Changing Perceptions: Goal Directed Fluid Therapy

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Abstract

Enhanced Recovery After Surgery (ERAS) is an evidenced based multimodal perioperative pathway designed to improve patient outcomes after surgery and decrease length of stay. ERAS contains several components that are necessary to follow during each phase of the operative process. Goal directed fluid therapy (GDFT), which occurs during the intraoperative phase is an area that anesthesia providers can focus on to improve patient outcomes. A needs assessment was conducted and it was determined that Palmetto Health Richland has a length of stay (LOS) that is higher than the national average for colon procedures. Therefore, it was determined this could be an area of improvement. Anesthesia providers use dynamic parameters obtained from the FloTrac/ClearSight minimally invasive hemodynamic monitor to guide clinical decisions regarding fluid administration when giving fluids based off of GDFT. Prior to implementing any new patient care guidelines, education should occur. The goal of this project was to develop an educational session regarding the FloTrac/ClearSight monitor and determine if the educational session increased CRNA's knowledge and changed perceptions regarding using the data obtained from the monitor to guide their patient's fluid management. The project consisted of administering a pre- and postintervention survey to determine if the teaching session was effective. The data analysis yielded favorable results that education should be used to increase knowledge and the likeliness to use the FloTrac/ClearSight monitor also increased after the presentation of the educational session.

Changing Perceptions: Goal Directed Fluid Therapy

Introduction

Background and Significance of the Problem

Enhanced Recovery After Surgery (ERAS) is a perioperative care pathway comprised of a multidisciplinary team and is aimed at patients recovering quicker after undergoing major surgery (ERASSociety, 2016). ERAS is a program of evidence-based modifications in preoperative, intraoperative, and postoperative elements of care to reduce surgical stress and postoperative destructive metabolism (Steenhagen, 2016). According to Bakker, Cakir, Doodeman, & Houdijk (2015), "The focus of ERAS seeks to maintain homeostasis and regain mobility and oral fluid and food intake as soon as possible" (p. 1130). ERAS has been shown to improve surgical outcomes by reducing length of stay, postoperative complications and readmission rates following colorectal surgery and therefore, has also been used in other types of surgeries (Labgaa et al., 2016).

ERAS programs contain guidelines for each phase of the surgical experience. The preoperative phase involves preoperative information, education, and counseling for the patient regarding expectations before, during, and after surgery. Preoperative optimization is necessary for patients who smoke or abuse alcohol. Smoking cessation and elimination of alcohol from the patient's lifestyle should occur at least four weeks prior to surgery (Nelson, Altman, et al., 2016). Optimizing patients preoperatively by correcting anemia and avoiding mechanical bowel preparation when bowel resection is planned is also beneficial with ERAS protocols (Nelson, Altman, et al., 2016; Nelson, Kiyang, et al., 2016). The American Society of Anesthesiologists (ASA) recommends fasting from clear liquids at least two hours prior to surgery, light meals have a recommendation of 6 hours and fried or fatty foods have a recommendation of 8 hours

(ASA, 2011). The ERAS society encourages providers to allow their patients to consume clear liquids up until 2 hours prior to surgery and solids until 6 hours prior to surgery with no differentiation between light and heavy meals (Nelson, Altman, et al., 2016). The ERAS Society recommends routine administration of sedatives should not be given and DVT prophylaxis with heparin or a low molecular weight heparin should be given preoperatively for gynecologic/oncologic surgical procedures (Nelson, Altman, et al., 2016).

Intraoperative guidelines suggest administration of intravenous (IV) antibiotics within 60 minutes before skin incision, use of short acting anesthetic agents, a multimodal approach for post-operative nausea and vomiting, minimally invasive surgery, avoidance of hypothermia and the use of goal directed fluid therapy (Nelson, Kiyang, et al., 2016). According to Miller, Roche, & Mythen (2014), "The goals of intraoperative fluid management are to maintain central euvolemia and to minimize excess salt and water" (p.158). An individualized fluid management program designed to optimize perioperative fluid administration has been identified as an important component of ERAS because perioperative fluid management influences patients' outcomes (Cannesson & Gan, 2016; Melloul et al., 2016). A meta-analysis conducted by Benes et al. shows that goal directed fluid therapy based on dynamic parameters (GDFTdyn) as compared to standard fluid management decreases post-surgical morbidity, the rate of infectious, cardiac and abdominal complications, as well as ICU length of stay (Benes, Giglio, Brienza, & Michard, 2014).

Problem Statement/PICO

According to Srinivasa, Kahokehr, Soop, Taylor, & Hill (2013), "GDFT therapy involves the administration of intravenous fluids to optimize pre-defined, patient-specific clinical proxies of tissue perfusion". Systolic pressure variation (SPV), pulse pressure variation (PPV), stroke

volume variation (SVV), and pleth variability index (PVI) also known as dynamic parameters (GDFTdyn), have been shown to be beneficial in identifying patients in advance whom will respond to a fluid load by a significant increase in stroke volume and cardiac output (Benes et al., 2014). In practice, GDFT involves repeated administration of small boluses of intravenous fluids until a certain target or plateau is reached (Srinivasa et al., 2013). Despite evidence in support of GDFT and despite the availability of the necessary monitoring equipment, a GDFT protocol has not been implemented at Palmetto Health Richland (PHR).

A priority for healthcare organizations is to improve patient outcomes, quality, and consistency of care by integrating evidence-based practice into daily care delivery (Saunders & Vehvilainen-Julkunen, 2016). The Institute of Medicine (IOM) has set a goal that, by the year 2020, 90% of clinical decisions will be supported by accurate, timely, and up-to-date clinical information, and will reflect the best available evidence (InstituteofMedicine, 2009). Best evidence supports optimizing intravascular volume during major abdominal surgery using SVV to achieve intraoperative hemodynamic stability and decrease serum lactate concentration at the end of surgery (Benes et al., 2010).

