IMPROVING ANTIEMETIC GUIDELINE ADHERENCE FOR ADULT PATIENTS RECEIVING HIGHLY EMETOGENIC CHEMOTHERAPY (HEC)

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A project submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice in the Doctor of Nursing Practice Program in the School of Nursing.

Chapel Hill
2017

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ABSTRACT

Corrine Mellin; Improving antiemetic guideline adherence for adult patient's receiving highly emetogenic chemotherapy (HEC)
(Under the direction of Deborah Mayer)

A quality improvement project was implemented to improve adherence to evidence based antiemetic guidelines for patient receiving HEC, and ultimately improve the rates of chemotherapy induced nausea and vomiting. Chemotherapy induced nausea and vomiting (CINV) can be prevented in 70-80% of cases when guidelines are followed; however, despite being recently updated, there is evidence that guideline utilization is less than optimal. Two potential reasons for inadequate CINV guideline adherence is provider lack of knowledge and/or how to implement them into practice.

Methods:

A retrospective chart analysis prior to the intervention was performed on 86 patients to assess for the presence of CINV and use of antiemetics. Pre-intervention, an electronic anonymous survey was provided to nurses and APP's. In-person education interventions were provided to nurses and APP's over one month. An immediate post and three month post-intervention survey was provided to RN's and APP's. Three months post-implementation, a retrospective chart analysis was performed on 37 patients to again assess for presence of CINV and use of antiemetics.

Results:

In a pre-intervention chart review of the 86 patients, 42 (48.8%) experienced CINV with only 6 (7%) receiving guidelines appropriate antiemetic prophylaxis. Out of 82 nurses, 60 participated in the pre-intervention survey scoring an average percent correct of 57.7%, and five of six APP's participating scoring an average of 60.8%. Immediately post-intervention 55 of 78 nurse participated scoring an average percent correct of 66.1%, and all six APP's participated scoring 71.9%. Three months post-

intervention 41 of 74 nurses participated scoring an average of 66.2%, and five of the six APP's participated scoring a 70.8%. Of the 37 patients selected for three months post-intervention chart review, 14 (37.8%) experienced CINV with 8 (21.6%) receiving guideline appropriate antiemetic prophylaxis. Conclusion:

The study demonstrates an effective approach in improve provider adherence to antiemetic guidelines, which resulted in a decrease in the rates of CINV. Findings also demonstrate the need for guideline reinforcement and continuing education on recent updates and chart audits to ensure continued adherence, allowing for the best evidence base care to be provided to patients.

To all my friends and family who have not only supported me, but also encouraged me along throughout this whole process, I sincerely thank you. I would not have made it through this program and project without all of you making numerous selfless sacrifices in order for me to achieve this degree and huge accomplishment. To my parents, thank you for all the meals, emotional/financial support, and help through all of life's many journeys these past three years, love you both endlessly. To my two sisters, thank you for accepting all my late night stress phone calls, taking me to dinner, distractions, and emotional support. Thank you specifically to Juliann for reading and helping me edit my paper a million times, my IRB submission, and giving me all your wonderful research knowledge, I can never thank you enough. To Mallory, who did her research dissertation paper on this project, but also gave up many extra hours and time to help me see this project through. Thank you for all the effort you put into this project, and appreciating the vision for this as if it was your own. And finally, to Max who has been by my side from the very start of this three years ago, taking this on as if it was his own personal journey, I love you for everything that you have done to support me throughout this experience.

ACKNOWLEDGEMENTS

I want to acknowledge and thank my committee members for the time, support, availability, and expertise in helping to guide this project. I could not have achieved this without each of you. I especially want to the Dr. Deborah Mayer for her guidance in helping me determine my project and develop my passion for this topic and process. Ashley Bryant, thank you for all your continued encouragement and inspiration to push through the tough times, most importantly your willingness to meet with me at a minutes notice. Finally, Suzie Mason thank you for answering all my millions of questions about guideline adherence and ways to implement changes into practice, your support was very crucial to this project.

Additionally I want to acknowledge all the staff on UNC Cancer Hospitals fourth floor inpatient hematology/oncology unit, specifically my nurse managers Crista Creedle and Summer Cheek. This project would not have been possible without your unwavering support in allowing me the opportunity to complete this project on the unit, along with both of your support throughout my entire journey in this program. To all the staff members, both nurses and APP's, whom participated in this project, your feedback and participation was priceless and I could not have completed this project without you. Thank you to Stephen Clark, one of the pharmacists on our unit, that met with me to discuss the project and its discovers in CINV rates. Thank you for working with me to determine the best way to improve guideline adherence, and helped me carry this project forward for all HEC regimen both inpatient and outpatient. Each and every person played an important role in the progression of this project, and I know will continue to make all efforts to carry this forward and continue providing the best care possible for our patients.

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LIST OF ABBREVIATIONS

5HT3 - 5-hydroxytryptamine Type 3

AC - Anthracycline/Cyclophosphamide

ASCO - American Society of Clinical Oncology

CDW - Carolina Data Warehouse

CINV - Chemotherapy Induced Nausea and Vomiting

DA-EPOCH - Doxorubicin + Etoposide + Vincristine + Cyclophosphamide

HEC - Highly Emetogenic Chemotherapy

Hyper CVAD - Doxorubicin + Vincristine + Cyclophosphamide + Cytarabine

i2b2 - Informatics for Integrating Biology and the Bedside

IV - Intravenous

MASCC - Multinational Association of Supportive Cancer Care

NCCN - National Comprehensive Cancer Network

NK1 RA - Neurokinin-1 Receptor Antagonist

OCN - Oncology Certified Nurse

ONS - Oncology Nursing Society

PO - By Mouth (Oral)

VDT-PACE - Bortezomib + Cisplatin + Cyclophosphamide + Etoposide + Doxorubicin

CHAPTER 1: INTRODUCTION

Problem Introduction

Chemotherapy induced nausea and vomiting (CINV) has been ranked as one of the most dreaded side effects associated with chemotherapy, and is a persistent problem for about 40-80% of patients receiving treatment (Viale, Grande, Moore, 2012; Vidall, Sharma, Amlani, 2016). The likelihood and severity of CINV varies depending on the chemotherapy agents used (Danial & Waddell, 2016). Chemotherapy agents are grouped into four categories depending on their ability to cause CINV without appropriate prophylaxis (i.e. emetogenic potential); highly emetogenic (>90% will experience CINV), moderately emetogenic (30-90% will experience CINV), and low emetogenic (10-30% experience CINV) and minimal (<10% experience CINV) (Fernandez-Ortega et al., 2012). CINV is classified into four different types; acute, delayed, breakthrough, and anticipatory. Acute CINV occurs within the first 24 hours after initiation of treatment, whereas delayed CINV occurs 24 hours after treatment and may persist up to five days (Boccia, 2013). Breakthrough CINV occurs in patients despite being given the appropriate prophylactic treatment (Navari & Aapro, 2016). Anticipatory CINV is nausea or emesis that occurs as a conditioned response from prior experience with chemotherapy and CINV (Navari & Aapro, 2016). CINV can lead to complications such as metabolic imbalances, anorexia, dehydration, weakness, and weight loss (Navari, 2016). It can also be associated with more serious complications such as esophageal tears, fractures, decline in mental/behavioral health, and poor wound healing (Navari, 2016).

Current treatment guidelines commonly used for prevention and management of CINV include combined recommendations from the American Society of Clinical Oncology (ASCO), National Comprehensive Cancer Network (NCCN), and Multinational Association of Supportive Care in Cancer (MASCC) (Boccia, 2013). Clinical practice guidelines for CINV incorporate the most recent available research, along with use of an expert team to establish optimal treatment approaches (Boccia, 2013).

UNC Hospital has chosen to use a combination of the ASCO and NCCN guidelines to guide the creation of treatment plans and standing order sets to manage CINV based on the emetic potential of the chemotherapy regimen. With the recent switch to EPIC electronic records, the EPIC governance group used the ASCO guidelines to update standing order sets for chemotherapy templates. There are slight differences among these guidelines, with the unanimous consensus focused on appropriate prevention and management of CINV being critical in patient care (Schwartzberg, 2012). All three of the guidelines (ASCO, NCCN, and MASCC) have all been updated within the last year. These guidelines were created to serve as a tool for practitioners to appropriately implement and treat patients using the latest recommendations based on clinical research in practice (Danial & Waddell, 2016).

Problem Description/Background

The prevalence of CINV continues despite many recent advances in antiemetic therapy since the 1990's, and continuous guideline updates for clinical practice (Viale et al., 2012). CINV can be prevented in about 70-80% of cases with appropriate antiemetic prophylaxis and management (Fernandez-Ortega et al., 2012). Yet despite recently updated guidelines, there is evidence that utilization of guidelines is less than optimal (Fernandez-Ortega et al., 2012). In oncology, especially with supportive care, the lack of "life or death" outcomes related to incorrect decisions or adherence, allows providers more autonomy for practice (Grunberg, 2009). Thus, implementing guidelines for CINV has proven difficult (Grunberg, 2009). Another consideration for the lack of guideline adherence is that health care providers may not be familiar with specific guidelines (Grunberg, 2009). Burmeister et al. (2012) supported the importance of health care providers undergoing periodic education on supportive care measures, along with continued education on guideline adherence. One study demonstrated that health care providers need to increase their awareness on the actual incidence of CINV (Viale et al., 2012). Another study suggested that healthcare providers lack knowledge on how to effectively implement guidelines into practice (Van Laar, Desai, & Jatoi, 2015). Very few studies have evaluated approaches to improve provider adherence with guidelines, and those that have showed limited success (Jordan et.al., 2015). Another complicating issue

with guideline adherence is the complicated management of multi-day chemotherapy regimens, with antiemetic decisions further complicated by the overlap of acute and delayed emesis (Boccia, 2013). This issue is under represented in literature, however the guidelines do suggest ways to effectively prevent and manage CINV with multi-day chemotherapy (Boccia, 2013).

Clinical practice guidelines recommend several different three drug antiemetic combination regimen for the prevention of CINV after administration of HEC (NCCN, 2017). Thc commonly suggested regimen is a combination of 5HT3 antagonist, dexamethasone, and NK-1 antagonist (NCCN, 2017). The NCCN and MASCC guidelines include olanzapine, along with 5HT3 antagonist and dexamethasone, as an alternative three drug regimen to the NK-1 antagonist (NCCN, 2017). There have been numerous studies looking at the efficacy of olanzapine, all of which show highly effective rates of CR (complete response), especially when in combination for the prevention of acute and delayed CINV with HEC (NCCN, 2017). Olanzapine has been shown to be highly effective in the delayed phase of CINV, and is also cost-effective when compared to the NK1 RA's (Wang et. al., 2014). Though many providers worry about the side effects of olanzapine, given its use as an atypical antipsychotic, the most frequently experienced are sedation and weight gain which may not be concerning for oncology patients (Wang et. al., 2014).

In a study by Vidall et. al., nearly one in five patients reported that during their first cycle of chemotherapy they felt their antiemetic coverage was insufficient. In addition, 42% said that at least two medications had to be changed in order to achieve symptoms control (Vidall et. al., 2016). Both symptom control and the patients quality of life should be considered one of the main goals of care, with studies showing there needs to be more efforts in encouraging healthcare workers to adhere to guidelines and treat prophylactically.

With the cost of cancer therapy rapidly increasing, the cost in managing CINV appropriately with newer drugs also is continuing to rise (Viale et. al., 2012). Although the costs of antiemetics are significantly lower than the cost of chemotherapy agents, the combination of both increases the financial burden of treatment costs (Viale et. al., 2012). However, the cost of antiemetics must be heavily weighed

against the price of inadequate treatment of CINV (Viale et. al., 2012). The monetary value of the antiemetic does not represent the total physical and psychological effects, including the suffering of those patients experiencing the most dreaded side effect of chemotherapy (Viale et. al., 2012). There can also be significant costs associated with the need for prolonged hospitalization, frequent clinic/emergency department visits, additional medications, and even a separate admission for management of CINV effects (Burke, Wisniewski, & Ernst, 2011).

The prevention of CINV is critical to maximizing patient's quality of life during their cancer treatment (Thompson, 2012). Uncontrolled CINV can place a substantial burden on the patient and their caregivers, impacting their quality of life and physical wellbeing (Boccia, 2013). Patients who experience CINV are often discouraged from finishing chemotherapy treatment, as it effects both quality of life and the patients ability to carry out activities of daily living (Aapor et. al., 2012). Many studies have noted that the intensity and duration of CINV are two factors heavily associated with a larger impact on quality of life (Viale et. al., 2012). This is very important to consider, as newer chemotherapy regimen maximize doses to create shorter regimen durations, thus the intensity and duration should be heavily considered in relation to expected CINV (Viale et. al., 2012). Not only does CINV decrease the compliance with chemotherapy treatments, but can also cause numerous other complications such as anorexia, metabolic imbalances, and poor nutritional support (Daniel & Waddell, 2016). These symptoms in combination with the associated morbidity of CINV, has resulted in some patients withdrawing from a potentially useful and/or curative treatment (Daniel & Waddell, 2016). Fortunately, the appropriate use of modern and new antiemetic agents has successfully shown a significant reduction or elimination of CINV in about 70-80% of patients (Daniel & Waddell, 2016). Research has definitively shown that following the clinical guidelines will significantly improve CINV control when compared to inconsistent guideline use (Boccia, 2013; Viale et. al., 2015).

