excessive fluids preoperatively were significantly less likely to require antiemetic administration postoperatively. ($p = .008$). 3. Patients who received preoperative fluid administration also showed lower risk of needing analgesic administration postoperatively for pain.

Appendix B

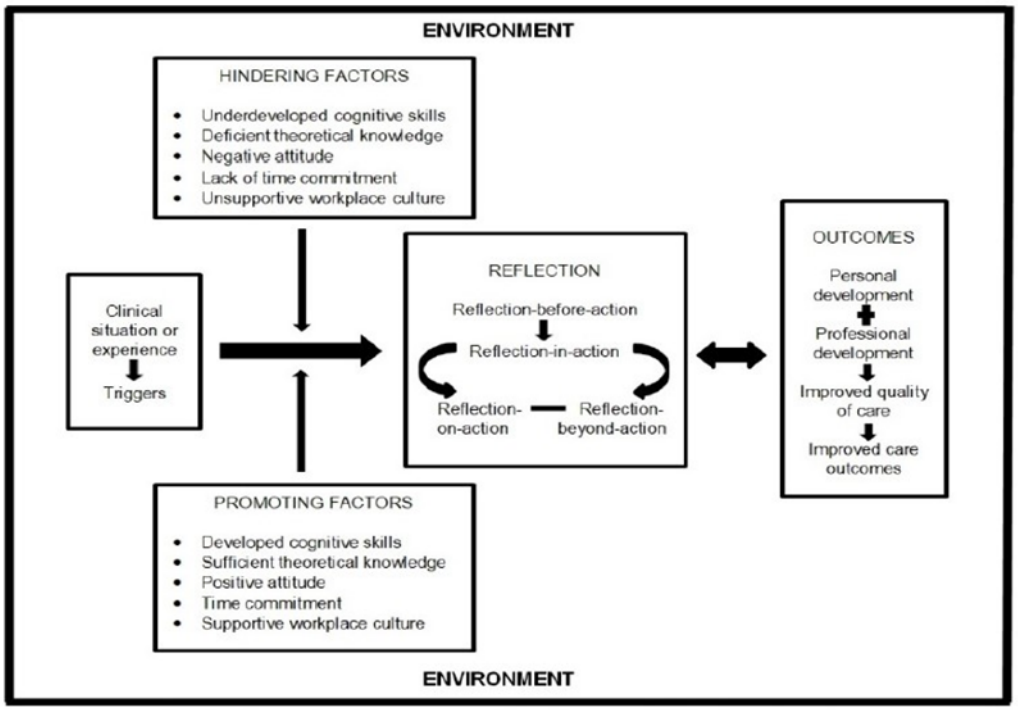
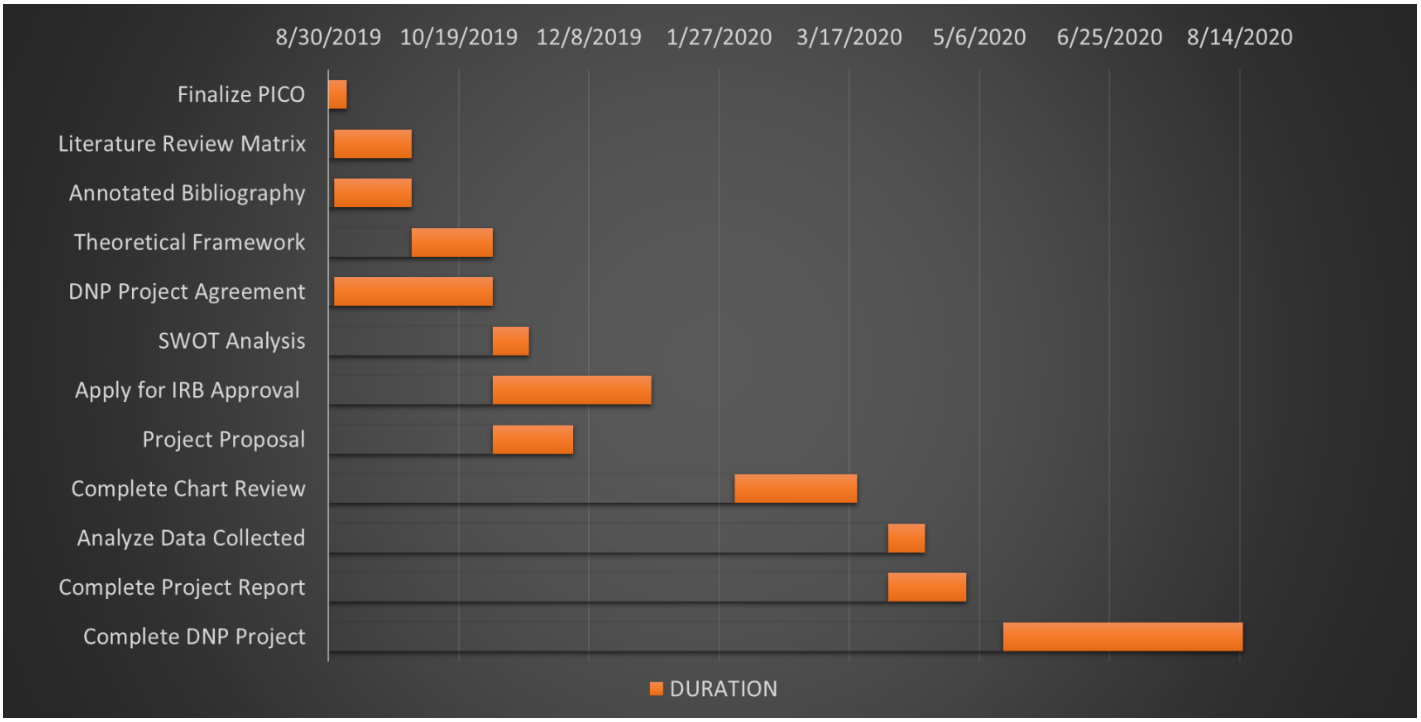