Palmetto Health has a mission that is committed to improving the physical, emotional, and spiritual health of all individuals and communities it serves; to providing care with excellence and compassion; and, to working with others who share their fundamental commitment to improving the human condition (PalmettoHealth, 2016). However, PHR had an average length of stay of 14.6 days for colon procedures in 2016 which exceeds the national average of 8-12 days length of stay for colon procedures (DeBarros & Steele, 2013; PHR, 2016). Implementing a GDFT program at PHR may be beneficial in helping the facility accomplish their mission.

According to Srinivasa, et al. (2013), “The most significant barriers to conducting GDFT were either a lack of availability of monitoring tools or a lack of experience with instrument”. Because the barrier to equipment is not a factor at this facility, it may be surmised that the issue is lack of education and experience. Therefore, the goal of this project is to develop a structured educational program on the use of the FloTrac/ClearSight, a minimally invasive hemodynamic monitor by Edwards Lifesciences, which will increase clinical decision making utilizing the data obtained from the FloTrac/ClearSight hemodynamic monitor. This project will seek to determine if a structured educational program will increase the perception and knowledge of clinical decision making using the FloTrac/ClearSight hemodynamic monitor.

Ethical Threats and Barriers

Interprofessional. Surgeons have preferences for their patients. Some surgeons believe in giving generous amounts of fluids to correct a perceived hypovolemia or restricting fluid if they believe their patient is hypervolemic.

> According to Pearsall, Meghji, Pitzul, & Aarts (2015), “General surgeons cited themselves, their colleagues, and residents as barriers due to personal preferences and resistance to change. Some surgeons acknowledged that they would be hesitant to change some of their practices solely due to not liking change or not believing that changing practice would not make a difference for their patient. A few surgeons also commented on some of their colleagues' resistance to change or their department as a whole being resistant to change” (p. 94).

One approach to overcoming this barrier would involve education of the surgeons regarding the benefits of GDFT as evidenced by best practices. Implementing change amongst physicians was felt to be easier to accomplish when collaboration communication, and a physician champion were involved in the process (Pearsall et al., 2015). However, sometimes there is difficulty with collaboration from other specialties. Therefore, it would be beneficial to start with the least resistant group of surgeons and allow the physician champion to be responsible for overcoming the resistance that will be met by reluctant surgeons.

Anesthesiologists may also be a barrier to implementation of GDFT. Physicians identified inadequate basic knowledge of EBP, time constraints, and limited time as barriers to new EBP protocols (Chiu et al., 2010). GDFT involves the use of the FloTrac/ClearSight technology to monitor dynamic parameters and this may pose a challenge to anesthesiologists that are not familiar with the new monitoring equipment. Much of this barrier can be overcome by the CRNAs increasing their use of the technology and then the anesthesiologist may become more comfortable with change in practice with increased exposure to the FloTrac/ClearSight technology.

Intraprofessional. Buy-in amongst the CRNAs is one of the biggest barriers. Many CRNAs are content in their current practice and don't believe a change in their practice is necessary (Srinivasa et al., 2013). Educational meetings have been effective with convincing individuals to change. According to the National Institute for Health and Clinical Excellence (2007), "Conferences, workshops, training courses and lectures are often used to educate healthcare professionals about the latest developments in their field (p.21). Anesthesia providers may feel that their workload is increased if additional monitoring is required. However, having a patient that is more hemodynamically stable and knowing exactly which intervention to use,

pressor or fluid, would actually decrease the anesthetist workload. Education can decrease the perceived barrier of an increased workload as well.

Organization/Community. Currently, there are two FloTrac/ClearSight hemodynamic monitors. As individuals increase the use of GDFT protocols, the facility may have to purchase more monitors. However, the potential savings from decreased LOS and improved patient outcomes will be able to justify the increased cost of purchasing additional equipment. Presenting a cost analysis to the hospital executives demonstrating a profit after multiple decreased LOS should motivate the facility to purchase additional equipment.

Synthesis of the Literature

Goal Directed Fluid Therapy. Fluid management is essential in the management of patients during surgery (Mythen & Grocott, 2016). Insufficient or excessive fluid administration during the peri-operative period can be linked to post-surgical complications (Benes et al., 2014). Overloading patients with excessive fluid has been associated with harm (Miller et al., 2014). According to Miller et al. (2016), "Administration of excessive fluid will result in hypervolemia and a subsequent increase in intravascular hydrostatic pressure with release of atrial natriuretic peptides that can damage the endothelial glycocalyx" (Miller et al., 2014).

Focusing on intraoperative fluid management, the challenge is to find the optimal balance while achieving 2 primary goals: establishing and maintaining central euvolemia, and avoiding the administration of inadequate or excessive fluid with a high salt content. Hypovolemia may lead to hypoperfusion, bowel ischemia, organ dysfunction, and increased adverse outcomes. Conversely, administration of an excessive amount of fluid will increase edema, organ dysfunction, postoperative ileus, and an increase in adverse outcomes may result (Shodhan,

Miller, Mythen, & Gan, 2016). According to a meta-analysis conducted by Gomez-Izquierdo, Feldman, Carli, & Baldini (2015), "intraoperative GDT shortens the time to the first bowel motion, the time to resume oral intake, and the incidence of postoperative nausea and vomiting after abdominal surgery" (p. 586).

Administering fluid until the patients' heart has reached the plateau on the Frank-Starling curve has been the most effective way to prevent hypovolemia and hypervolemia (Benes et al., 2014). According to Benes et al. (2014), "In clinical practice, this approach consists of giving fluid until flow parameters (stroke volume or cardiac output) reach a plateau value (to prevent hypovolemia), then to stop giving any additional fluid volume (to prevent fluid overload)" (p. 4)

Dynamic Parameters. Dynamic predictors such as stroke volume variation (SVV), pulse pressure variation (PPV), systolic pressure variation (SPV) are not markers of blood volume, nor markers of cardiac preload, but markers of the position on the Frank-Starling curve and indicate fluid responsiveness (Benes et al., 2014). For GDFT, the use of dynamic parameters has been shown to be more beneficial in predicting fluid responsiveness than flow parameters (Benes et al., 2014).