Purpose of the Project

The purpose of this DNP project is to determine the rate of and barriers to adherence to antiemetic guidelines for chemotherapy induced nausea and vomiting in hospitalized cancer adults receiving highly emetogenic chemotherapy.

CHAPTER 2: REVIEW OF LITERATURE

A review of literature was conducted using CINHAL and PubMed. Search terms include: "chemotherapy induced nausea and vomiting", "CINV management", "antiemetic guideline adherence", "CINV breakthrough management", and "CINV adherence". Search limits include those articles include those articles published in 2010 or later. Articles in 2010 or later were targeted to ensure incorporation of the most recent guideline updates and the newer antiemetics suggested for management of HEC. Articles chosen consisted of journal articles, editorials, evidence based practice guidelines, literature reviews, surveys, and research articles. Other searches were performed on Education Full Text (via EBSCOHost), International Pharmaceutical Abstracts (via EBSCOHost) using: "evidence based practice implementation"; "provider adherence"; "cost analysis"; and "chemotherapy vomiting management". Articles were excluded if they used non-pharmacological management, were about specific drug trials, supportive care for individual cancer types, or discussed patient adherence to antiemetics only.

Effects of Chemotherapy Induced Nausea and Vomiting

CINV is one of the most commonly experienced and feared symptoms in chemotherapy treatment (Viale et al., 2012; Hilarius et al., 2012; Fernandez-Ortega et al., 2012; Ng, Hutton, & Clemons, 2015; Schwartzberg, Grunberg, & Kris, 2011; Underhill, Chicko, & Berry, 2015; Grassi et al., 2015; Boccia, 2013). Adequate control of CINV remains a vitally important challenge in caring for cancer patients as it affects the patient, caregivers, healthcare providers, and the healthcare system (Schwartzberg, Grunberg, & Kris, 2011). The prevention of CINV is possible when the evidence-based practice recommendations are adequately utilized (Viale et al., 2012).

CINV has a significant impact on the patient's quality of life and treatment outcomes (QoL) (Fernandez-Ortega et al., 2012; Haiderali et. al., 2011; Grassi et al., 2015; Boccia, 2013, Middleton, 2011;

Hilarius et al., 2012; Davidson et al., 2011; Moradian & Howell, 2015). Despite improvements in antiemetic treatment and the emergence of new drugs, CINV continues to be a significant problem, with 45-65% experiencing nausea, and 15-25% experiencing vomiting (Grassi et al., 2015; Ng, Hutton, & Clemons, 2015; Hawkins & Grunberg, 2009; Boccia, 2013; Underhill, Chicko, & Berry, 2015). CINV is a common side effect experienced by cancer patients, resulting in debilitating side effects that interfere with their ability to perform daily activities (Haiderali et al., 2011). Uncontrolled CINV may require patients to present for rehydration and emesis control, which may require an emergency department visit or hospitalization (Navari, 2015). Patients who develop electrolyte imbalances from CINV are at a greater risk of developing serious complications (Navari, 2015). Severe or uncontrolled CINV can result in patients self-electing to discontinue chemotherapy treatment (Viale et al., 2012). Healthcare providers are also effected by uncontrolled CINV, which results in a disruption to scheduled treatment plans, often requiring providers to make a difficult decision to delay or discontinue potentially curative treatments (Celio, Ricchini, & De Braud, 2013).

Lack of Guideline Adherence

There is a lack of adherence to antiemetic guidelines for prevention and management of CINV by both advanced practice providers and nurses (Hilarius et al., 2012; Schwartzberg, Grunberg, & Kris, 2011; Jordan et al., 2014; Viale et al., 2012; Jordan, Jahn, & Aapro, 2015; Fernandez-Ortega et al., 2012; Caracuel et al., 2015; Escobar et al., 2015; Schwartzberg, 2014; Boccia, 2013). The reason for low compliance with guidelines is multifactorial and found in all areas of healthcare, not just with antiemetic guidelines (Jordan et al., 2014). Fortunately, guidelines are very useful tools for providers to appropriately employ and integrate the newest clinical research into practice (Daniel & Waddell, 2016; Jordan et. al., 2014). Despite the recently updated and easily accessible NCCN and ASCO guidelines, there is evidence that adherence and use of these guidelines is less than optimal (Fernandez-Ortega et al., 2012).

Recent studies show that providers overestimate the control of CINV in patients receiving highly emetogenic chemotherapy (HEC), demonstrating the need to increase awareness of the incidence of

CINV (Viale et al., 2012; Jordan, Jahn, & Aapro, 2015; Hilarius et al., 2012; Schwartzberg, Grunberg, & Kris, 2011). More than 75% of providers and nurses underestimate the rates and incidence of delayed emesis after administration of highly emetogenic chemotherapy (Rha et. al., 2016; Schwartzberg, Grunberg, & Kris, 2011; Hilarius et al., 2012; Schwartzberg, 2014; Viale et al., 2012; Boccia, 2013; Caracuel et. al., 2015). Also, health care providers lack knowledge on how to implement guidelines effectively into practice (Van Laar et. al., 2015). Less than optimal adherence to guidelines results in deficient control of CINV, which can lead to excessive use of health care resources and interfere with patients' compliance with treatment regimen (Fernandez-Ortega et al., 2012). Failure of the healthcare teams to understand CINV and implement guidelines contributes to poorer patient outcomes and plays a major role in the problem (Hawkins & Grunberg, 2009). It is critical that providers recognize the prevalence of CINV to minimize nausea and vomiting to allow patients to maintain quality of life and focus on their cancer treatments (Jordan et al., 2014).

Cost Associated with CINV

CINV can be associated with substantial healthcare resource utilization, as patients may require additional medical care to treat the consequences and symptoms CINV (Burke, Wisniewski, & Ernst, 2011; Viale et al., 2012; Fernandez-Ortega et al., 2012; Haiderali et. al., 2011; Craver, Gayle, Balu, & Buchner, 2011). Deficient control of CINV requires rescue medication use, emergency department visits, and/or hospitalizations, resulting in increased use of health care resources and cost of medical care (Hawkins & Grunberg, 2009; Fernandez-Ortega et al., 2012; Haiderali et. al., 2011). The direct cost of antiemetics should be balanced against the cost of inadequately prevented and managed CINV, which often includes unnecessary or prolonged hospitalizations (Viale et al., 2012). There is also an indirect cost involving the missed time at work for both the patient and their caregivers (Viale et al., 2012; Haiderali et. al., 2011).

One study by Burke et. al. showed that inpatient hospitalizations were the most common type of visit for CINV, with inpatient admissions after the first cycle amounting the highest cost, on average

$5,300 per visit. Also hospital visits after the first cycle of chemotherapy were most pronounced in those receiving HEC (Burke et. al., 2010). Through numerous studies assessing the cost burden of uncontrolled CINV, it can be said that the clinical and economic burden is substantial (Craver et. al., 2011, Burke et. al., 2010, Hideraldi et. al., 2011). Antiemetic costs can be potentially higher up front, however inadequately treated CINV can result in increased resource costs for both payers and institutions (Viale et. al., 2012;). The most significant cost of inadequate antiemetic prophylaxis is patient suffering, therefore clinical guidelines should be utilized by healthcare providers in determining appropriate antiemetic prophylaxis (Viale et. al., 2012; Fernandez-Ortega et al., 2012; Craver et. al., 2011). In a study by Schwartzberg et. al., patients that received neurokinin-1 receptor antagonists (NK_1-RA) had lower rates of resource utilization, which may suggest that NK_1-RA's used in accordance to national guidelines can reduce healthcare resource utilization.

CHAPTER 3: CONCEPTUAL FRAMEWORK

Conceptual Framework

Kurt Lewin's Change Theory was developed in the area of psychology, and considered the start in the development of contemporary theories for change management and organizational change (Burnes, 2004). This theory consisted of four elements: (1) field theory, focuses on human behaviors; (2) group dynamics, which understands behavior of groups; (3) action research, analyzing situation and choosing best change process; and (4) three-step change model, consisting of unfreezing, moving, and refreezing steps (Medley & Akan, 2008). Field Theory was Lewin's approach to mapping out an understanding for group behavior (Burnes, 2004). Action Research stressed that in order for change to be successful, change must occur at a group level, involving collaboration and participation of all those involved or concerned (Burnes, 2004). The idea of group dynamics is to veer away from individual behaviors, and rather focus on the behavior of the group as the emphasis for change (Burnes, 2004). Lewin's theory of change, specifically utilization of the 3-step model, provides an organized step-wise approach to implementing the proposed education and overall change in practice.

Unfreezing involves the ability to recognize the need for change in either an individual or a group setting, along with creating motivation for the change (Manchester et al., 2014). The first task in the unfreezing step requires the identification of a problem or assessing the need for a change in practice (Buonocore, 2004). This need for change could be determined based off quality improvement initiative data, practitioner or nurse queries as to why we do things the way that we do, or newer evidence based research (Buonocore, 2004). The extreme importance of this step is to clarify and prove that a problem really does exist (Buonocore, 2004). Moving is the stage of change implementation where data is obtained, the problem is diagnosed, the action for implementation of change is planned, change is

implemented, and follow up assessment is performed to stabilize or 'refreeze' the change (Tools, 2007). These implemented changes are embraced by utilizing effective communication, along with empowering members to embrace new changes and behaviors (Tools, 2007). Solutions for problems are typically education on and implementation of protocols, procedures, or practice guidelines (Buonocore, 2004). Refreezing is when the new practice has shaped the organization, and reinforcements for the new procedures are utilized to increase the probability of sustaining them (Manchester et al., 2014). Successfully implementing this last stage is why Lewin saw it most effective to focus the change process at a group level. Unless "norms" of the group are effectively transformed, any change to individual behavior will not remain (Burnes, 2004).

Lewin's 3-step change model will be used as a framework for the project intervention, while incorporating important aspects from the other three elements. Lewin's change theory is relevant to understanding how to invoke influential changes in a practice in regards to provider education on evidence based practices (Tools, 2007).

CHAPTER 4: PROJECT AIMS/OUTCOME

A combination intervention was proposed including (1) data collection of patients receiving HEC to determine rates of nausea and vomiting and (2) an education session for health care providers on current guidelines. The goal of the education sessions was to increase adherence to antiemetic guidelines, which ultimately would improve rates of emesis experienced by patients receiving HEC.

Primary Aim/Subjects

The primary aim was to determine the rates of both nausea and vomiting experienced by patients receiving HEC. Vomiting/emesis is defined as the actual forceful upward expulsion of contents from the stomach (Wood, Chapman, & Eilers, 2011). Nausea is an unpleasant sensation experienced in the back of the throat and epigastric area that may or may not result in the expulsion of contents from the stomach (Wood, Chapman, & Eilers, 2011). While nausea is a "patient reported outcome", for the purposes of this project, records of nausea were assessed through patient charts in the assessment tab and nursing notes. Patient subjects were selected using an i2b2 data query, a web application where you can input your inclusion/exclusion criteria that provides de-identified UNC Health Care data to help determine the feasibility of research/trials. The i2b2 data query resulted in 400 patients that met inclusion criteria from July 2015 to July 2016. The inclusion criteria included both male and females, 18 years or older, receiving a highly emetogenic chemotherapy (HEC) agent for cancer on the inpatient unit at UNC cancer hospital (Appendix).

Secondary Aim/Subjects

A secondary aim focused on improving healthcare provider adherence to the clinical practice guidelines for antiemetics in patients receiving HEC by using a powerpoint education session aimed at educating providers on the guidelines. The education intervention participants for the project targeted six

advanced practice providers (APP's), which are both PA's and NP's, along with 83 staff nurses that work on the inpatient hematology/oncology unit. The intervention focused on the APP's from a provider perspective in regards to guidelines implementation in practice. Physicians (including residents and interns) were not included, since they rotate off the unit every six weeks, and there would be no time to assess the effectiveness of their education over an extended period of time. The APP's are part of the medical team, directly overseeing care for the majority of patients admitted for chemotherapy, as well as responsible for reviewing the orders and adjusting medications in the chemotherapy orders. Unlike the medical residents and interns that rotate around the hospital every six weeks, the APP's are fixed on the unit. APP's received the educational training on the use of antiemetic guidelines (both ASCO and NCCN), with the goal of improving implementation of these guidelines on the unit. The staff nurses on the unit were targeted because of their role in administration of appropriate antiemetics to the patients.