Figure 1. Conceptual Framework of the Theory of Reflective Practice in Nursing

Figure 1. The Theory of Reflective Practice in Nursing Conceptual Framework (Galutira, 2018)

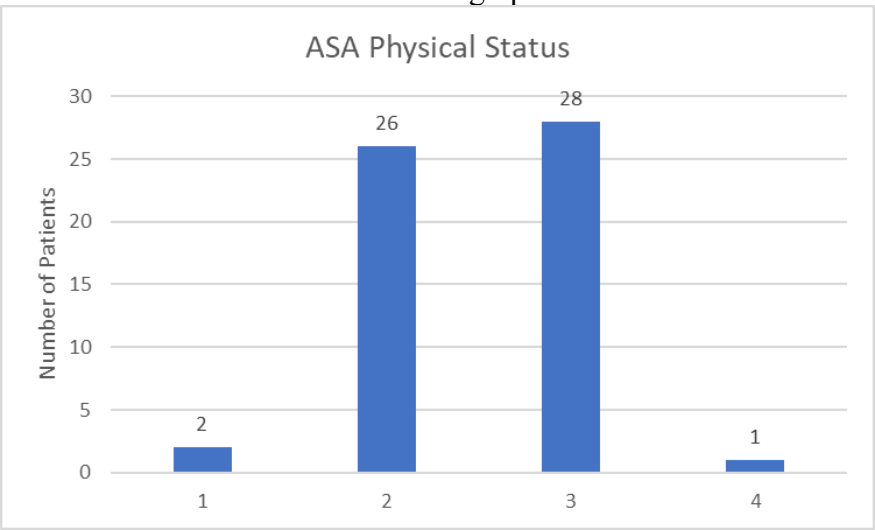
Appendix C

GANTT Chart

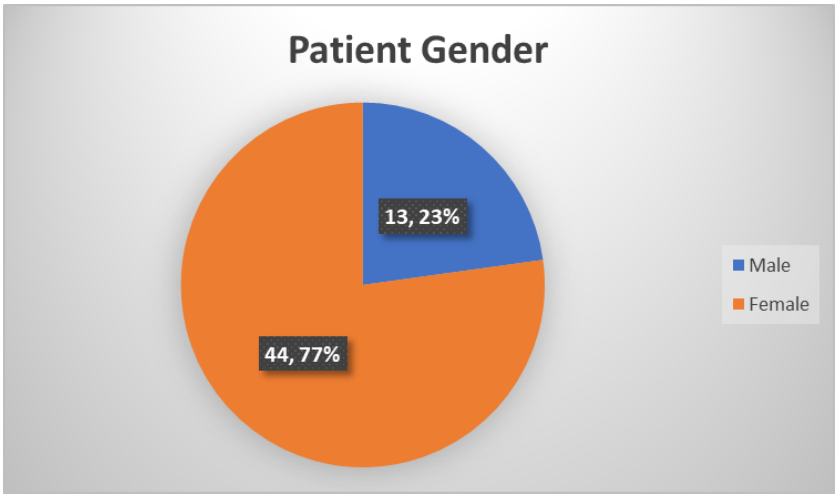


Appendix D

Patient Demographics



Graph 1. Distribution of ASA physical status



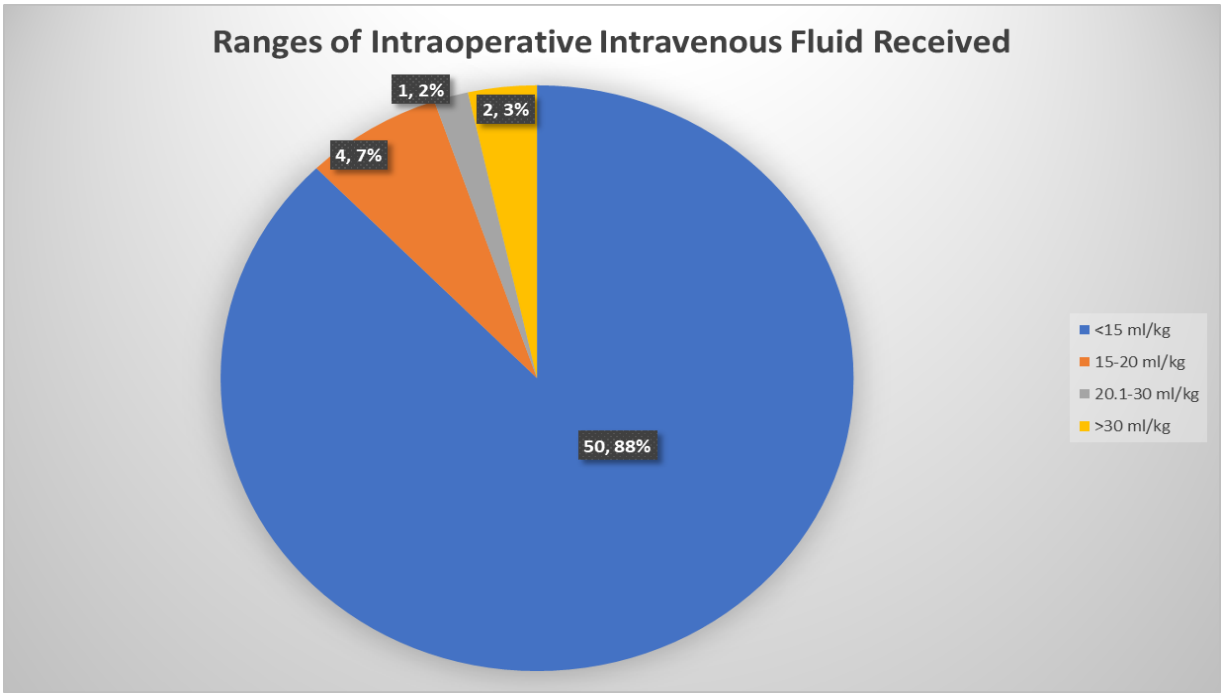
Graph 2. Distribution of gender

	N	Mean	Median	Minimum	Maximum