According to Benes (2014), dynamic parameters have the "advantage of being simple, whereas the use of flow parameters require interventions and calculations to guide fluid therapy" (p. 6). Using dynamic parameters does not require any intervention to know if the patient is a fluid responder or not (a high SPV, PPV, SVV or PVI value suggests that the patient is fluid responsive), nor any calculations (delta change in stroke volume, oxygen delivery) (p.6). Caregivers simply have to monitor dynamic parameters and ensure the value remains below a predefined target value (usually around 10 to 12%)" (p. 6).

Implementing Evidence Based Guidelines. Introduction of new treatment guidelines in the surgical environment can be particularly difficult due to fear of increased complications and readmission rates that could occur if LOS is shortened (Pedziwiatr, Kisialeuski, Wierdak, Stanek, & Natkaniec, 2015). However, when implementing changes based on evidence those fears should be eliminated because the research exists to support clinical use.

Evidence-based practice has a purpose, which is to improve patient care and outcomes (Innis, Dryden-Palmer, Perreira, & Berta, 2015). According Innis et al. (2015), "Despite repeated findings that the use of evidence-based practice has been associated with improved patient care, quality, and outcomes, numerous studies have found that patients do not receive care that is based on strong, scientific evidence (p. 254). The question must be asked, what can be done to improve the utilization of evidence based practice or why is there a lack in the use of evidence based practice? To implement evidence based practices, barriers such as reluctance from staff must be overcome. Identification of the best practice for implementation of new procedures can help with transitioning staff to use evidence based practice to guide clinical judgement.

Innis et al. (2015) states, "When evidence-based practice is introduced into an organization, implementation can be facilitated if the practice is tied to the mission and values of the organization, and to its strategic direction" (p. 257). Palmetto Health's mission describes its commitment to a holistic approach towards enhancing the well-being of the community. Individuals employed by Palmetto Health should share in the mission of the facility which seeks to improve the care of all the patient's it serves. Therefore, individuals should seek to increase their knowledge and stay abreast of the latest evidence to help Palmetto Health with accomplishing their mission for the patient population they serve.

Scope of the Project

The project began by distributing a pre-intervention survey at a scheduled departmental meeting to assess CRNA perception and current knowledge regarding use of the FloTrac/ClearSight hemodynamic monitor in guiding clinical judgement regarding fluid therapy. After completion of the pre-intervention survey, a structured teaching session with specific learner objectives was presented to the CRNA staff. After completion of the teaching session, a post-intervention survey was given to the same CRNA's to assess if the perceptions and knowledge changed based on the information presented in the teaching session.

Theoretical Framework

The theoretical framework guiding this project is the ACE STAR Model of Knowledge Transformation. The Anne Arundel Medical College (AAMC) (2016) states, "The ACE STAR Model of Knowledge Transformation is a framework for the systematic integration of evidence into practice". It is made up of five stages which include: knowledge discovery, evidence summary, translation into practice recommendations, integration into practice, and evaluation (AAMC, 2016). This project will progress through the five major stages also referred to as Star Points. Star point 1 builds the collection of evidence to support clinical actions (UTHSC, 2016). This stage involves recognition that there is evidence that exists to support the use of dynamic parameters to guide fluid management. Literature reviews were conducted to obtain the current evidence regarding ERAS and GDFT. Star Point 2 is evidence summary. This stage involves review of randomized clinical trials, meta-analysis, and other systematic reviews. The systematic methodology also increases reliability and reproducibility of results. The research obtained is synthesized to combine findings of the research. A structured educational program was developed in regard to the FloTrac/Clearsight during this phase which was then presented to

the CRNA staff. Star Point 3 is translation guidelines. After the initial survey, an educational program was presented to staff regarding utilizing the data obtained from the FloTrac/Clearsight monitor to guide clinical decision making for fluid management. Once the education is presented, the goal is for the provider's knowledge and perception of the equipment to change. A post-intervention survey will then be issued to assess if there was an increase in knowledge and positive change regarding the FloTrac/ClearSight hemodynamic monitor and to determine if clinical decision making increased. The results obtained from the postintervention survey will help guide future education and help decrease the perceived barriers identified by the survey. Analyzing the results of the survey will allow for translation into guidelines to occur. Star Point 4 is practice integration. While this project will not examine practice integration of a GDFT protocol during the allotted time frame, it will examine individual's perceptions regarding the equipment necessary for monitoring dynamic parameters when following a GDFT protocol. Star Point 5 is evaluation of outcomes. Outcomes will be evaluated by a post survey that will determine if provider's perceptions have changed after a guided educational program. The goal of this project is to present knowledge that will then transform practice based on the current evidence.

ACE Star Model of Knowledge Transformation (adapted from Stevens 2012)