CHAPTER 5: METHODOLOGY

Study Design

The method for this project is a Quality Improvement Project will be the PDSA (Plan, Do, Study, Act) method. The PDSA cycle is a series of steps to assist in gaining knowledge to allow for continual process improvement (AAN, 2013). The cycle begins with the Plan step, which help identify the project's purpose, formulate a theory, and put a plan into action (AAN, 2013). The second step is the Do step, when the plan is implemented, followed by the Study step when outcomes are monitored and the plan is assessed for progress or problem areas (AAN, 2013). Lastly, the Act step ends the cycle integrating what was learned to adjust future goals and methods (AAN, 2013). The PDSA model is a never-ending cycle of continuous improvement (AAN, 2013). The goal of this project is to implement the use of antiemetic guidelines, which are the recognized standards of practice, to directly benefit the care of patients receiving highly emetogenic chemotherapy. The endpoint is to improve rates of chemotherapy-induced nausea and vomiting, and hopefully provide a successful method of education for providers to improve guideline adherence.

Setting

This study took place at UNC Cancer Hospital, on the inpatient adult hematology/oncology unit. UNC Cancer Hospital serves a variety of cancer patients. In total, the cancer hospital treats more than 135,000 patients each year throughout North Carolina and surrounding states. The cancer hospital has one inpatient hematology/oncology unit, which as of April 2016 expanded from 34 to 53 beds to better serve a growing population of oncology patients. The unit is comprised of three medical hematology/oncology teams, otherwise known as Med E teams. One team (Med E1) is responsible for the "liquid" tumors (leukemia, lymphoma, etc.), another team (Med E2) is responsible for the "solid" tumors. The last team (Med E3) is comprised of six APP's responsible for scheduled chemotherapy admissions and newly

diagnosed patients with "liquid" tumors. There are a total of 83 staff nurses that work on the unit, including full-time, part-time, and per diem staff. This number did change a few times during the project as some staff left and others were newly hired.

Tools

For the selection of primary study subjects, an i2b2 data query tool was utilized to help determine appropriate subjects based on inclusion/exclusion criteria. Selected inclusion criteria helped to create a query tool targeting those patients that received HEC over one year's time on the inpatient unit. This query tool was then submitted to the Carolina Data Warehouse (CDW), a central data source that houses clinical data from the UNC Health Care System from Epic (an electronic healthcare record). Patients selected utilizing this tool then became part of a retrospective chart analysis that helped determine previous rates of nausea and vomiting. Qualtrics, an online survey tool provided by UNC Chapel Hill for UNC-related problems, was used to create a survey to assess knowledge levels of both APP's and staff nurses on antiemetic guidelines. The survey included 10 demographic/education questions for nurses, 6 demographic/education sessions, and 14 questions assessing basic knowledge [describe how developed/reviewed/tested before deployment] such as how to find the guidelines, how to implement them into practice, how to utilize them, etc. There were also a few advanced knowledge questions with case studies testing application of the guidelines for nurses and APP's separately.

Ethical Considerations

All participants were given a consent information sheet the discussed what their participation in the project would entail, also discussing that their participation would be voluntary and completely anonymous. There was no written consent, which could potentially link the participant to the study, and instead all consents were verbal. All Qualtrics surveys completed by participants were anonymously submitted, to eliminate any embarrassment that could be felt for insufficient knowledge of the material or concerns about answering the demographic questions. These survey results were only reviewed by the principal investigator and co-investigator, before being combined into charts. There is no identifiable

information included in the study for any of the participants. This project underwent IRB review and was determined that the research presents no more than minimal risk of harm to the participants, and involved no consent that is normal required outside of the research context. [did this undergo IRB review? If so state that]

Patients whose charts that were selected for the retrospective chart analysis were exempt from the need for participation consent. Informing the patient that an education study is being done to ensure that UNC and providers are adhering to guidelines, the subjects may unintentionally experience doubt and mistrust in the providers and treatment team. This could ultimately lead risk their treatment and overall health. Without utilizing the patients charts, there would be no way to definitively determine the lack of guidelines adherence to educate providers and RN's. There would also be no way to determine the rates of nausea and vomiting experienced by these patients. The importance of improving guidelines adherence among providers and RN's will significantly improve patient outcomes with CINV, and ultimately improve their health and experience with chemotherapy treatments as an inpatient at UNC. Therefore, a waiver of written consent was granted by the IRB for only patient's whose charts would be part of the analysis.

Primary Subject Selection

Using the i2b2 data query, two lists were created using the inclusion criteria. Two lists were needed to specify the HEC agents; one for the individual HEC agents and one for the combination of anthracycline plus cyclophosphamide. These lists were then submitted to the CDW, which used the i2b2 queries to pull the patient's medical record numbers (MRN's). Once the lists of MRN's were received, they were compared to exclude any duplicate patient's/MRN's, resulting in 308 patient charts total for retrospective analysis. Given the number of inclusion criteria and how the search database works, the CDW recommended that we verify all of the important parts of the inclusion criteria were present. The retrospective chart analysis started with reviewing the chemotherapy regimen given to ensure that it;

included a HEC agent, the regimen was given on the inpatient oncology unit and not on another unit/outpatient, and that it was given in the selected time frame.

Secondary Subject Selection

All nurses and APP's on the inpatient hematology oncology unit were targeted as potential subjects. Each nurse was provided with a participant consent to explain what would be asked of them if they agreed to participate in this study. The consents were read over with the nurse and the APP, and their verbal consent was given if they agreed to participate. All nurses were asked, regardless of whether they were certified to given chemotherapy or not, and even newly hired nurses were included in the consent process for this project.

Data Collection

Patient Charts. Data was collected from EPIC to determine the rates of nausea and vomiting in patients receiving HEC from July 2015 to July 2016 (pre-intervention) and from October 2016 to January 2017 (post-intervention). The patient charts selected using the i2b2 query were used for the retrospective chart analysis to determine if nausea and/or vomiting did occur. Qualtrics was used to create a template for data collection to ensure all the same data points were collected on every patient. First things collected were basic patient demographics such as age, gender, race, and cancer diagnosis. The names of the chemotherapy regimen given, along with the individual chemotherapy agents name, route and dose, were collected next. The chemotherapy cycle number was also documented, as literature suggests that CINV rates are higher with the first cycle. Not all patients received cycle one in the inclusion time frame, therefore the earliest cycle given within the allotted time was the one utilized in the chart review. The presence of vomiting/emesis was found in the patient charts in the intake/output section as an occurrence or volume amount, in the assessment section under the gastrointestinal (GI) section, and/or in the nursing notes. The experience of nausea was found in the patient assessment section under the GI section, and/or in the nursing notes. Since the presence of nausea is a patient reported outcome, the nursing notes were utilized heavily for this section, which is were nausea is most often reported in patient charts. Nursing

notes/care plan notes are the notes written at the end of every shift by the nursing staff caring for the patient to summarize what happened during the day. This is most frequently where vomiting was quantified (ex: patient experience 2 episodes of emesis during the shift) and also were the presence of nausea in patients was noted. The number of times vomiting/emesis and/or nausea were experienced was collected, along with where the experience was charted. Lastly, the prophylactic antiemetics given as premedications were documented, which helped to determine if the prophylaxis antiemetics given followed the guidelines. Patient MAR's (medication administration record) were assessed for the use of additional breakthrough antiemetic administration during their chemotherapy treatment. These were documented as name of drug, dose, route, and the number of times given over a span of dates. The patient's MAR was assessed from the initial start of the chemotherapy regimen and up to five days after chemotherapy completion, which is the length of time in which breakthrough CINV can occur.

Surveys.

Data collection with the surveys occurred three times during the project implementation; pre-intervention, post-intervention, and three months post-intervention. There were two surveys, one for the nurses and one for the APP's; each Qualtrics survey contained 21 questions for APP's and 24 questions for nurses.. Surveys were administered by email through Qualtrics, which provided an anonymous link that could only be used the participant and would become inactive after they submitted the survey. This was how all three surveys were distributed to the nursing staff and APP's. The first nine questions in the nurses survey and the first six questions in the APP survey were basic demographic questions, and the rest were to assess their knowledge of evidence based guidelines for prevention and management of CINV. Questions were developed using the evidence based guidelines and the targeted areas where providers lacked knowledge of guidelines determined by recent literature. Each survey was timed for 15 minutes to ensure immediate responses and dissuade anytime for use of outside resources. Upon completion, the survey was electronically submitted to Qualtrics, which aided in the overall scoring of the surveys.

Nursing Survey.

Nursing surveys were developed to assess knowledge of the guidelines and how they are useful in preventing/managing CINV in outpatients. The pre-intervention surveys were provided to nursing staff three weeks before the education interventions began. Once all the education sessions for nursing staff were complete, the post intervention survey was sent out to nursing staff. This survey included the same questions as the pre-intervention survey, with questions and answers scrambled in their order. This was then compared to the pre-intervention survey scores to assess immediate knowledge improvement after education. Three months later, they were asked to take the same anonymous Qualtrics survey with same questions, just scrambled in order. This survey was compared to both the pre-intervention and initial post-intervention survey to assess knowledge retention among nursing staff (Appendix 1).

APP Survey

APP surveys were developed to assess the knowledge in the utilization of the guidelines to prevent and/or manage CINV in patients. The pre-intervention survey was provided to the APP's three weeks prior to when the education interventions began. When the one education session was complete, and the voice recorded powerpoint was sent out for the one APP who was unable to attend, the post-intervention survey was sent out to the APP's. The post-intervention survey included the same questions as the pre-intervention survey, with the questions and answers scrambled in their order. This was used to compared to the pre-intervention survey scores to assess immediate knowledge improvement after the education. Then three months later, another post-intervention survey was sent out, again with the same questions and answers, again scrambled in their order. This survey was compared to both the pre-intervention and initial post-intervention survey to assess knowledge retention amongst the APP's (Appendix 2).

Education Intervention

Nurse Education.

Nurses that agreed to participate were then asked to attend a powerpoint education session that lasted about 30 minutes, including time for case studies and questions. These education sessions were focused on educating nursing staff on the guidelines, how/why they are utilized, and reviewing the important sections that can be utilized for both prevention and management of CINV. There were nine education sessions offered to the nursing staff over a period of four weeks to allow everyone access to the sessions. It was decided that it would be easier to provide education to nurses on a day they were scheduled to work, instead of holding education sessions at staff meetings or on additional days, as most people would rather call in and would not be immediately present for the education. For day shift nurses, the education sessions were from noon to 1pm, with lunch provided to allow people to use their lunch break to attend the session. On night shift, the education session were offered from 12:30 am to 1:30 am, again with food provided, to allow them to attend on their break. Days for the sessions were decided based on ensuring that every nurse, both night and day shifts, was working on a day the education sessions were provided. Sessions were announced to all the nurses 20 minutes prior to starting, and the unit was split so that half of the nurses attended the first session so that the floor and patients would still be covered. This allowed for most of the nurses to be able to attend the entire education session. For those fourteen nurses unable to attend, and those that may not have been able to stay for the entire session, and voice-recorded powerpoint presentation was emailed out for everyone to listen to and/or review.

APP Education.

All the APP's agreed to participate, and were then asked to attend a powerpoint education session lasting about 30 minutes total, including time for case studies and questions. These powerpoint sessions were focused on; basic guideline education, discussing how to implement guidelines, antiemetics for both prevention and management, and the importance in utilizing them for quality patient care. The APP's received additional education, specifically on the use of ASCO and NCCN clinical guidelines, and how to

effectively implement them into practice. There was one powerpoint education session offered to the APP's during one of their weekly meetings, which captured five out of the six. For the one APP that was unable to attend the session in person, a voice recorded powerpoint presentation was emailed to them.

Statistical Analysis

Utilizing a one-tailed homoscedastic t-test, the statistical significance was determined for each question in the survey for both RN's and APP's. A homoscedastic t-test utilizes a two-sample population data set that assumes both populations are equal with equal variances. This test was chosen since the survey was taken anonymously and not by the same people every time, therefore the two populations could not be paired but were determined to have equal population variances. A homoscedastic t-test was used for each survey question to compare pre-intervention to post-intervention, post-intervention to three months post-intervention, and pre-intervention to three months post-intervention for both RN's and APP's. This same test was also used to determine statistical significance of guideline adherence, CINV rates, and the presence of nausea/emesis between pre-education and three months post-education.

CHAPTER 6: RESULTS

Primary Aim: Retrospective Chart Analysis

Pre-Intervention Patient Demographics. Of the 86 patients, the mean age was 55.5 years old, with the majority being white (61.6%) males (65.1%) (Table 1.1). The most common cancer diagnosis was lymphoma (64%), followed by leukemia (17.4%). Chemotherapy regimen given were classified as either HEC Non-AC (Anthracycline/Cyclophosphamide) regimen or HEC AC Regimen. The AC Regimen were more commonly given on the inpatient unit (62.8%), and R-DA-EPOCH was the most commonly given regimen (22.1%) (Table 1.1). Lymphoma was the most common cancer diagnosis (62.8%), followed by Leukemia (17.4%) (Table 1.1).