Age	57	50	48	19	86

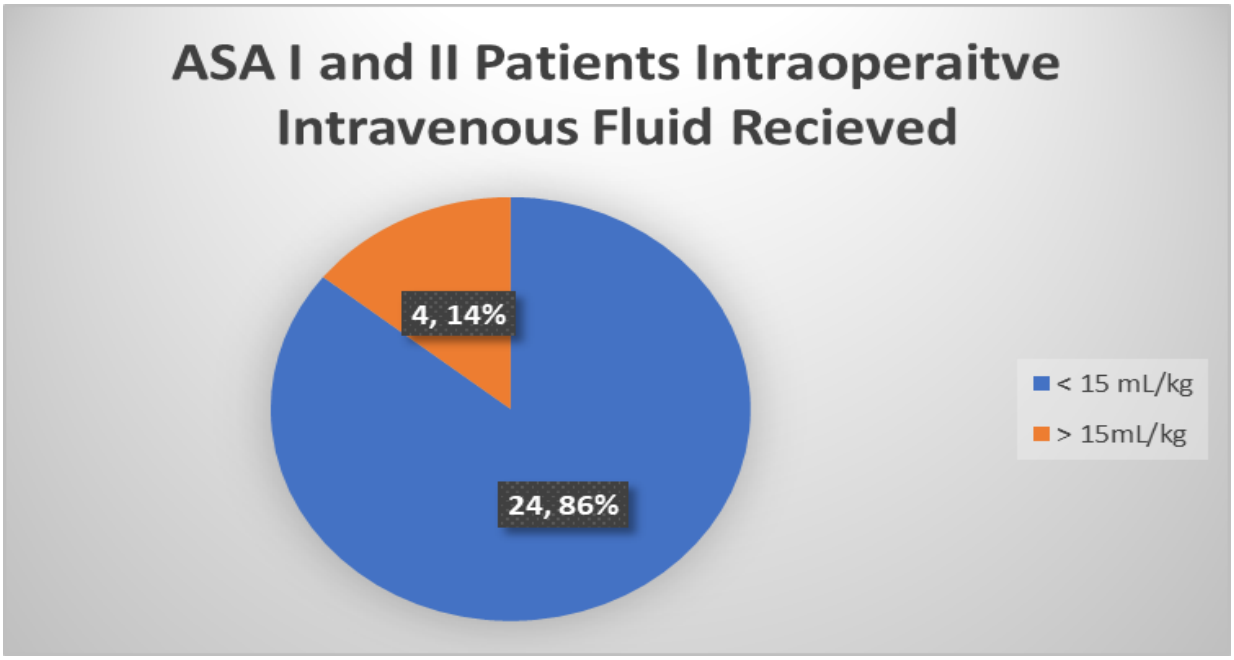
Table 1. Distribution of age

Appendix E

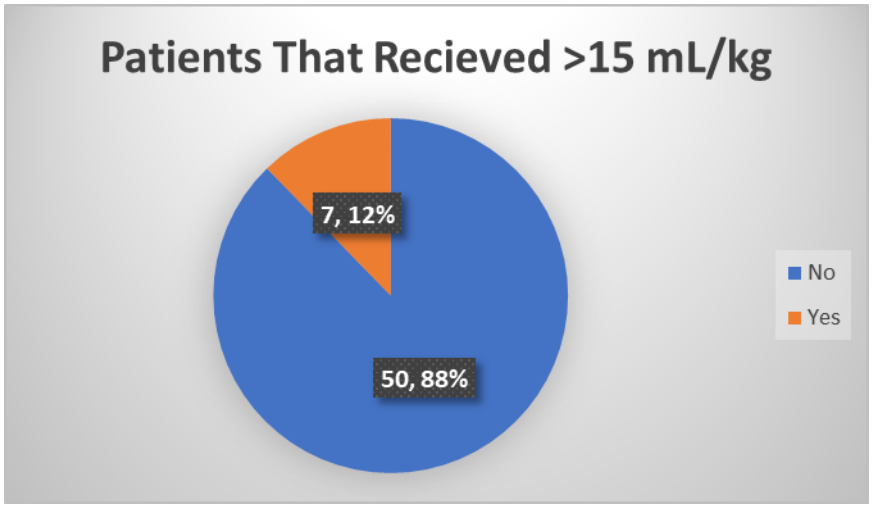
Data Graphs



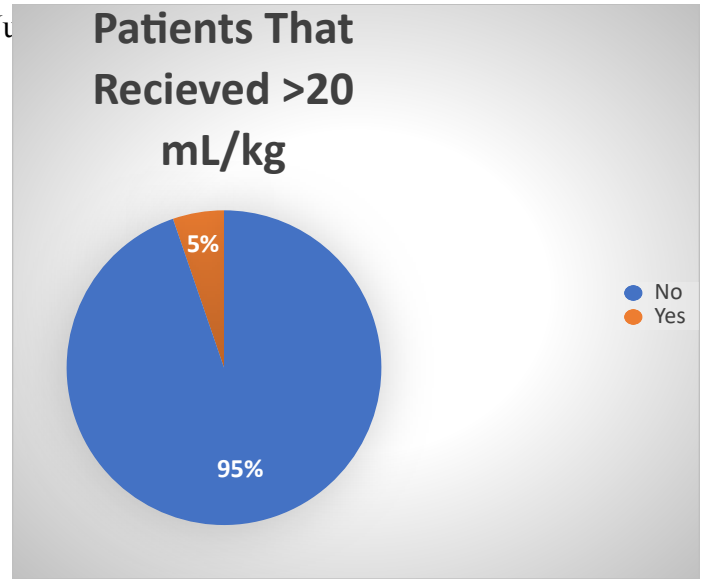
Graph 3. Intraoperative Intravenous Fluids Received mL/kg



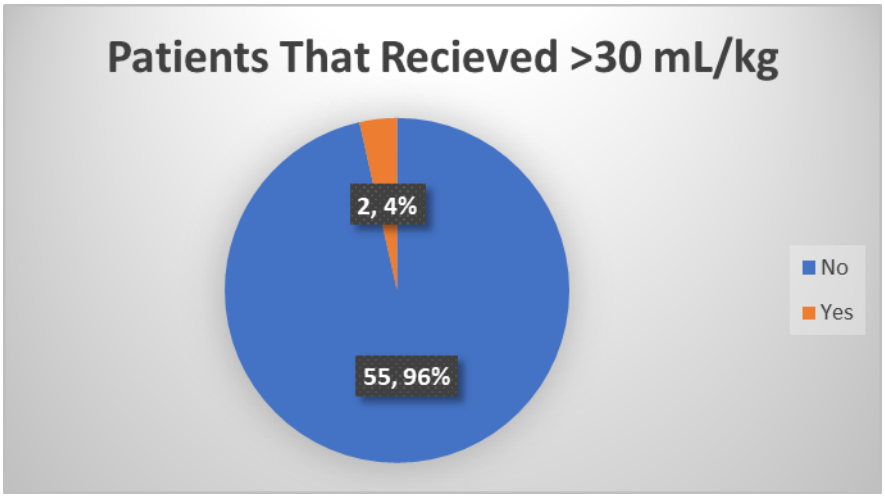
Graph 4. Intraoperative Intravenous Fluids Received mL/kg ASA I and II Patients Only



Graph 5. Nu



Graph 6. Number of patients that received greater than 20mL/kg



Graph 7. Number of patients that received greater than 30mL/kg

	Mean	Median	Minimum	Maximum	SD
mL/kg of fluids received	10	9.2	3	34.8	6.1

Table 2. Distribution of intravenous fluids mL/kg

Appendix F

SWOT Analysis

Clinical Site

Andrea Gum

Strengths	Weaknesses
• Academic Institution • Magnet Designated Facility • Evidence Based Protocols currently in place • Supportive Environment (Indiana University Health, 2019)	• No current standards involving fluid administration in place for the prevention of PONV
Opportunities	**Threats**
• Improve patient outcomes • Reduce costs • Improve patient satisfaction • Develop protocol regarding fluid management for the prevention of PONV • Improve provider knowledge • Identify practice improvement	• Inability to reach consensus between differing anesthesia providers (MDA vs CRNA) • Restrictive fluid therapy practices • Fear of adverse effects related to supplement fluid practices