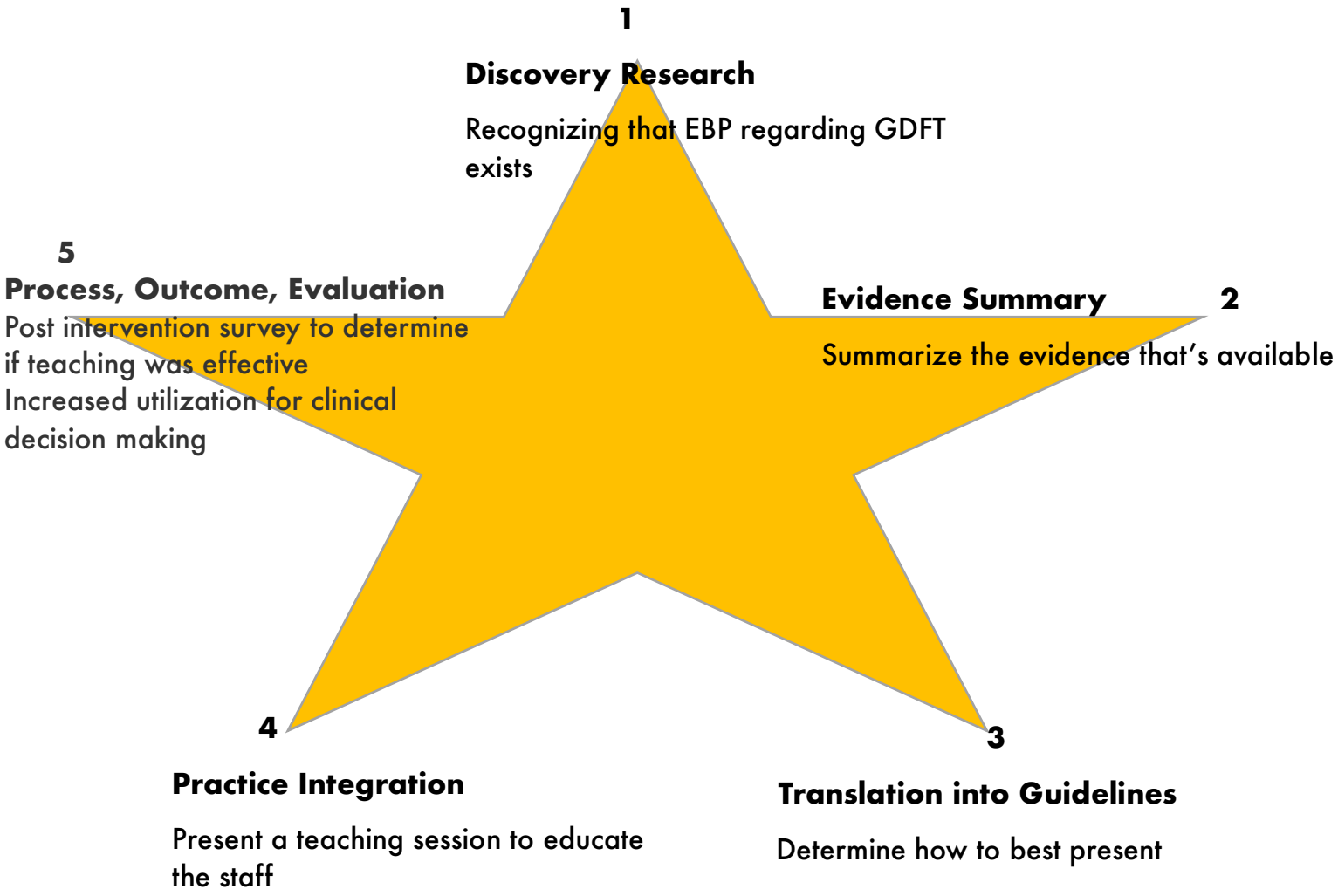

Figure 1. Project Framework. Changing Perceptions: Goal Directed Fluid Therapy

Work Plan

Projected Timeline/Milestones

The timeline for this project was outlined to have a completion date of July 1, 2017. Milestones in this project include the Palmetto Health IRB determining that this project is not

human research and was exempt from IRB review. The MUSC IRB deemed this project as quality improvement and determined that IRB review was not necessary. Presentation of the teaching session occurred on May 17, 2017. The pre-intervention and post-intervention surveys were both issued on May 17, 2017. Data analysis was completed October 9, 2017.

Formative and Summative Objectives

Formative Objectives

1. February 4, 2017, a survey to assess CRNAs knowledge regarding the FloTrac/ClearSight was created.
2. March 3, 2017, a teaching presentation regarding the use of FloTrac/ClearSight for goal directed fluid therapy was developed.
3. May 17, 2017, presentation of teaching series along with the pre- and post intervention survey was issued to staff at project facility.
4. October 9, 2017, analysis of data was completed.

Summative Objectives

Primary: Change the staff's perception based on a teaching series regarding use of the data obtained from the FloTrac/ClearSight hemodynamic monitor to guide clinical decision making.

Secondary: Development of a protocol for goal directed fluid therapy (GDFT) using the FloTrac/ClearSight hemodynamic monitor.

Secondary: Development of a complete ERAS Protocol

Leadership and Teamwork

Change Strategy

Kurt Lewin's Change Theory is a three-stage model of change known as unfreezing-change-refreeze model that requires prior learning to be rejected and replaced (NursingTheory, 2017). GDFT using dynamic parameters is a paradigm shift from traditional fluid management and involves a change from previous learning. Calculations of intraoperative fluid deficits during colorectal surgery included so-called "third space" losses and perioperative fluid therapy was guided by static indicators of volume status (Thiele et al., 2016).
Intraoperative fluid management involving administering excessive fluid and restricting fluid has been linked to increased complications, death, cost, and length of stay (Shin et al., 2017). Therefore, the current methods of fluid management need to change to a more evidenced based practice. Lewin's Change Theory describes the process of changing from current practice to a new practice.

Unfreezing is the process which involves finding a method of making it possible for people to let go of an old pattern that was somehow counterproductive (NursingTheory, 2017). This phase involves a nurse leader, who serves as a change agent, that can recognize a problem exists, identify the need for a change, and involve and organize others to see the need for a change (Shirey, 2013). According to Shirey (2013), "Unfreezing may begin with nurse leaders conducting a gap analysis illustrating discrepancies between the desired and current state" (p. 69). After the gap analysis, a solution is identified and the preparation to transition and move away from the current state of equilibrium begins (Shirey, 2013).

At Palmetto Health Richland, the LOS is significantly higher than the national average length of stay which indicates a change needs to be made and creates a sense of urgency in the organization. A solution to fix increased LOS is to develop a GDFT program. While this project won't meet the requirements to "refreeze," it will go thru the process of unfreezing.

After unfreezing occurs, the next stage is to move into the transition phase which consists of individuals trying out the proposed change. Transitioning involves creating a detailed plan of action and engaging people to try out the proposed change (Shirey, 2013). Upon completion of education regarding using the FloTrac/ClearSight hemodynamic monitor to guide fluid therapy, individuals will be able to apply they information they learned during the unfreezing phase to try out a new clinical practice to care for their patients.

Implementation of a GDFT protocol as the standard of care for colon procedures will occur during the refreezing stage. According to Shirey (2013), refreezing demands stabilizing the change so that it becomes embedded into existing systems such as culture, policies, and practices" (p. 70). The dynamic that occurs with refreezing the new change produces a new standard which is then recognized as the new higher level of performance expectation (Shirey, 2013). This stage is essential because embedding this change is a critical factor to sustaining the change long term (Vanderheide, Moss, & Lee, 2013). During this refreezing phase, a protocol "cheat sheet" will be attached to each FloTrac/ClearSight manual for easy accessibility by each clinician. The "cheat sheet" will serve as an easy guide and reminder for clinical decision making. Also, comparison of pre- and post- protocol data will be analyzed to determine if there was in a fact an improvement in patient outcomes and decreased LOS. These steps will be necessary to "refreeze" GDFT as the new standard.