Table 1.1: Patient Demographics Who Received HEC

Characteristic	**Before Education Total Patients (N=86)**	**3 months post ed. Total Patients (n=37)**
Age – years (%)		
Median	55.5 (20-88)	55 (24-76)
Age by Decade		
20-29	12 (14%)	3 (8.1%)
30-39	10 (11.6%)	8 (21.6%)
40-49	11 (12.8%)	4 (10.9%)
50-59	20 (23.2%)	8 (21.6%)
60-69	22 (25.6%)	11 (29.7%)
> 70	11 (12.8%)	3 (8.1%)
Race or Ethnic Group – no. (%)		
White	53 (61.6%)	22 (59.5%)
Black	18 (20.9%)	9 (24.3%)
Asian	3 (3.5%)	
American Indian or Alaska Native	1 (1.2%)	
Hispanic	11 (12.8%)	6 (16.2%)

Sex – no. (%)		
Female	30 (34.9%)	7 (18.9%)
Male	56 (65.1%)	30 (81.1%)
Cancer Diagnosis		
Leukemia	**15 (17.4%)**	**4 (10.8%)**
ALL	13 (15.1%)	3 (8.1%)
Plasma Cell Leukemia	2 (2.3%)	1 (2.7%)
Lymphoma	**54 (62.8%)**	**25 (67.6%)**
Burkitt's Lymphoma	10 (11.5%)	2 (5.4%)
CNS Lymphoma	1 (1.2%)	1 (2.7%)
Diffuse Lg B-cell Lymphoma (DLBCL)	28 (32.5%)	19 (51.4%)
T-cell Lymphoma	3 (3.5%)	2 (5.4%)
Hodgkin Lymphoma	1 (1.2%)	1 (2.7%)
Anaplastic Lg Cell Lymphoma	4 (4.6%)	
Mantle Cell Lymphoma	3 (3.5%)	
Follicular Lymphoma	1 (1.2%)	
Lymphoplasmacytic Lymphoma	1 (1.2%)	
Double Hit Lymphoma	1 (1.2%)	
EBV Associated Lymphoma	1 (1.2%)	
Testicular Cancer	3 (3.5%)	3 (8.1%)
Sarcoma	5 (5.8%)	1 (2.7%)
Multiple Myeloma	8 (9.3%)	2 (5.4%)
Small Cell Lung Cancer (SCLC)	1 (1.2%)	
Ethmoid Sinus Cancer		1 (2.7%)
Mycosis Fungoides		1 (2.7%)
Chemotherapy Regimen Name – no. (%)		
HEC Chemotherapy (Non AC Regimen*)	**(n=32) 37.2%**	**(n=18) 48.6%**
ICE (Ifosfamide + Carboplatin + Etoposide)	4 (4.6%)	5 (13.5%)
R-ICE (Rituximab + ICE)	6 (7%)	2 (5.4%)
MM VDT PACE (Bortezomib + Cisplatin + Cyclophosphamide + Etoposide +	9 (10.5%)	3 (8.1%)

Doxorubicin)		
BEP (Bleomycin + Etoposide + Cisplatin)	1 (1.2%)	1 (2.7%)
Lung SCLC XRT Cisplatin/Etoposide	1 (1.2%)	1 (2.7%)
ICE + Romidepsin	2 (2.3%)	
ICE + Ofatumumab	1 (1.2%)	
Doxorubicin/Ifosfamide	5 (5.8%)	
TI-CE (Paclitaxel + Ifosfamide)	1 (1.2%)	
VIP (Etoposide + Ifosfamide + Cisplatin)	1 (1.2%)	
Cyclophosphamide + Bortezomib + Dexamethasone	1 (1.2%)	
R-MVP (Rituximab + Methotrexate + Vincristine + PO Procarbazine)		1 (2.7%)
Etoposide/Cisplatin		1 (2.7%)
Sarcoma: Ifosfamide/Mesna		1 (2.7%)
TIP (Paclitaxel + Ifosfamide + Cisplatin)		1 (2.7%)
R-DHAP (Rituximab + High Dose Cytarabine + Cisplatin)		2 (5.4%)
HEC Chemotherapy (AC Regimen*)	**(n=54) 62.8%**	**(n=19) 51.4%**
*DA-EPOCH (Etoposide + Vincristine + Doxorubicin + Cyclophosphamide)	2 (2.3%)	1 (2.7%)
Hyper CVAD (Vincristine + Cyclophosphamide + Doxorubicin)	8 (9.3%)	3 (8.1%)
R-CHOP (Rituximab + Cyclophosphamide + Doxorubicin + Vincristine)	8 (9.3)	3 (8.1%)
R-Hyper CVAD (Rituximab + Hyper CVAD)	8 (9.3)	1 (2.7%)
R-DA-EPOCH (Rituximab + DA-EPOCH)	19 (22.1%)	7 (18.9%)
R-EPOCH (Rituximab + EPOCH)	1 (1.2%)	4 (10.8%)
B-DA-EPOCH (Bortezomib + DA-EPOCH)	3 (3.5%)	
Hyper CVAD + Dasatinib	1 (1.2%)	
R-Hyper CVAD + Dasatinib	3 (3.5%)	

*(DA = Dose Adjusted); (AC = Anthracycline + Cyclophosphamide)

Pre-intervention Chart Analysis.

The UNC i2b2 data queries submitted to the CDW returned 400 patient medical record numbers (MRN) that met the inclusion criteria. These MRN's were provided in two separate lists; one for all individual HEC agents, and one for the combination of anthracyclines and cyclophosphamide. The lists were combined, and all duplicates were removed, which left 294 patient MRN's for the chart review. All 294 charts were reviewed to make sure that each chart met the inclusion criteria in the allotted time frame from July 2015 to July 2016. During chart audits patient charts were excluded if (Table 1.6); patient didn't receive the chemotherapy on the inpatient hematology/oncology unit (n=66), received the inclusion chemotherapy prior to July 2015 (n=38), chemotherapy did not match inclusion parameters because of dosing (n=30), or the patient did not receive HEC (n=74). This left 86 patient charts that met all inclusion criteria to be used in the pre-intervention retrospective chart audit.

The rates of CINV for patients receiving HEC was 48.8%, with 42 out of the 86 patients experiencing CINV (Table 1.2). Management of CINV consistent with guideline adherence should result in rates of CINV being around 20-30%, therefore rates of CINV with HEC on the inpatient hematology/oncology are high. One of the reasons for such elevated rates of CINV is that of the 86 patients only six received the guideline recommended prophylaxis for HEC regimen, meaning there was a 7% rate of adherence to the guidelines. The incidence of nausea in patients was higher than the incidence of vomiting (48% vs. 21%), which was expected given that the literature suggests that nausea is more frequently experienced and less controlled (Table 1.2). All of the 42 patients experienced nausea, but only 19 (45.2%) of the 42 patients experienced vomiting (Table 1.5). Of the 42 patients experiencing CINV, 25 of them (59.5%) received an AC regimen. The two most common AC regimen to cause CINV were HyperCVAD (35.7%) and DA-EPOCH (19%) (Table 4). The remaining 17 patients that experienced CINV received a Non-AC regimen (40.5%), with the most common regimen to cause CINV being VDT-PACE (19%) (Table 1.5).

Management of breakthrough CINV was most commonly managed with the use of IV and/or PO Compazine (prochlorperazine) in all 42 patients (100%) who experienced CINV (Table 1.4). Zofran (ondansetron) IV and/or PO was used to manage breakthrough CINV in 18 (40.5%) of patients, followed

by Ativan (lorazepam) IV and/or PO for 10 (23.8%) patients (Table 1.4). All 86 patients were premedicated with Zofran 24mg daily while receiving chemotherapy. There were six patients (7%) that received additional doses of Zofran, along with the 24 mg prophylactic dose, for management of breakthrough within a 24 hour period.

Table 1.2: Presence of CINV

Presence of CINV – no. (%)	**Before Education Total Patients (N=86)**	**3 months post ed. Total Patients (n=37)**	**P-Value**
Yes	42 (48.8%)	14 (37.8 %)	0.13
No	44 (51.2%)	23 (62.2%)	0.13
Experience of CINV by Gender no./total (%)			
# Female Exp CINV	13/30 (43.3%)	1 /7 (14.3%)	
# Male Exp CINV	29/56 (51.8%)	13/30 (43.3%)	
Experience of CINV by cancer diagnosis no./total (%)			
Leukemia	11/15 (73.3%)	3/4 (75%)	0.45
Lymphoma	18/54 (33.3%)	5/25 (20%)	0.11
Testicular Cancer	2/3 (66.7%)	3/3 (100%)	0.18
Multiple Myeloma	8/8 (100%)	1/2 (50%)	0.02
Sarcoma	3/5 (60%)	1/1 (100%)	
Chemotherapy Cycle # - no. (%)			
1	76 (88.4%)	25 (67.6%)	
≥ 2	10 (11.6%)	12 (32.4%)	

(From the retrospective patient chart audits)
**(Comparing pre and post education, P <0.05)

Table 1.3: Prevalence of CINV

Results	**Chart Review Pre-Education (n=86)**	**Chart Review 3 mos. Post-Education (n=37)**	**P-Value****
Patients Given Guideline Appropriate Premedications			
Not given	80 (93%)	29 (78.4%)	0.01
Given	6 (7%)	8 (21.6%)	0.01
Presence of Emesis (Vomiting) – no. (%)			
none	68 (79%)	31 (83.8%)	0.27

one time	18 (21%)	6 (16.2%)	0.27
>1 time	11 (13%)	5 (13.5%)	0.45
Presence of Nausea – no. (%)			
none	45 (52%)	23 (62.2%)	0.15
one time	41 (48%)	14 (37.8%)	0.15
>1 time	31 (36%)	9 (24.3%)	0.10

(From the retrospective patient chart audits)
**(Comparing pre and post education, P <0.05)

Post-Intervention Patient Demographics

Of the 37 patients, the mean age was 55 years old, with the majority being white (59.5%) males (81.1%) (Table 1.1). Lymphoma was the most common cancer diagnosis (67.6%), followed by Leukemia (10.8%), similar to the first chart analysis (Table 1.1). Chemotherapy regimen were classified as either HEC Non-AC or HEC AC Regimen. As in the pre-intervention chart reviews, the AC regimen were more commonly given on the inpatient unit (51.4%), with R-DA-EPOCH being being given the most (18.9%). In this chart review, there were a few different Non-AC Regimen given then in pre-intervention chart review (Table 1.1).

Post-intervention Chart Analysis

Three months after completion of the education intervention, the i2b2 data queries were submitted to the CDW, returning 78 patient MRN's that met the inclusion criteria. The MRN's this time were combined into one list by the CDW analyst, and all duplicates were removed prior to returning the patient MRN's to the investigator. The same patient charts included in the first analysis were not targeted for this post-intervention retrospective chart review. Though the list may include some of the patients from the first retrospective chart review, depending on if they returned to the unit after July 2016 for further cycles of chemotherapy or began a new treatment regimen. All 78 charts were reviewed to make sure that each chart met the inclusion criteria in the allotted time frame from October 2016 to January 2017. Patient charts were excluded if (Table 1.6); patient didn't receive the chemotherapy on the inpatient hematology/oncology unit (n=9), received HEC chemotherapy prior to October 2016 (n=12),

chemotherapy did not match inclusion parameters because of dosing (n=13), the patient did not receive HEC (n=7). This left 37 patient charts that met all inclusion/exclusion criteria to be used in the post-intervention retrospective chart audit.

The rate of CINV for patient receiving HEC was 37.8%, with 14 out of the 37 patient experiencing CINV (Table 1.2). This was an 11% decrease in the rate of CINV, but was not a significant decrease in the CINV rates (p=0.13) (Table 1.2). As previously stated, the rates of CINV when adhering to the guidelines should be 20-30%, meaning CINV rates signaled improved guideline adherence. Of the 37 patients, eight received the guideline recommended prophylaxis for HEC, demonstrating a 21.6% rate of adherence to the guidelines (Table 1.3). This was a 14.6% increase in guideline adherence from pre-intervention, which showed a significant increase in guideline adherence (p=0.01) (Table 1.3). As in the pre-intervention chart analysis results, the incidence of nausea in patients was higher than the incidence of vomiting (37.8% vs. 16.2%) (Table 1.3). All of the 14 patients experienced nausea, but only six experienced vomiting (16.2%) (Table 1.3). Of the 14 patients experiencing CINV, nine of them (64.3%) eceived Non-AC regimen. The most common Non-AC regimen given, resulting in both nausea and vomiting, was VDT-PACE (14.3%) (Table 1.5). The remaining five patients that experienced CINV received AC Regimen (35.7%), with the most common regimen to cause CINV being Hyper-CVAD (21.4%) (Table 1.5).

Management of breakthrough CINV was most commonly managed with the use of PO and/or IV Compazine (prochlorperazine) in 13 of the 14 patients (92.3%) (Table 1.4). Zofran (ondansetron) IV and/or PO was used to manage breakthrough CINV in 5 (35.7%) of patients, followed by Ativan (lorazepman) IV and/or PO for 2 (14.3%) patients (Table 1.4). All 37 patients were premedicated with Zofran 24mg daily while receiving chemotherapy treatment. For both patients with a PRN order for Ativan, indications for administration stated “for anticipatory nausea/vomiting”. There were two patients (5.4%) that received additional doses of Zofran, along with the 24 mg prophylactic dose, for management of breakthrough within a 24 hour period.