Leadership

Kumar (2013) states, "There are multiple definitions of leadership" (p. 39). Kumar (2013), used Warren Bennis' definition that defined leadership as "a function of knowing yourself, having a vision that is well communicated, building trust among colleagues, and taking effective action to realize your own leadership potential" (p.39). Presenting the evidence to colleagues and defining your vision early in the process of change can help with building trust and is essential to be successful with change implementation. The vision for this project was communicated early in this project and aligns will with the vision for Palmetto Health Richland.

Ortega, Van den Bossche, Sanchez-Manzanares, Rico, & Gil (2014) state, "Leadership is a critical factor of healthcare effectiveness because it significantly shapes the direction and organization of work teams" (p. 317). Leaders should be change oriented to effectively lead their team members to successful change. According to Ortega (2014), "there is a positive association between change-oriented leadership and team learning behavior in healthcare teams" (p. 317). Oftentimes, change is unsuccessful due to lack of change oriented leadership. Leaders who are resistant to change will not be effective in transitioning their organization to change their current practices. Therefore, it was necessary to take on the role of a transformational leader for this project to be successful. According to Buchbinder and Shanks (2017), "the transformational leader could significantly change an organization through its people by raising their consciousness, empowering them, and then providing the nurturing needed as they produced the results desired" (p. 27).

Effective leadership of a quality improvement project should align with the organizations strategic business plan. According to McLaughlin (2011), "An organization that executes well has an effective strategic planning process" (p. 17). A strategic plan is the

foundation for executing in a timely and cost-effective manner (McLaughlin, 2011). Palmetto Health has five strategic aims that are part of the Nursing Strategic Plan which is conducted within the framework of EBP principles and the patient and team member experience (PalmettoHealth, 2016). According to Palmetto Health's Nursing Strategic Plan, those aims are "leverage technology and health information systems to improve the overall quality, safety and efficiency of nursing practice; apply evidence based principles and best practice models to achieve sustained improvement in clinical outcomes and patient safety; align clinical processes with the strategic initiatives of the organization to support the achievement of established goals; provide leaders and emerging leaders with the training, resources, and opportunities needed to be effective in leadership roles and processes; and improve the ability of individuals and teams to work together, problem solve, and achieve organizational goals by creating an environment of mutual trust and support."

GDFT aligns with several of the strategic aims for Palmetto Health. Each strategic aim has specific action aims that are necessary to accomplish the overall strategic aim. Encouraging the use of research to improve outcomes would help meet strategic aim 1. GDFT is an evidence based practice which when implemented has been shown to improve outcomes, therefore it would help meet strategic aim 1 listed above. The goal of strategic aim 2 is to implement evidence-based care delivery models. Although, this project is narrowed down to dynamic GDFT, it could open the door to developing a complete ERAS program which would also allow the application of evidence based principles and best practice to guide clinical judgement and improve patient outcomes.

Interprofessional Collaboration

Interprofessional collaboration is necessary when implementing change projects in healthcare. According to Chiocchio (2015), "Goal clarity such as sharing a common representation of what needs to be achieved and implicit coordination (i.e., the ability to anticipate others' actions) are the key components of collaboration and a shared mental model, both of which are critical for team and project performance" (p. 27). The common goal for this project is to educate providers regarding the use of data obtained from FloTrac/Clearsight monitor in guiding clinical judgement for fluid management.

Education regarding GDFT should occur with more than one group of providers. Collaboration needs to occur between surgeons, anesthesiologists, and nursing staff for successful adaption of GDFT. Initially, the project focuses on education of the CRNA's. Overall, many anesthesiologists and surgeons felt that increased communication and collaboration among surgeons and nurses was essential for effective implementation (Pearsall et al., 2015). Even though the primary focus for the project is education of the CRNAs, the anesthesiologists will be educated regarding the importance of maintaining a normovolemic patient.

Interprofessional collaboration needs to occur with other members of leadership. Once individuals are using a GDFT protocol to guide their patient's fluid management, additional equipment may need to be purchased and that requires support from leadership. Communication regarding improved outcomes will need to occur and a champion from the team would need to share in the responsibility of communication with leadership regarding the needs to be successful with a GDFT program.

Development of the teaching session involved collaboration with the Edwards Lifesciences representative. She was instrumental in reviewing the fundamentals of the monitor and providing evidence based literature regarding the benefits of using dynamic parameters to guide fluid management during the perioperative course. She also gave valuable input into the objectives that should be covered when developing an educational session regarding GDFT and utilization of the FloTrac/ClearSight monitor.

Stakeholder Involvement and Roles

The stakeholders in this project include the anesthesiologists, surgeons, CRNAs, the organization, and the patients receiving care in this organization. The anesthesia providers, both anesthesiologists and CRNAs, will be the individuals interpreting data obtained from the FloTrac/ClearSight monitor to make decisions regarding fluid management. Stakeholders benefit with this project because the care delivered to the patients they serve will be evidence based.

After education of the CRNAs, they will be responsible for implementing GDFT during their anesthetic based on the knowledge obtained. Upon implementation of GDFT, the educational session Power Point presentation will serve as a reference for the CRNAs. CRNAs will be responsible for documentation of the data obtained and documentation of their interventions. This will allow for anesthesia record reviews to occur at a later time to determine compliance with GDFT interventions.

Surgeons will be doing follow-up on their patients postoperatively and determining when their patients are appropriate for discharge. Surgeons will benefit from their patients receiving GDFT because their surgical complication rates should decrease and their patient's length of stay should decrease. Surgeons that have decreased complication rates and decreased length of stay

time will be viewed favorably by their patients and by hospital administration because there will be decreased cost associated with care for the patients.