***Table 1.4: Documentation of CINV and Antiemetics**

Documentation Chart Location of Nausea – no. (%)	**Pre-Education Intervention (n=42)**	**3 mos. Post Education Intervention (n=14)**	****P-Value**
Nursing Note	40 (95.2%)	14 (100%)	
Nursing Assessment Flowsheet	28 (66.7%)	6 (42.9%)	
Documentation Chart Location of Vomiting – no. (%)			
Nursing Note	14 (33.3%)	5 (35.7%)	
Nursing Assessment Flowsheet	10 (23.8%)	4 (28.6%)	
Intake & Output	8 (19%)	2 (14.3%)	
Most Frequent Antiemetics Given for Breakthrough – no. times given (%)			
Prochlorperazine (IV and PO)	42 (100%)	13 (92.3%)	
Ondansetron (IV and PO)	18 (40.5%)	5 (35.7%)	
Lorazepam (IV and PO)	10 (23.8%)	2 (14.3%)	
Promethazine (IV and PO)	9 (21.4%)	1 (7.1%)	
Metoclopramide (IV and PO)	2 (4.8%)		
Dronabinal (PO)	1 (2.4%)		
Scopolamine Patch		1 (7.1%)	
Zofran given for breakthrough after 24mg given for prophylaxis – no. (%)			
Add. Zofran given	6/86 (7%)	2/37 (5.4%)	0.37

*(From the retrospective patient chart audits)
**(Comparing pre and post education, P <0.05)

Table 1.5: Chemotherapy Resulting in CINV

	Pre-Intervention		**Post-Intervention**	
Chemotherapy Regimen (Total) – no. (%)	Nausea (n=42)	Vomiting (n=19)	Nausea (n=14)	Vomiting (n=6)
***HEC (Non AC Regiment- total # (%)**	**17 (40.5%)**	**8 (42%)**	**9 (64.3%)**	**4 (66.7%)**
BEP (Testicular)	1 (2.4%)	0	1 (7.1%)	
VIP (Testicular)	1 (2.4%)	1 (5.3%)		
Doxorubicin/Ifosfamide	3 (7.1%)	2 (10.5%)		
ICE/RICE	3 (7.1%)	1 (5.3%)	1 (7.1%)	
MM VDT PACE	8 (19%)	3 (15.8%)	2 (14.3%)	2 (33.3%)

Cyclphosphamie/Bortezimib/Dexamethasone	1 (2.4%)	1 (5.3%)		
R-DHAP			1 (7.1%)	1 (16.7%)
Cisplatin/Etoposide			2 (14.3%)	
TIP (Testicular)			1 (7.1%)	
Ifosfamide/Mesna			1 (7.1%)	1 (16.7%)
***HEC (AC Regimen) – total # (%)**	**25 (59.5%)**	**11 (58%)**	**5 (35.7%)**	**2 (33.3%)**
R-Hyper CVAD/Hyper CVAD	15 (35.7%)	10 (52.6%)	3 (21.4%)	1 (16.7%)
R-DA-EPOCH/DA-EPOCH	8 (19%)	1 (5.3%)	1 (7.1%)	
R-CHOP	2 (4.8%)	0	1 (7.1%)	1 (16.7%)

*(See Table 1 for chemotherapy regimen names and included chemotherapy agents)

Table 1.6: Chart Exclusion Criteria

Exclusion Criteria	Pre-Intervention Chart Review (n= 208)	Post-Intervention Chart Review (n= 41)
Didn't Receive Chemotherapy on the Inpatient Hematology/Oncology Unit	66 (31.7%)	9 (22%)
Received the Inclusion Chemotherapy Prior to July 2015	38 (18.3%)	12 (29.3%)
Chemotherapy Did Not Match Inclusion Criteria Due to Dosing	30 (14.4%)	13 (31.7%)
Patient Did Not Receive HEC	74 (35.6%)	7 (17%)

Secondary Aim: RN/APP Survey Results

Demographic Results.

Table 2.1 and 2.2 summarizes the demographics of both the RN's and APP's for all three of the surveys. For the pre-intervention survey 60 nurses responded; the mean was 29.5, with the majority of respondents being white (81.7%) females (93.3%) with 1-5 years (61.7%) of experience in oncology. Of the 60 nurses, 51 (85%) were ONS chemotherapy biotherapy certified, and only 14 (23.3%) were OCN certified. For the immediate post-intervention survey, 57 nurses responded; the mean was 30, with the majority of respondents being white (87%) females (96.4%) having 1-5 years (61.8%) of experience in

oncology. Of the 57 nurses, 47 (82.5%) are ONS chemotherapy/biotherapy certified, and only 13 (22.8%) are OCN certified. For the three months post-intervention survey, 41 nurses responded; the mean was 29, with the majority being white (90.3%) females (95.1%) having 1-5 years (70.7%) of experience in oncology. Of the 41 nurses, 38 (92.7%) were ONS chemotherapy/biotherapy certified, and 16 (39%) were OCN certified. Bachelor of Science in Nursing was the most common highest degree among all three surveys (68.3% - 75.6%). The APP's had 5-6 respondents for each survey; the mean age was 31.6 with the majority being white (100%) female (81.5%) having 6-10 years (56.7%) of experience in oncology. All APP's are Licensed Oncology Providers with a Masters degree specifically as an Adult Gerontology Nurse Practitioner or Physicians Assistant.

Table 2.1: RN Demographics

Characteristics	**Nurses (n=60)**	**Nurses (n=57)**	**Nurses (n=41)**
Age – no. (%)			
Mean	29.5	30	29
Age by Decade	(n=58)	(n=52)	(n=32)
20-29	30 (51.7%)	28 (53.8%)	17 (53%)
30-39	13 (22.4%)	12 (23.1%)	8 (25%)
40-49	8 (13.8%)	5 (9.6%)	6 (19%)
50-59	7 (12.1%)	7 (13.5%)	1 (3%)
Gender – no. (%)			
Male	4 (6.7%)	2 (3.6%)	2 (4.9%)
Female	56 (93.3%)	54 (96.4%)	39 (95.1%)
Race or Ethnicity – no. (%)			
White	49 (81.7%)	47 (87%)	37 (90.3%)
Black/African American	5 (8.3%)	1 (1.9%)	
Hispanic	2 (3.3%)	1 (1.9%)	1 (2.4%)
American Indian or Alaska Native			
Asian	1 (1.7%)	1 (1.9%)	2 (4.9%)
Pacific Islander			
Other	3 (5%)	4 (7.4%)	1 (2.4%)
Years of Experience in Oncology – no. (%)			
<1 yr	10 (16.7%)	11 (20%)	3 (7.3%)
1-5 yrs.	37 (61.7%)	34 (61.8%)	29 (70.7%)
6-10 yrs.	5 (8.3%)	5 (9.1%)	4 (9.8%)
11-15 yrs.	5 (8.3%)	3 (5.5%)	2 (4.9%)
16-20 yrs.	2 (3.3%)	2 (3.6%)	3 (7.3%)
>20 yrs.	1 (1.7%)		
ONS Chemotherapy/Biotherapy Cert. – no. (%)			
Yes	51 (85%)	47 (82.5%)	38 (92.7%)
No	9 (15%)	10 (17.5%)	3 (7.3%)

OCN Certified – no. (%)			
Yes	14 (23.3%)	13 (22.8%)	16 (39%)
No	46 (76.7%)	44 (77.2%)	25 (61%)
Highest Level of Education – no. (%)			
Diploma in Nursing	1 (1.7%)	0	1 (2.4%)
Associates Degree	14 (23.3%)	14 (25.5%)	9 (22%)
Bachelors of Science	41 (68.3%)	39 (70.9%)	31 (75.6%)
Masters in Nursing	3 (5%)	1 (1.8%)	
Other Degree (in add. to nursing)	9 (15%)	7 (12.7%)	

Table 2.2: APP Demographics

Characteristics	**APP's (n=5)**	**APP's (n=6)**	**APP's (n=5)**
Age – no. (%)			
Mean	33	32	30
Age by Decade			
20-29	1 (20%)	2 (33.3%)	2 (40%)
30-39	3 (60%)	3 (50%)	2 (40%)
40-49	1 (20%)	1 (16.7%)	1 (20%)
50-59			
Gender – no. (%)			
Male	1 (20%)	1 (16.7%)	1 (20%)
Female	4 (80%)	5 (83.3%)	4 (80%)
Race or Ethnicity – no. (%)			
White	5 (100%)	6 (100%)	5 (100%)
Black/African American			
Hispanic			
American Indian or Alaska Native			
Asian			
Pacific Islander			
Other			
Years of Experience in Oncology – no. (%)			
<1 yr		1 (16.7%)	
1-5 yrs.	2 (40%)	1 (16.7%)	2 (40%)
6-10 yrs.	3 (60%)	3 (50%)	3 (60%)
11-15 yrs.		1 (16.7%)	
16-20 yrs.			
>20 yrs.			
Highest Level of Education – no. (%)			
Masters in Nursing	5 (100%)	6 (100%)	5 (100%)
Are you a Licensed Oncology Provider (LOP)?			
Yes	5 (100%)	6 (100%)	5 (100%)
No			

Pre-Intervention Survey.

For the pre-intervention survey, 60 out of 82 nurses completed the survey, and five out of the six APP's completed the survey (Table 2.3). The average overall score for the nurses was 57.3%, and the APP's scored an average of 60.8%. Average scores were calculated by adding together the percentage correct for every question, then dividing the total score by the total number of questions.

Table 2.3: Pre-Intervention Survey Participation

	RN	**APP**
Participation Rates	60/82 (73%)	5/6 (83%)
Total Average Score	*692.4/13 = **57.7%**	*730/13 = **60.8%**

*total points correct divided by total number of questions

Post-Intervention Survey.

For the post-intervention survey, 55 out of 78 nurses completed the survey, and all six of the APP's completed the survey (Table 2.4). In the time frame of a few months, there were four nurses that left the unit, but only those consented and educated from the beginning were included. Post-education surveys showed improved results; nurses scored an average of 66.1%, and APP's an average of 77%.

Table 2.4: Post-Intervention Survey Participation

	RN	**APP**
Participation Rates	55/78 (70%)	6/6 (100%)
Total Average Score	*859/13 = **66.1%**	*935/13 = **71.9%**

*total points correct divided by total number of questions

Three Month Post-Intervention Survey.

For the three month post-intervention survey, 41 out of the 74 nurses completed the survey, and five out of the six APP's completed the survey (Table 2.5). In the three months since implementation, four more nurses left the unit, but again only those consented and educated from the beginning were included. Three months post education survey showed mix results; nurses scored an average of 66% showing retained knowledge, while APP's scored an average of 68% showing a lack of knowledge retention.

Table 2.5: Three Months Post-Intervention Survey Participation

	RN	APP
Participation Rates	41/74 (55%)	5/6 (83%)
Percent with Correct Responses	860/13 = **66.2%**	920/13 = **70.8%**

*total points correct divided by total number of questions

Managing CINV.

At the end of each survey, RN's and APP's were asked to rank their comfort in managing CINV. In the pre-intervention survey, the majority of nurses were either neutral or uncomfortable (54.4%) and the majority of APP's were slightly comfortable (60%) (Table 2.6). Immediately after the education, provider comfort levels improved. The majority of nurses were slightly comfortable (63%) with less than 20% feeling neutral or uncomfortable. APP's all felt either slightly comfortable (50%) or extremely comfortable (50%). These improvements in comfort were also correlated with improved knowledge scores on the survey. Three months post-intervention, comfort levels remained about the same with the majority of nurses being slightly comfortable (73%) with managing CINV, and majority of APP's being slightly comfortable (60%).

Table 2.6: Managing CINV

	Pre-intervention		Post-intervention		3 mos. Post-intervention	
How comfortable are you managing CINV? –no. (%)	Nurses (n=57)	APP's (n=5)	Nurses (n= 46)	APP's (n=6)	Nurses (n= 41)	APP's (n=5)
Extremely comfortable	8 (13.3%)	1 (20%)	8 (17.4%)	3 (50%)	2 (4.9%)	1 (20%)
Slightly comfortable	17 (28.3%)	3 (60%)	29 (63%)	3 (50%)	30 (73%)	3 (60%)
Neutral	11 (18.3%)	1 (20%)	6 (13%)		5 (12.3%)	1 (20%)
Slightly uncomfortable	16 (26.7%)		3 (6.6%)		2 (4.9%)	
Extremely uncomfortable	4 (6.7%)		0		2 (4.9%)	

Statistical Analysis.

Utilizing a one-tailed homoscedastic t-test, the statistical significance was determined for each question in the survey for both RN's (Table 2.7) and APP's (Table 2.8). Assessing their knowledge of where to locate the guidelines prior to education, only 4 (11.4%) of the 40 nurses that answered yes, and 2 (50%) of the 4 APP's knew where to fine the guidelines. This improved for the nurses after education,

with 17 (50%) of 44 nurses knowing where to locate the guidelines (p=0.0004). Knowledge levels of acute, delayed, and breakthrough CINV improved among the nurses from 33% pre-education to 55% post-education (p=0.01), with a significant change from pre-education to three months post-education (p=0.04). Also, nurses knowledge on the use of Ativan (lorazepam) for anticipatory CINV only significantly improve from pre-education to three months post education (p=0.002). The APP's scores were relatively consistent from pre-intervention to post-intervention. Knowledge levels on the use of NK1 RA's pre-education were very low and showed significant improvement post-education (p=0.001) and three months post-education (p=0.03).

The same one-tailed homoscedastic t-test was used to determine statistical significance of the overall total scores from each time period; baseline (pre-education) to EOE (end of education = post-education), EOE to Final (three months post-education), and baseline to final (Table 3.1, 3.2). This was done for the both RN's and the APP's. No statistical significance was found for the overall total scores, however for both the p-values from baseline to EOE were lowest, trending in the right direction. Therefore, statistical significance for each questions in both surveys was determined to demonstrate areas of strengths and weaknesses in knowledge for both RN's and APP's (Table 2.7, 2.8).

RN Survey Analysis:

For the RN survey, significant results were most frequently found when comparing pre-education to post-education for eight of thirteen questions; where to locate antiemesis guidelines, choice of antiemetics are based off which of the following, correctly pairing the definition with the type of CINV (acute, delayed, breakthrough), is management of PO HEC different than IV HEC, which antiemetic would you not give for a patient experiencing breakthrough CINV six hours post chemo administration, maximum daily dose of ondansetron, when should lorazepam be used for CINV, and which organizations provide antiemetic guidelines (Table 2.7). For those questions that did not show statistical significance, scores between the pre and post-education were very similar, demonstrating no improvement in knowledge (Table 2.7). Statistical significance when assessing knowledge between pre-education and

three months post-education were found for the following questions; where to locate antiemesis guidelines, choice of antiemetics are based off which of the following, correctly pairing the definition with the type of CINV (acute, delayed, breakthrough), and when should lorazepam be used for CINV (Table 2.7). Again, no statistical significance was found for questions where the scores were very similar between the pre and three month-post surveys. Lastly, statistical significance was found less frequently when comparing results from post-education to three months post-education because scores were similar, which demonstrates a retention of knowledge for most questions. The questions with statistical significance include; which of the following is true regarding emetogenicity of chemotherapy, is management of PO HEC different than IV HEC, and which organizations provide antiemetic guidelines (Table 2.7). For question number seven, no statistical significant could be calculated when comparing post-education to three months post-education as 100% of the nurses answered correctly each time (Table 2.7). Questions with no statistical significance proven when comparing any time frame included; which of the following chemotherapy agents are considered HEC, when discharging a patient home do they need a script for antiemetics, and what is the purpose of an NK1-RA (Table 2.7). This was because the scores of all three time frames were very similar, for example when assessing the purpose of an NK1-RA the scores averaged in the 50's for all three (Table 2.7).

APP Survey Analysis

For the APP survey results, when assessing their understanding of where to locate the guidelines, no statistical significance was found because the percent correct was so similar between the pre-education, post-education, and three months post-education (Table 2.8). Non-significant results were most frequently found when comparing pre-education to three months post-education results. However significant results for this time period were found for the question 'what is the purpose of an NK1-RA' (Table 2.8). For the pre-education to post-education time period, statistical significance was found for the question 'is management of oral HEC and IV HEC different' (Table 2.8). Lastly, from pre-education to post-education, statistical significance was found for the following questions; is management of oral HEC

and IV HEC different, and what is the purpose of an NK1-RA (Table 2.8). For question seven, no statistical significance was determined among all three time period because all APP's got this question correct in every survey. From post-education to three months post-education, no statistical significance could be found for question one and question nine because all APP's got this question correct in the survey during this time frame. Statistical significance was hard to prove for the APP survey results due to a small sample size and scores being very similar throughout the three surveys.

Table 2.7: RN Qulatrics Survey Results

Q#	Q (Question)	*Baseline	P-Value Baseline to EOE	*End of Education	P-Value EOE to Final	*3 months after Education	P-Value Baseline to Final
Q1	Knows where to find CINV guidelines? – no. (%)	40/60 (66.7%)	0.10	44/57 (77%)	0.02	38/41 (93%)	0.001
Q2	If yes than where?	4/40 (11.4%)	0.0004	17/44 (50%)	0.13	8/38 (21%)	0.03
Q3	Which of the following are considered highly emetogenic chemotherapy (HEC)?	40/60 (67%)	0.34	40/57 (71%)	0.28	31/41 (75%)	0.17
Q4	Choice of antiemetics are based on which of the following..?	41/60 (69%)	0.02	49/57 (86%)	0.47	35/41 (86%)	0.03
Q5	Which of following is paired with its correct statement? (acute, delayed, breakthrough CINV)	20/60 (33%)	0.01	31/57 (55%)	0.38	22/41 (53%)	0.04
Q6	Which of the following is TRUE regarding the emetogenicity of chemotherapy agents?	10/60 (17%)	0.45	9/57 (16%)	0.09	11/41 (28%)	0.11

Q7	When discharging a patient home after receiving highly emetogenic chemotherapy, the patient should be given a prescription for an antiemetic even if they did not experience CINV during hospitalization?	59/60 (98%)	0.17	57/57 (100%)	n/a	41/41 (100%)	0.21
Q8	The management of highly emetogenic oral chemotherapy is different than intravenous highly emetogenic chemotherapy?	34/60 (57%)	0.04	23/57 (40%)	0.09	22/41 (53%)	0.38
Q9	What is the purpose of adding a Neurokinin-1 (NK1) receptor antagonist (aprepeitant or fosaprepitant) as a premedication for highly emetogenic chemotherapy?	35/60 (59%)	0.48	33/57 (58%)	0.34	22/41 (53%)	0.32
Q10	On day 1, a patient receives 24 mg of ondansetron and 8mg of dexamethasone as premedications for their chemotherapy treatment. The patient then experiences breakthrough nausea 6 hours following their first administration, which of the following would you NOT give as a breakthrough antiemetic?	38/60 (63%)	0.05	44/57 (77%)	0.24	29/41 (71%)	0.22
Q11	Ondansetron has a maximum effective daily dose limit of 24mg in 24 hours?	53/60 (89%)	0.05	55/57 (96%)	0.20	38/41 (92%)	0.24

Q12	When should you use benzodiazepines (Lorazepam) for breakthrough CINV?	27/60 (45%)	0.04	35/57 (61%)	0.11	30/41 (74%)	0.002
Q13	Which of the following organizations provides antiemetic guidelines	50/60 (84%)	0.07	41/57 (72%)	0.10	34/41 (82%)	0.48

EOE = end of education
*Number of people who answered correctly/total number who took quiz
**p <0.10 one-tailed homoscedastic t-test

Table 2.8: APP Qualtrics Survey Results

Q#	Q (Question)	*Baseline	P-Value Baseline to EOE	*End of Education	P-Value EOE to Final	*3 months after Education	P-Value Baseline to Final
Q1	Knows where to find CINV guidelines? – no. (%)	4/5 (80%)	0.15	6/6 (100%)	n/a	5/5 (100%)	0.17
Q2	If yes than where?	2/4 (50%)	0.21	4/6 (67%)	0.42	3/5 (60%)	0.29
Q3	Choice of antiemetics are based on which of the following..?	4/5 (80%)	0.15	6/6 (100%)	0.15	4/5 (80%)	0.50
Q4	Which of the following is TRUE regarding the emetogenicity of chemotherapy agents?	2/5 (40%)	0.22	1/6 (17%)	0.22	2/5 (40%)	0.50
Q5	The management of highly emetogenic oral chemotherapy is different than intravenous highly emetogenic chemotherapy?	4/5 (80%)	0.02	1/6 (17%)	0.02	4/5 (80%)	0.50
Q6	What is the purpose of adding a Neurokinin-1 (NK1) receptor antagonist (aprepeitant or fosaprepitant) as a premedication for highly emetogenic	1/5 (20%)	0.001	6/6 (100%)	0.15	4/5 (80%)	0.03

	chemotherapy?						
Q7	Ondansetron has a maximum effective daily dose limit of 24mg in 24 hours?	5/5 (100%)	n/a	6/6 (100%)	n/a	5/5 (100%)	n/a
Q8	When should you use benzodiazepines (Lorazepam) for breakthrough CINV?	4/5 (80%)	0.15	6/6 (100%)	0.15	4/5 (80%)	0.50
Q9	Which of the following organizations provides antiemetic guidelines	4/5 (80%)	0.15	6/6 (100%)	n/a	5/5 (100%)	0.17
Q10	Mrs. B is a 56 year old female receiving a highly emetogenic chemotherapy regimen. The nurse approaches you stating that Mrs. B is vomiting despite appropriate premedication, and needs an additional antiemetic ordered. Which of the following would you order for Mrs. B?	4/5 (80%)	0.33	4/6 (67%)	0.42	3/5 (60%)	0.27
Q11	Mrs. B's primary nurse, you go in to the give the ordered medication but Mrs. B states that is has not helped her with nausea in the past. In this case, what would be the next antiemetic you would expect to be ordered for Mrs. B?	2/5 (40%)	0.38	3/6 (50%)	0.38	2/5 (40%)	0.50

Q12	Palnosetron has been proven to be more effective that ondansetron (Zofran) in preventing chemotherapy induced nausea and vomiting (CINV)?	1/5 (20%)	0.17	3/6 (50%)	0.38	3/5 (60%)	0.12
Q13	In the recent ASCO guideline updates (2011-2015), which of the following changes have been made in regards to highly emetogenic chemotherapy?	2/5 (40%)	0.21	4/6 (67%)	0.21	2/5 (40%)	0.50

EOE = end of education
*Number of people who answered correctly/total number who took quiz
**p <0.10 one-tailed homoscedastic t-test

Table 3.1 RN Total Score Comparison

Pre-education score	Post-education score	3 months post-education score	*P-value Pre-education to post-education	*P-value Post-education to 3 mos. post-education	*P-value Pre-education to 3 mos. post-education
57.7%	66.1%	66.2%	0.13	0.18	0.17

Baseline = pre-education; EOE = end of education (post-education); Final = three months post-education
* P <0.10 one-tailed homoscedastic t-test

Table 3.2 APP Total Score Comparison

Pre-education score	Post-education score	3 months post-education score	*P-value Pre-education to post-education	*P-value Post-education to 3 mos. post-education	*P-value Pre-education to 3 mos. post-education
60.8%	71.9%	70.8%	0.16	0.19	0.29

Baseline = pre-education; EOE = end of education (post-education); Final = three months post-education
* P <0.10 one-tailed homoscedastic t-test

CHAPTER 7: DISCUSSION

The aim of this quality improvement project was to both increase providers adherence to CINV guidelines and to decrease rates of CINV in patients receiving HEC. This study specifically aimed to determine if improving provider knowledge of the guidelines would improve adherence to the guidelines, and ultimately decrease rates of CINV. The correlation of guideline adherence and improved CINV rates has been widely demonstrated in research, however little has been done to assess ways to improve provider adherence to guidelines. Adherence rates to the CINV guidelines increased from 7% before the intervention to 23.3% three months after the intervention (Table 1.3). Survey scores for RN's increased by about 10%, and APP's increased by 11% after the education intervention, with nursing staff retaining their knowledge, and APP's only dropping 1% in their three months post average score. This project demonstrates the continued need for reinforcement of guideline adherence, along with the importance of education health care providers on the guidelines annually. The CINV guidelines are developed and updated yearly, therefore guideline education should be part of all providers annual competencies.

CINV Rates.

While not statistically significant, the rates of CINV did decrease from 48% before the education to 37.8% after the education over five months. The lack of statistical significance may be attributed to the variance in sample size; pre-education found 86 patients over a time span of one year, and post-education found 37 patients over a time span of three months. The rates of nausea were still substantially higher than rates of emesis, which is consistent with the current literature suggesting that the control of nausea remains most important in the management of CINV (Gilmore et al., 2014). Surprisingly, there was not a statistically significant decreased in rates of emesis between pre-education and post-education, but there was a statistically significant reduction in the presence of nausea. The reduction in rates of nausea is

contrary to the literature, which states that the experience of nausea occurs with greater frequency than emesis (Morrow, 2012). Control of chemotherapy induced vomiting as been reportedly advanced over the years, while control chemotherapy induced nausea has been less than apparent (Morrow, 2012).

The clinical significance of improving provider knowledge and adherence to antiemesis guidelines is that adult receiving HEC are now receiving appropriate treatment for CINV. A statistically significant improvement in guideline adherence from 7% pre-education to 21.6% post-education was proven. Rates of adherence improved slowly overtime, suggesting that education to improve knowledge correlated with slight improvements in guideline adherence over three months.

Another issue addressed with management of CINV was the use of antiemetics for breakthrough CINV. It is highly unlikely that breakthrough CINV will respond to an agent in the same drug class after unsuccessful prophylaxis with a drug from that same class (Navari, 2015). Ondansetron was the second most frequently given antiemetic for breakthrough, behind prochlorperazine that was used for every patient that experienced CINV. There was no significant improvement in decreasing the use of ondansetron for breakthrough CINV from pre-education to post-education. Breakthrough management is a difficult situation to manage, and therefore continues to be an important educational gap that needs to be addressed. In the literature, women are cited as having a slightly higher risk of developing CINV (Boccia, 2013). In this study, women had lower rates of CINV than men, however more men were included in the study due to cancer diagnosis.