The organization and their leaders have a responsibility to the community to provide the safest and best care possible. The organization benefits when they implement policies and procedures based on evidence. Implementation of an evidence based protocol such as GDFT helps meet the Institute of Medicine goal that 90% of clinical decisions will be based off the best available evidence. According to Manecke, Asemota, & Michard (2014), "Pay-for-performance programs and economic constraints call for solutions to improve the quality of health care without increasing costs." Postsurgical complications increased cost by 172% in a study conducted by Manecke et al. (2014) at the University HealthSystem Consortium (UHC). The risk of losing payment for not meeting governmental goals is decreased with improved outcomes for the population it serves.

Finally, patients will be stakeholders as well. They will recover quicker and spend less time in the hospital which will allow them to reunite with their families sooner or return to work sooner. The increased cost associated with longer LOS will be eliminated which means there is a decreased cost to the patient. The risk of developing hospital related infections, pressure ulcers, generalized weakness, and other complications that can occur from prolonged hospitalization will decrease as well.

Challenges

Challenges are inevitable when an individual is driving change in an environment that is fairly resistant to change. According to Conn, McKenzie, Pearsall, & McLeod (2015), "ERAS uptake has been relatively slow and inconsistent despite the strength of supporting evidence."

There are many factors that contribute to the perceived challenges of implementing ERAS and its components. Those factors include lack of time, resistance to change by providers, lack of buy-in, and questionable lack of resources (Conn et al., 2015).

In a study conducted by Brown, Wickline, Ecoff, & Glasser (2009), factors related to time were the top two challenges identified when trying to implement evidenced based practice (p. 375). There was limited time to present the teaching session to staff and there was no time available to do additional teaching for individuals whom were not able to be present for the initial teaching. Having opportunities for additional teaching during regular hours would've allowed a larger number of CRNAs to receive the teaching. Although, this challenged existed the teaching session was able to be emailed to the entire staff of the CRNA department. However, no data collection was able to be obtained from any individual that wasn't present at the department meeting. Individuals arriving to the presentation late presented a challenge as well because they were not able to complete an unbiased preintervention survey.

Education has been identified in the past as a mechanism to overcome resistance to change by providers and also increase buy-in by increasing knowledge and provider skills (Brown et al., 2009). However, education without additional mentorship and adjunct educational offerings may not be beneficial when trying to transition to EBP in the clinical area (Brown et al., 2009). In the future, development of printed materials as a quick resource may be beneficial and serve as adjunct education when personal interaction is not possible. According to Giguere et al. (2012), "printed educational materials are meant to improve healthcare professionals' awareness, knowledge, attitudes, and skills, and ultimately improve professional practice and patients' health outcomes.

According to Wallen et al. (2010) "EBP beliefs of nurses are significantly correlated with EBP implementation, and that having an EBP mentor leads to stronger beliefs and greater EBP implementation by nurses" (p. 2768). Although, additional time constraints prevented additional formal teaching sessions, having an expert in the department regarding GDFT will help decrease resistance to change amongst CRNAs in the department.

Changing perceptions of staff and shifting towards EBP presents challenges. However, identifying potential challenges before they occur will allow an easier transition towards EBP.

Implementation Methods

Implementation

The project leader administered a preintervention survey to the staff CRNAs of PHR that assessed basic demographics such as gender and age range, years since graduating from an anesthesia program, clinical knowledge, and perceptions regarding the FloTrac/ClearSight monitor. After completion of the preintervention survey, a teaching session with specific learner objectives was presented on GDFT. After completion of the teaching session, a postintervention survey, same as the preintervention survey, was administered to assess if there was an increase in clinical knowledge and an increase in positive perception regarding GDFT.

Development of Teaching Session. The teaching session was developed with specific learner objectives to highlight the expectations of the learner at the end of the presentation. After extensive literature reviews, conversations with the Edwards Lifesciences representative regarding important concepts for GDFT, and conversations with the staff regarding the information they would like covered in an educational session, the learner objectives were developed. Learner objectives were important because they were specific to the knowledge that

the CRNAs needed to obtain to be able to use the FloTrac/ClearSight hemodynamic monitor after the completion of the teaching session. Effective learning objectives are specific, measureable, achievable, relevant, and timely (Dalto, 2013). The learner objectives were as follows: define Goal Directed Fluid Therapy; define dynamic parameters that can be used to guide fluid therapy; discuss limitations to the utilization of Stroke Volume Variation (SVV) for guiding fluid therapy; and interpret the data obtained from the FloTrac/ClearSight hemodynamic monitor to guide clinical judgement regarding fluid therapy.

Survey Development. A preintervention and postintervention survey titled, Survey to Assess Knowledge of the FloTrac and Clearsight Hemodynamic Monitor by Edwards Life Sciences, was developed to assess basic knowledge and current perceptions regarding GDFT. The survey (Appendix B) consisted of ten questions that assessed demographic information, the number of years since graduation, clinical questions, barriers to use of the FloTrac/ClearSight and likelihood that the learner would use the monitor in the future. The clinical questions were all multiple choice and the question regarding use of the FloTrac/ClearSight was a Likert scale question using extremely likely, likely, neutral, unlikely, and extremely unlikely. The clinical questions assessed the basic knowledge that is required for an individual using dynamic parameters to guide fluid management. Some of the knowledge assessed included normal values for SV, SVV, and the required intervention for abnormal stroke volume variation. The postintervention survey was the same as the preintervention survey to assess if there was an impact on the clinician after the teaching session. According to the Institute of Medicine (US) Committee on Health and Behavior: Research (2001), "Impact evaluation assesses the effectiveness of the intervention in achieving desired changes in targeted mediators" (p.289). The target mediators include the knowledge, attitudes, and participants (Institute of Medicine

(US) Committee on Health and Behavior: Research, 2001) Postintervention survey results will then be compared to preintervention survey results to see if the teaching session resulted in an increase in knowledge and positive perception regarding the FloTrac/ClearSight monitor.

Data Analysis

Survey participants (N=24) were predominantly female (n=16); between the ages of 36-45 (n=10); and graduated from a nurse anesthesia program within 1-5 years (n=10). Table 1 describes the demographics of the survey participants.