Provider Knowledge.

As previously stated, one of the main purposes of this study was to determine if improving provider knowledge of guidelines would improve adherence to guidelines, and ultimately decrease rates of CINV. This project demonstrates the continued need for provider education and reinforcement of knowledge after implementation of this quality improvement study. In correlation to the improved knowledge scores of both RN's and APP's, improvement was shown with an 11% decrease in rates of

CINV three months post education. This demonstrates an almost statistically significant reduction in CINV rates, that can likely be related to improved provider knowledge of antiemesis guidelines.

The survey provided to the RN's and APP's was utilized with the goal of determining knowledge barriers prior to education, assessing improvement in knowledge immediately post education, and then knowledge retention three months after education. In general, survey participants displayed a good basic knowledge of CINV and guideline management. However, the survey does indicate areas of concern where healthcare providers could potentially benefit from a more focused education session on those topics. The intents of the education was to be broad and generalized, focusing on weak areas in the initial survey, and demonstrating the appropriate prophylaxis for HEC along with appropriate antiemetics for breakthrough CINV.

For RN's, statistical significance was demonstrated in eight of the thirteen survey questions when comparing the pre-education survey results to post-education, demonstrating improved knowledge after the education sessions. When comparing pre-education to three months post-education, five of thirteen questions showed statistical significance, which demonstrated lower rates of knowledge improvement and instead showed that scores were similar to the pre-education scores. With more than half of the survey questions demonstrating significant improvement in knowledge immediately post education, and less than half three months post education, this underscores the importance in continuing to reinforce guideline knowledge. For the APP's, demonstrating statistical significance was difficult due to a small sample size. However, statistical significance was demonstrated in two of the thirteen survey questions when comparing pre-education to post-education. When comparing the pre-education to three months post-education, there was only one statistically significant question, meaning that scores from both time frames were very similar. In some cases this meant that there was little improvement needed in knowledge (ex: question 7), or the knowledge levels remained the same despite education.

These surveys demonstrated several areas of knowledge gaps that invite the need for development of annual education programs to continue to reinforce knowledge. Survey findings showed that despite receiving education on organizations that produce guidelines (NCCN, ASCO, MASCC) along with ways

in which to locate guidelines, RN's and APP's still significantly struggled with knowing where to locate antiemesis guidelines. The NCCN website is a weblink under common links in the electronic medical record (HER), however this requires a login/password to be set up, and requires one to search within NCCN for the guidelines. One suggestion was made to hyperlink the NCCN antiemesis guidelines into EPIC, however this would still require login information to access, but would provide direct access to the updated guidelines. NCCN pocket antiemesis guidelines were retrieved from NCCN and distributed to the APP's and placed on the unit for RN use in an effort to make the guidelines more accessible.

Another area of weakness for RN's was in determining which chemotherapy agents were considered HEC, though this was only briefly presented in the education. There was little knowledge improvement for this question, probably related to the fact that some chemotherapy agents are considered HEC only when above a certain dose, which was most frequently the incorrect chemotherapy agent was selected. To address this knowledge gap, flagging the regimen that are considered HEC or containing HEC agents in EPIC with a banner in the order set would alert providers, and take out the need to know each individual agent. The last topic that was a major area of weakness for the RN's was the purpose of adding an NK1-RA as a premedication. Education sessions discussed the importance of all three antiemetics (NK1-RA, 5HT-3 receptor antagonist, and dexamethasone), along with the importance of selecting the appropriate prophylactic agents. Given that there are numerous antiemetics available and discussed in the guidelines, emphasis needs to be placed on appropriate use of antiemetics (Boccia, 2013).

Though there remained some knowledge gaps despite education, the survey identified some major improvements in knowledge. First, RN's demonstrated a statistically significant knowledge improvement in understanding the definitions of acute, delayed, and breakthrough CINV. Understanding the different types of CINV is crucial to understanding the management of CINV, as early prevention of acute and delayed nausea is the best prevention for delayed vomiting (Gonella & Di Guilio, 2015). Second, they demonstrated a significant improvement in understanding the use of lorazepam for breakthrough CINV. The guidelines specifically address the use of lorazepam for anticipatory CINV, discussing that rates of anticipatory CINV decrease with appropriate use of effective prophylactic

antiemetic agents (NCCN, 2017). Lastly, there was a significant improvement between the pre and post-education on the maximum daily dose of ondansetron being 24mg. Ondansetron has maximum daily dose limit of 24 mg, any additional doses are not harmful but with the maximum binding of receptors reached after 24mg, the additional doses will not be effective (GSK, 2016). Though not statistically significant, prior to education six (7%) of patients received ondansetron for breakthrough CINV in addition to the 24mg prophylaxis dose in the same 24 hour period, while after education only 2 (5.4%) received additional ondansetron for breakthrough. The lack of statistical significance in this may again be contributed to the variance in sample size between the pre and post education. One suggestion to prevent additional doses of ondansetron from being given on days the patient is receiving 24mg for chemotherapy was to have a soft stop in the electronic MAR. This soft stop would alert the nurse when scanning in ondansetron that the patient already received the recommended max daily dose of 24mg, and ask if they would still like to proceed. For the nurse that is not administering the 24mg prophylaxis dose, this would signal to them a reminder to prevent additional doses from being given, as they will be ineffective in managing CINV.

The statistical results for the APP survey were less significant then the RN survey, which can likely be attributed to a much smaller population when comparing time frames of survey results. One large area of knowledge improvement for the APP's was in regards to the addition of an NK1 RA and it purpose as a prophylactic antiemetic. Providers demonstrated improved knowledge in understanding that the addition of an NK1-RA was not only utilized to prevent just acute CINV, but to also prevent delayed CINV up to five days after administration, when combined with ondansetron and dexamethasone. Another interesting area of significance was the decline in knowledge from pre-education to post-education on whether the management of CINV for PO and IV chemotherapy were different. This was also discussed in the education, making note that all PO HEC needs to be given ondansetron prior to administration, but management of delayed and breakthrough CINV is the same as for IV HEC (NCCN, 2017). The wording of the question created confusion, which was addressed, and scores improved again three months post-education.

One of the knowledge gaps for APP's was in regards to understanding the emetogenicity of chemotherapy agents. This question assessed their understanding of the guidelines in regards to the emetogenicity of chemotherapy, and understanding the weakness noted in the guidelines. The purpose of this question was to make providers aware that while guidelines include many common chemotherapy agents, not all chemotherapy agents are classified in an emetogenic category, especially newer approved agents (Navari & Aapro, 2015). Most of the providers selected that chemotherapy agents were divided amongst three categories (high, moderate, and low), forgetting the minimal category. Another a knowledge gap for the APP's was in administering antiemetic agents from different drug classes when one class is unsuccessful. The purpose of this question was to assess their understanding of the drug classes, and also to assess their understanding of avoiding drugs from similar classes if one is unsuccessful in preventing breakthrough CINV.

In order to inform providers along the way, and discuss specific areas for improvement, a board was created and placed on the unit. This board informed providers of the CINV rates, the overall total scores of their surveys for RN's and APP's, and also pointed out areas in need of improvement such as avoiding additional doses of ondansetron. It also contained important slides from the education sessions for providers to reference if needed. In addition, the weekly emails sent out to all providers contained knowledge questions on CINV with the correct answer, to continue knowledge improvement/retention of knowledge. In general, the overall total scores for RN's and APP's increased by about 10% each from before education to after education, indicating that basic fundamental education and review of guidelines was of some value. One suggestion for improved knowledge is the development and implementation of a program, for nurses administering chemo and providers creating/signing chemotherapy orders, focused on best practice utilizing clinical guidelines for symptom management. This program should be a yearly requirement for all providers as a priority for all patients to receive quality cancer care.

Provider Adherence.

Improved adherence to the guidelines was assessed in two ways; decreased rates of CINV and increased use of guideline appropriate prophylactic regimen. The rates of CINV decreased from 48% to 37.8%, and while not statistically significant the trend was moving in the right direction. Adherence to the guidelines increased from 7% pre-education to 21.6% after education over five months, demonstrating statistical significance and a small improvement in guideline adherence. One issue commonly addressed in the literature is the very limited number of studies examining different approaches to improve adherence to antiemetic guidelines, and those who have only showed minimal success (Jordan et. al., 2014). Passive dissemination of education materials was determined ineffective (Jordan et al., 2014). While active involvement, specifically when providers received feedback about their patient's actual experience of CINV, was notably effective (Jordan et. al., 2014). Providers were notified of the rates of CINV (48.8%), and informed of what suggested rates should be if guideline consistent prophylaxis and management are utilized. Upon hearing the rates, both APP's and RN's were highly motivated to participate in the education sessions and improve the care of their patients.

While provider adherence is difficult to assess, aside from decreasing rates of CINV and demonstrated improvement in administering the appropriate prophylaxis regimen, there were a few noticeable changes found during the retrospective chart audits. Providers were educated extensively about the importance of utilizing lorazepam and benzodiazapines for anticipatory CINV, or if there was an anxiety component to the nausea/emesis. Post-education, orders for lorazepam began to contain specific instructions to be given only for anticipatory CINV or if there was an anxiety component to the experience of CINV, which can be related to improved knowledge in the use of lorazepam. The education sessions also included a discussion on antiemetics that were available, discussing medications such as scopolamine patches and olanzapine, which were less frequently used than prochlorperazine and ondansetron. In the post-education session, one of the 14 patients experiencing CINV was started on a scopolamine patch, along with scheduled antiemeitcs. There also was an increase in the number of

patients on scheduled antiemetics who experienced CINV, another suggestion from the guidelines discussed in the education sessions.

Overall, multiple strategies need to continually be used in order to continue guideline adherence and implementation of guidelines into practice. One additional approach for guideline adherence would be the use of financial incentives, with special attention to enforcing the value that adherence to guidelines can bring to cost reduction and quality improvement. The ability to motivate providers by improving measurable outcomes, such as CINV rates and cost reduction of healthcare cost, may be highly successful in improving overall guideline adherence in the organization. The lack of continued education for providers may directly contribute to low knowledge levels, but simple dissemination of the guidelines is not a sufficient solution (Navari & Aapro, 2016). Education of providers is essential to best practice, in addition computerized order sets should include guideline appropriate antiemetics for prophylaxis, and order sets including HEC should be flagged. The implementation of those changes may help to effectively improve adherence to guidelines and overall CINV rates.

Guideline Adherence Changes

The clinical significance in improving adherence to the guidelines was that adult patients being treated with HEC were now receiving appropriate treatment and management of CINV. Numerous studies have proven that CINV incidence is significantly reduced in patients who receive guideline appropriate prophylactic regimen (Dushenkov et al., 2016). As outlined in NCCN, ASCO, and MASCC guidelines, fosaprepitant (intravenous form) or aprepitant (oral form) in combination with a corticosteroid and a 5HT3 receptor antagonist is recommended for the prevention of CINV in patients receiving HEC (NCCN, 2017; Hesketh et al., 2015; Herrstedt et al., 2016). However, aprepitant/fosaprepitant is extensively metabolized through the CYP450 system in the liver, resulting in possible drug interactions with antineoplastics and many other drugs used in supportive cancer care (Dushenkov et al., 2016). In a study by Dushenkov et. al., they determined that there were some potentially significant interactions resulting in an over or under exposure of the antineoplastic agents such as doxorubicin, etoposide, vincristine, along

with dexamethasone. Given that many of the HEC regimen given in this study included ifosfamide, etoposide, vincristine, doxorubicin, and dexamethasone it was decided to use an alternative recommended prophylactic regimen for CINV. This was an unanticipated finding from this project that was originally suggesting the use of NK1 RA's to being given along with dexamethasone and ondansetron.

However, recently both the NCCN and MASCC guidelines provide recommendations for the alternative use of olanzapine in place of an NK1 receptor antagonist for patient receiving HEC. ASCO guidelines, last updated in 2015, mention the emerging interest of olanzapine but did not have adequate evidence-based data to support its use. The use of olanzapine in the prophylactic antiemetic regimen was reported effective in preventing both acute and delayed CINV based on phase 2 and phase 3 trials, along with a meta-analysis (NCCN, 2017). In a phase 3 study by Navari et. al. in 2016 showed that olanzapine compared to an NK1 RA in combination with a 5HT3 receptor antagonist and dexamethasone was more effective (Navari et. al., 2016). Though there have been studies on olanzapine and its effects on CINV, further research is still required to confirm efficacy and determine safety profile of side effects in oncology populations. Given the data supporting interactions with aprepitant/fosaprepitant and many of the antineoplastic agents commonly given, it was decided that olanzapine would be utilized instead. For all the HEC regimen at the time of this study that were not utilizing guideline appropriate antiemetic prophylaxis, olanzapine would be slowly integrated into the treatment plans. In this study the first retrospective chart analysis showed that 15 (35.7%) of the 42 patients that experienced nausea received Hyper-CVAD regimen, with 10 (52.6%) people experiencing vomiting out of 19. Given that Hyper-CVAD had this highest rates of CINV in this study, the decision was made to trial the use of olanzapine with ondansetron and dexamethasone in patients receiving Hyper-CVAD odd cycles.

Limitations.

One limitation of this study was that knowledge assessments and education were only performed with the APP's, and did not include the oncologists, medical residents/interns, or pharmacists. Those three roles also play a large part in the adherence to guidelines, and contribute to improving the rates of

CINV among patients. In the future the oncologists, oncology fellows, and pharmacists should be assessed for their knowledge on the guidelines and be provided education to ensure guideline adherence. As stakeholders, they also play a major role in the process of approving the use of and addition of antiemetics to chemotherapy templates. Another limitation was the decline in survey participation from the nurses, which made for accurate determination of statistical significance in knowledge improvement difficult to prove. The short time period of three months for the post-education retrospective chart analysis created a small population of patients to audit, which potentially interfered with providing statistical significance in CINV rates. Ideally, a retrospective chart audit should be done one year after the education to get a more accurate assessment of the CINV rates and guideline adherence. In the short span of three months, the addition of olanzapine had just been in use for about 2 months, and there was surprisingly a decline in the number of patients admitted inpatient for Hyper-CVAD.

CHAPTER 8: CONCLUSION

The CINV antiemetic guidelines were created using evidence based practice to guide providers in preventing and managing a common side effect experienced by oncology patients. When providers increase their awareness on the incidence of CINV and improve their knowledge on the utilization of guidelines, adherence levels increase. Ultimately, this improves rates of CINV and the overall experience that patients perceive when coming in for their chemotherapy treatment. Overall, this study demonstrated an approach that effectively began improvements to guideline adherence, and decreased the total rates of CINV experienced among patients receiving HEC. By continuing to reinforce the use of guidelines, along with continuing education on guideline updates for practice, adherence rates will continue to improve and CINV rates will continue to decrease. This allows for institutions to consistently deliver the best evidence based care to their patients.

APPENDIX A: RN QUALTRICS SURVEY

Q1 What is your age?

Q2 What is your gender?

- ❍ Male
- ❍ Female

Q3 What is your ethnicity?

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaska Native
- ❍ Asian
- ❍ Native Hawaiian or Pacific Islander
- ❍ Hispanic
- ❍ Other

Q4 What is the highest level of education that you have received?

- ❍ Diploma in Nursing
- ❍ Associates Degree in Nursing
- ❍ Bachelors of Science in Nursing
- ❍ Masters Degree in Nursing
- ❍ PhD in Nursing
- ❍ Doctorate of Nursing Practice
- ❍ Degree in Field other than Nursing
- ❍ Degree in Field other than Nursing: _____

Q5 Are you OCN certified?

- ❍ Yes
- ❍ No

Q6 Are you Chemotherapy/Biotherapy Certified?

- ❍ Yes
- ❍ No

Q7 Did you take the ONS Chemotherapy/Biotherapy certification course? (hint: if you were certified at UNC, the answer is yes!)

- ❍ Yes
- ❍ No

Q8 How many years of experience have you had in Oncology Nursing?

_____

Q9 If you have experience in nursing outside of oncology, how many total years and in what areas have you also worked? _____

Q10 Do you know where to locate antiemetic guidelines for management of chemotherapy induced nausea and vomiting (CINV)?

- ❍ Yes
- ❍ No

Q11 If yes, where would you find them? _____

Q12 Which of the following are considered highly emetogenic chemotherapy (HEC)? Select all the apply:

- ❑ Ifosfamide
- ❑ Cisplatin
- ❑ Carboplatin
- ❑ Cyclophosphamide > 1,500 mg/m2
- ❑ AC Combination (anthracycline + cyclophosphamide)

Q13 The choice of antiemetics is (are) based on which of the following:

- ❍ Emetogenic potential of chemotherapy
- ❍ Prior experience with antiemetics
- ❍ Patient factors (age, gender, co-morbidities)
- ❍ A and C
- ❍ All of the above

Q14 Which of the following is paired with its correct statement?

- ❍ Breakthrough CINV has a specific sections within the guidelines for management
- ❍ Acute CINV occurs within 12 hours after initiation of treatment
- ❍ Delayed CINV occurs up to 3 days after completion of chemotherapy

Q15 Which of the following is TRUE regarding the emetogenicity of chemotherapeutic agents?

- ❍ Chemotherapy agents emetogenicity effects are not categorized based of their dose
- ❍ Guidelines classify chemotherapy agents into only 3 risk groups: high, moderate, low
- ❍ Anthracyclines (doxorubicin or epirubicin, for example) and cyclophosphamide given together are NOT considered highly emetogenic
- ❍ Not all chemotherapy agents have been grouped into a risk category based on emetogenicity

Q16 When discharging a patient home after receiving highly emetogenic chemotherapy, the patient should be given a prescription for an antiemetic even if they did not experience CINV during their hospitalization?

- ❍ True
- ❍ False

Q17 The management of highly emetogenic ORAL chemotherapy is different than highly emetogenic IV chemotherapy?

- ❍ True
- ❍ False

Q18 What is the purpose of adding the Neurokinin-1 (NK1) receptor antagonist (ex: aprepitant or fosaprepitant) as a pre-medication for highly emetogenic chemotherapy?

- ❍ Its efficacy has not been continuously proven, therefore UNC does not typically give it
- ❍ To prevent delayed CINV
- ❍ To prevent acute CINV
- ❍ To prevent both acute and delayed CINV

Q19 UNC follows the American Society of Clinical Oncology (ASCO) and National Comprehensive Cancer Center (NCCN) recommended CINV guidelines for the management of highly emetogenic chemotherapy?

- ❍ True
- ❍ False

Q20 On day 1, a patient receives 24mg of ondansetron and 8mg of dexamethasone as pre-medications for their chemotherapy treatment. The patient then experiences breakthrough nausea 6 hours following that first chemotherapy administration. Which of the following would you NOT give as a breakthrough antiemetic?

- ❍ ondansetron (Zofran) 4mg ODT
- ❍ lorazepam (Ativan) 0.5mg IV
- ❍ prochlorperazine (Compazine) 10mg PO
- ❍ Scopolamine patch

Q21 Ondansetron has a maximum daily dose limit of 24 mg in a 24 hour period?

- ❍ True
- ❍ False

Q22 When should you use benzodiazepines (Lorazepam) for breakthrough CINV?

- ❍ If in the standing order set
- ❍ When compazine is ineffective
- ❍ For patients with a history of anxiety
- ❍ For anticipatory nausea

Q23 Which of the following organizations provide antiemetic guidelines?

- ❍ MASCC: Multinational Association of Supportive Care in Cancer
- ❍ NCCN: National Comprehensive Cancer Center
- ❍ ASCO: American Society of Clinical Oncology
- ❍ All of the above

Q24 After responding to these questions, how comfortable do you feel with managing CINV in your patients?

- ❍ Extremely comfortable
- ❍ Slightly comfortable
- ❍ Neither comfortable nor uncomfortable
- ❍ Slightly uncomfortable
- ❍ Extremely uncomfortable

APPENDIX B: APP QUALTRICS SURVEY

Q1 What is your age?

Q2 What is your gender?

- ❍ Male
- ❍ Female

Q3 What is your ethnicity?

- ❍ White
- ❍ Black or African American
- ❍ American Indian or Alaska Native
- ❍ Asian
- ❍ Native Hawaiian or Pacific Islander
- ❍ Hispanic
- ❍ Other

Q4 What is the highest level of advance practice education that you have received? _____

Q5 How many years of experience have you had in Oncology? _____

Q6 Are you a Limited Oncology Prescribing Provider?

- ❍ Yes
- ❍ No

Q7 Do you know where to locate antiemetic guidelines for management of chemotherapy induced nausea and vomiting (CINV)?

- ❍ Yes
- ❍ No

Q8 If yes, where would you find them? _____

Q9 Mrs. B is a 56 year old female receiving a highly emetogenic chemotherapy regimen. The nurse approaches you stating that Mrs. B is vomiting despite appropriate premedications and needs an additional antiemetic ordered. Which of the following would you order for Mrs. B?

- ❍ Benzodiazapine - lorazepam (Ativan) 0.5mg IV q6h PRN
- ❍ 5HT3 Anatagonist - ondansetron (Zofran) PO 8mg ODT q8h PRN
- ❍ Phenothiazine - prochlorperazine (Compazine) 10mg IV q6h PRN
- ❍ Neurokinin-1 receptor antagonist- fosaprepitant (Emend) 150mg IV once

Q10 Mrs. B's primary nurse goes in to give the ordered medication, but Mrs B states that it has not helped her with nausea in the past. Her primary nurse comes to ask for another antiemetic. What would be the next antiemetic you would order for Mrs. B?

- ❍ Phenothiazine - promethazine (Phenergan) 12.5mg IV q6h PRN
- ❍ Benzodiazapine - lorazepam (Ativan) 0.5mg IV q6h PRN
- ❍ 5HT3 antagonist - ondansetron (Zofran) PO 8mg ODT q8h PRN

Q11 Palonosetron has been proven to be more effective than ondansetron (Zofran) in preventing chemotherapy induced nausea and vomiting (CINV).

- ❍ True
- ❍ False

Q12 The choice of antiemetics is (are) based on which of the following:

- ❍ Emetogenic potential of chemotherapy
- ❍ Prior experience with antiemetics
- ❍ Patient factors (age, gender, co-morbidities)
- ❍ A and C
- ❍ All of the above

Q13 Which of the following is TRUE regarding the emetogenicity of chemotherapeutic agents?

- ❍ Chemotherapy agents emetogenicity effects are not categorized based of their dose
- ❍ Guidelines classify chemotherapy agents into only 3 risk groups: high, moderate, low
- ❍ Anthracyclines (doxorubicin or epirubicin, for example) and cyclophosphamide given together are NOT considered highly emetogenic
- ❍ Not all chemotherapy agents have been grouped into a risk category based on emetogenicity

Q14 The management of highly emetogenic ORAL chemotherapy is different than highly emetogenic IV chemotherapy?

- ❍ True
- ❍ False

Q15 Which of the following organizations provide antiemetic guidelines?

- ❍ MASCC: Multinational Association of Supportive Care in Cancer
- ❍ NCCN: National Comprehensive Cancer Center
- ❍ ASCO: American Society of Clinical Oncology
- ❍ All of the above

Q16 When should you use benzodiazepines (Lorazepam) for breakthrough CINV?

- ❍ If in the standing order set
- ❍ When compazine is ineffective
- ❍ For patients with a history of anxiety
- ❍ For anticipatory nausea

Q17 Ondansetron has a maximum daily dose limit of 24 mg in a 24 hour period?

- ❍ True
- ❍ False

Q18 UNC follows the American Society of Clinical Oncology (ASCO) and National Comprehensive Cancer Center (NCCN) recommended CINV guidelines for the management of highly emetogenic chemotherapy?

- ❍ True
- ❍ False

Q19 What is the purpose of adding the Neurokinin-1 (NK1) receptor antagonist (ex: aprepitant or fosaprepitant) as a pre-medication for highly emetogenic chemotherapy?

- ❍ Its efficacy has not been continuously proven, therefore UNC does not typically give it
- ❍ To prevent delayed CINV
- ❍ To prevent acute CINV
- ❍ To prevent both acute and delayed CINV

Q20 In the recent ASCO guideline updates (2011-2015), which of the following changes have been made in regards to highly emetogenic chemotherapy?

- ❍ Use of NK1 receptor antagonists for highly emetogenic chemotherapy
- ❍ The recommended use of benzodiazepines for anticipatory nausea/vomiting or an anxiety component to CINV only
- ❍ The combination of anthracycline plus cyclophosphamide is considered to be highly emetogenic regimen

Q21 After responding to these questions, how comfortable do you feel with managing CINV in your patients?

- ❍ Extremely comfortable
- ❍ Slightly comfortable
- ❍ Neither comfortable nor uncomfortable
- ❍ Slightly uncomfortable
- ❍ Extremely uncomfortable

APPENDIX C: RN SURVEY ANSWER KEY

Q11. NCCN, ASCO, MASCC organization

Q12. Cisplatin, Cyclophosphamide, AC Combination

Q13. All of the Above

Q14. Breakthrough CINV has a specific sections within the guidelines for management

Q15. Not all chemotherapy agents have been grouped into a risk category based on emetogenicity

Q16. True

Q17. False

Q18. To prevent both acute and delayed CINV

Q19. Opinion question

Q20. prochlorperazine (Compazine) 10mg PO

Q21. True

Q22. For patients with a history of anxiety

Q23. All of the above

APPENDIX D: APP SURVEY ANSWER KEY

Q8. NCCN, ASCO, MASCC organization

Q9. Phenothiazine - prochlorperazine (Compazine) 10mg IV q6h PRN

Q10. Benzodiazapine - lorazepam (Ativan) 0.5mg IV q6h PRN

Q11. True

Q12. All of the above

Q13. Not all chemotherapy agents have been grouped into a risk category based on emetogenicity

Q14. False

Q15. All of the Above

Q16. For patients with a history of anxiety

Q17. True

Q18. Opinion question

Q19. To prevent both acute and delayed CINV

Q20. The combination of anthracycline plus cyclophosphamide is considered to be highly emetogenic regimen

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