Table 1

Demographic Information

Gender	Age	Years Since Graduation
Female (n=16)	25-35 (n=7)	1-5 years (n=10)
Male (n=8)	36-45 (n=10)	6-10 years (n=7)
	46-55 (n=6)	11-15 years (n=3)
	> 55 (n=1)	16-20 years (n=3)
		> 20 years (n=2)

McNemar's test was used to determine if statistical significance existed regarding questions 4-8 on the pre- and postintervention survey (Appendix B). There were individuals (n=2) that responded they were able to operate the monitor after the intervention. However, there was no statistical significance pre- and post- intervention regarding operation of the FloTrac/Clear Sight monitor ($p=0.4795$). Questions 5-7 addressed clinical knowledge regarding SV, SVV, and appropriate treatment for SVV. No statistical significance existed regarding clinical knowledge for question 5-7 ($p>=0.999$). However, individuals (n=15) answered question 8 incorrectly on the preintervention survey but answered correctly on the postintervention survey. This presented

a statistically significant result ($p<0.001$) which would indicate that the teaching session was effective in increasing knowledge regarding the appropriate tidal volume when using the FloTrac/ClearSight to guide fluid management.

Summary scores were given to identify the importance of the barriers. Higher scores indicate higher importance as a barrier (Figure 2). The scores were computed by assigning a value of 4 if the barrier was listed as the most important barrier, 3 if second most important, 2 if third most important, and 1 if fourth most important.

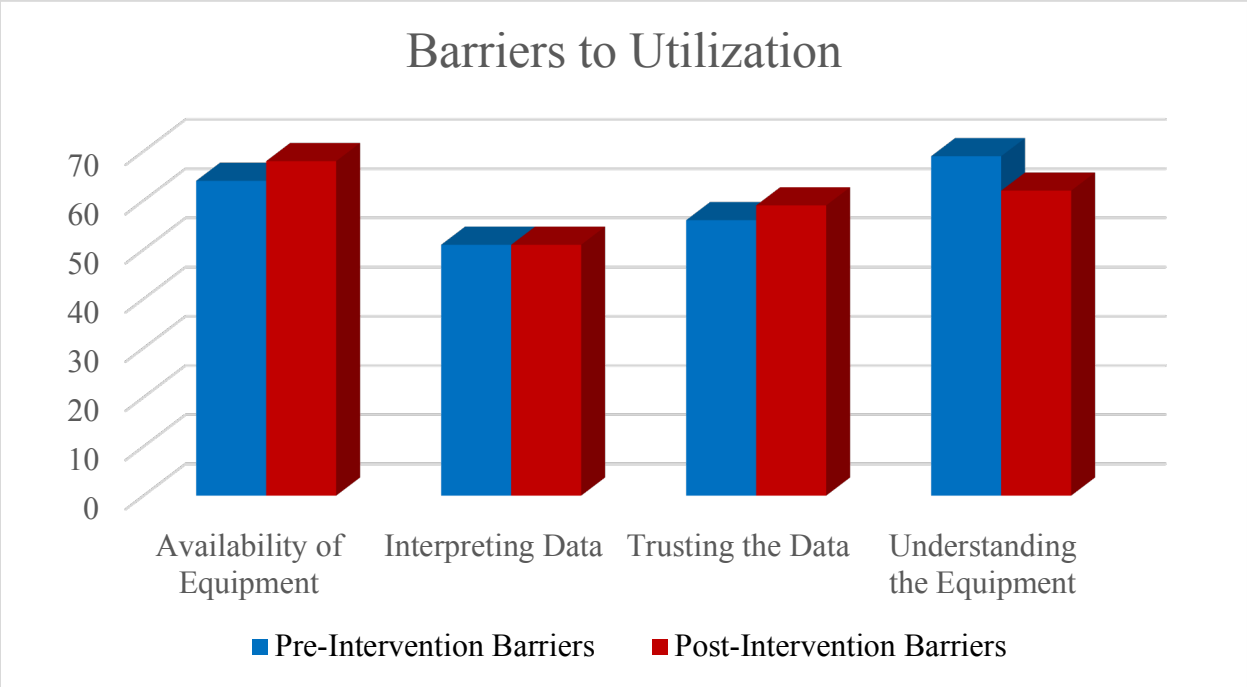

Figure 2. Barriers to utilization of the FloTrac/ClearSight.

Based on the above data, the number one barrier prior to presentation of the educational session was understanding how the equipment works. However, the number one barrier after the educational session was availability of equipment. This would indicate that there was an increase in the understanding of equipment function after the educational session.

A contingency table was constructed from the data obtained from the final question to determine if an individual was likely to use the FloTrac/ClearSight monitor based on their current knowledge both pre- and postintervention (Table 3).

Table 2

Contingency Table to Determine Likeliness to Use FloTrac/ClearSight

	Extremely unlikely	Unlikely	Neutral	Likely	Extremely likely	Sum
PRE	1	9	5	6	3	24
POST	1	4	8	6	5	24
Sum	2	13	13	12	8	48

The gamma statistic was computed on the above table and gamma= 0.246 which indicates there is a positive relationship between current knowledge and likeliness to use the FloTrac/ClearSight monitor. This would indicate that the educational session increased the CRNAs likeliness to use the FloTrac/ClearSight. Eight individuals increased their response on the Likert scale post intervention. However, the p=0.222 which is statistically insignificant.

Discussion

The purpose of this study was to determine if an educational session increased clinical knowledge and perceptions. The results suggest that the respondents had a base knowledge of normal values for SV, SVV, and the appropriate intervention necessary to treat an abnormal SVV. However, there was a statistically significant increase in respondents that increased their knowledge regarding appropriate tidal volumes when using dynamic parameters to guide their fluid management. Inadequate tidal volumes when using dynamic parameters will skew SVV, therefore it's necessary that clinicians have a basic knowledge of necessary tidal volumes. This

is significant because tidal volumes of at least 8 ml/kg are necessary when using dynamic parameters to guide fluid therapy due to the heart-lung interaction that occurs during positive pressure ventilation. According to Pinsky (2012), "The cause of PPV and SVV are due to intrathoracic pressure-induced variations in right atrial pressure changing intrathoracic blood volume over the ventilatory cycle and this explains why PPV and SVV are inaccurate with smaller tidal volumes used in acute lung injury (p. 259)."

While the survey data didn't yield any statistically significant results in regard to barriers to utilization of the FloTrac/ClearSight monitor, areas of opportunity were identified. The number 1 barrier preintervention was understanding how the equipment works. Understanding how the equipment works decreased to the number 2 barrier postintervention, however, decreasing this barrier to the last would be more beneficial in providers using the FloTrac/ClearSight to guide fluid management. Therefore, including more information on the function of the equipment during the educational session may further decrease this barrier. According to Melnyk et al. (2004), "It is well recognized that knowledge alone does not typically result in behavior change" (p. 190). Therefore, the target of interventions in the future should be to strengthen the staff's beliefs regarding the benefits of GDFT which will in turn increase the level of motivation to change from current practice to evidenced based practice (Melnyk et al., 2004).

The number of respondents that had neutral feelings to extremely likely feelings towards use of the FloTrac/ClearSight monitor increased in the post survey. This indicated an increase in positive perception towards the use of the FloTrac/ClearSight monitor. However, this result was insignificant. The insignificance of this result could be related to the small sample size and in the future a larger sample may be needed to obtain clinically significant results.

Conclusion

This project met the primary summative goal by increasing knowledge and CRNA's perception towards the FloTrac/ClearSight monitor. The goal for the future is to continue education and seek out other champions that are able to help the PHR anesthesia department move towards an evidenced based GDFT protocol. As the 2020 deadline set by the IOM is approaching, it's essential for healthcare providers to focus on moving towards using evidence to guide clinical decision making.

The time frame of this project involved developing a teaching session to educate CRNAs and increase positive perceptions regarding GDFT, the ultimate goal is to implement a complete ERAS program. According to Grol et al. (2013), "in any improvement program, planning changes should be a comprehensive and balanced process, and ideally, strategies need to be piloted on a small scale before undertaking large scale efforts" (p. 169). Initially, it would be more beneficial to undertake eliminating the perceived barriers and offering more education to the staff on the function and utilization of the FloTrac/ClearSight monitor. As the department moves toward meeting the new demands of the healthcare environment and providing care based on evidence, there will have to be a shift in current practice.

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Appendix A

Palmetto Health IRB Approval

PALMETTO HEALTH Institutional Review Board

Not Human Subject Research Determination

April 21, 2017

Marcia Iszard
marcia9880@yahoo.com

Dear Ms. Iszard:

On April 21, 2017 the following was reviewed:

Type of Review:	Initial
Title:	Changing Perceptions: Goal Directed Fluid Therapy
IRB ID:	Pro00065832
Funding:	None
IND, IDE, HDE:	None
Documents Reviewed:	Pre-Post Survey.docx Last modified 3/14/17 Information%20letter.docx Last modified 4/20/17

The proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by Palmetto Health is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving human subjects, please submit a new request to the IRB for a determination.

Sincerely,

Sarah Newman-Norlund†
IRB Administrator

†**Electronic Signature**: This document has been electronically signed through the HSSC eIRB Submission System.

Appendix B

Preintervention/Postintervention Letter and Survey

Study: Changing Perceptions: Goal Directed Fluid Therapy

Purpose: The purpose of this study is to assess if a teaching session increases staff knowledge regarding clinical decision making utilizing the data obtained from the FloTrac/Clearsight hemodynamic monitor by Edwards LifeSciences. A pre-survey will be issued to assess current knowledge regarding the monitor. A teaching session with specific learner objectives will be presented to the staff regarding the use and interpretation of data obtained from the monitor. Upon completion of the teaching series a post survey will be issued to assess post education knowledge. This education will occur during one of the scheduled monthly meetings. The researcher will issue both surveys on the day of education and collect surveys upon completion.

Participants: As staff of this facility, you are being asked to participate in this research study. Participation in this study is completely voluntary. Your participation is not mandatory and in no way, will participation have an effect on your position at this facility. All data collected will remain completely anonymous and no information from the survey will be shared with other staff or management.

Researchers: Marcia Iszard, MSNA, CRNA is a student in the Doctor of Nurse Anesthesia Practice Program at the Medical University of South Carolina. Dr. Angela Mund, DNP, CRNA is the faculty advisor for this project.

I thank you for your consideration for participation in this study. If you have any questions about the nature of this study, you may contact the researcher or faculty advisor. Contact information can be found below.

Marcia Iszard: iszard@musc.edu 803-466-9544

Angela Mund: mund@musc.edu

Survey to Assess Knowledge of the FloTrac and Clearsight Hemodynamic Monitor by Edwards Life Sciences

1. What is your gender?
   Male
   Female

2. What is your age range?
   25-35
   36-45
   46-55
   >55

3. How many years has it been since graduating from a nurse anesthesia program?
   1-5 years
   6-10 years
   11-15 years
   16-20 years
   >20 years

4. Do you know how to operate the FloTrac or ClearSight hemodynamic monitor by Edwards Life Sciences?
   Yes
   No

5. What is a normal stroke volume?
   90-100 ml
   60-80 ml
   120-140 ml
   200-400 ml

6. What is a normal stroke volume variation?
   5-8%
   16-20%
   10-15%
   20-30 %

7. What is the appropriate treatment for a stroke volume variation of 20%?
   Adjust ventilator tidal volume settings
   Administer a vasopressor
   Administer a 250 ml fluid bolus
   No intervention is necessary

8. What is an appropriate tidal volume setting when using stroke volume variation to guide fluid therapy?
   5ml/kg
   7ml/kg
   8ml/kg
   4ml/kg

9. Rank the barriers to using the FloTrac or Clearsight hemodynamic monitor in order from 1-4 with 1 being the largest barrier and 4 being the smallest barrier.
   Understanding how the equipment works
   Interpreting the data correctly
   Trusting the data to assist with making clinical decisions
   Availability of equipment

10. Based on your current knowledge, how likely are you to use the FloTrac/Clearsight non-invasive hemodynamic monitor for fluid management during your anesthetic?
    Extremely likely
    Likely
    Neutral
    Unlikely
    Extremely unlikely