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Emergency Department Visits and Hospital Admissions for Adult Cancer Patients Post Outpatient Chemotherapy: Does the Oncology Nurse Navigator Make a Difference?

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Hahn School of Nursing and Health Science

DOCTOR OF PHILOSOPHY IN NURSING

Emergency Department Visits and Hospital Admissions for Adult Cancer Patients Post Outpatient Chemotherapy: Does the Oncology Nurse Navigator Make a Difference?

By

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DOCTOR OF PHILOSOPHY IN NURSING

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TITLE OF DISSERTATION: Emergency Department Visits and Hospital Admissions for Adult Cancer Patients Post Outpatient Chemotherapy: Does the Oncology Nurse Navigator Make a Difference?

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Abstract

Background: Cancer is the second leading cause of death in the United States and worldwide. Oncology related hospital visits account for over $88 billion annually; 35% of this cost is attributable to inpatient hospital stays even though most cancer treatments are given outpatient. The Centers for Medicare and Medicaid Services introduced the Chemotherapy Measure which tracks Emergency Department visits and hospitalization within 30 days of any outpatient chemotherapy treatment. The Oncology Nurse Navigator (ONN) has offered some benefit in cancer care, but its role in ED visits and hospital admissions is unknown for adult patients with cancer post outpatient chemotherapy.

Purpose: The purpose of this study was to examine the contribution of the ONN in ED visits and hospitalizations for adult cancer patients post outpatient chemotherapy. The three research aims provide a foundation to generate new scientific knowledge towards the improvement of understanding the role of the ONN in ED visits and hospital admissions for adult patients with cancer post outpatient chemotherapy. Aim 1: Describe patient sociodemographics (age, race, gender, language spoken at home, primary health insurance, cancer diagnosis, and admission source), care site characteristics (outpatient chemotherapy administration location, ED visit facility location, and hospital admission facility location), the ONN's involvement, ED visits and/or hospital admissions with any of ten chemotherapy related conditions. Aim 2: 2a: Examine relationships among sociodemographics, care site characteristics, the ONN involvement, ED visits, and hospitalizations. 2b: Describe the difference in ED visits and hospital admissions between the ONN involved and non-ONN involved groups. Aim 3: 3a: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of

variance in ED visits; 3b: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in hospitalizations.

Method: Descriptive correlational design using retrospective EHR data collected from January 1, 2018 to December 31, 2019. Descriptive and inferential statistical approaches were used to analyze the data.

Results: Approximately 35% of patients who had outpatient chemotherapy had an ED visit and/or a hospital admission. The most common conditions noted were anemia, dehydration, and pain. Medicare insurance, chemotherapy location, dehydration, diarrhea, emesis, and neutropenia were significantly related number of ED visits. Hospital length of stay, anemia, dehydration, fever, nausea, neutropenia, pain, pneumonia, and sepsis were significantly related to number of hospitalizations. There was no significant difference in number of ED visits and hospitalization between ONN vs. non-ONN groups. The multiple regression model showed Medicare insurance and chemotherapy location significantly contributed to the predictive model for ED visits. Nausea, pain, and pneumonia significantly contributed to the predictive model for number of hospital admissions.

Implications for Nursing Research: The study findings indicated that the chemotherapy measure metrics, such as ED visits and hospital admissions, were not appropriate clinical outcomes to measure the ONN's efficacy. Navigating cancer treatment is the primary role function of the ONN, rather than daily symptom management and intervention. Additional research is necessary to understand the fiscal and operational outcomes of the ONN, including using a longitudinal design to measure over the cancer continuum.

Dedication

To Aaron, my forever sidekick, for your bottomless love and support.

To Olivia, my beloved daughter, for helping me to write my proposal and dissertation.

To all my patients, whom I had an honor to walk along their cancer journey.

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Chapter I

Introduction

Cancer is a global health phenomenon. By 2040, 27 million new cancer cases and 16 million cancer deaths are expected globally (American Cancer Society, 2020b). Nearly 17 million Americans live with a diagnosis of cancer, and two million new cancer cases are expected to be diagnosed in 2020 (American Cancer Society, 2020b). Following cardiovascular disease, cancer is the second leading cause of death in the U.S., and worldwide (Heron, 2018). Despite its prevalence, risk factors of cancer have not been fully explained. Risk factors for developing cancer are complex and may differ for each individual (American Cancer Society, 2020b; National Cancer Institute, 2015).

Cancer patients' healthcare utilization is higher compared to the US general population. For example, 44% of cancer patients visited ED within a year, while approximately 21% of the U.S. population visited Emergency Department (ED) in 2010 (Lash et al., 2017). In the United States, patients with cancer usually have at least two ED visits and one admission per year, and nearly half of those are due to chemotherapy related complaints (Kolodziej et al., 2011). It is true that cancer patients may need greater health services in general, but many of them are potentially preventable.

The healthcare utilization cost of cancer patients is enormous. A total of $88 billion was spent for cancer treatment, with 35% of $88 billion spent is for inpatient hospitalization despite most of cancer treatments are given outpatient (Kolodziej et al., 2011; Soni, 2014; Williamson, 2008). Of these costs, nearly 40% are paid by government programs, i.e., Medicare and Medicaid (Soni, 2014; Williamson, 2008). Notably, cancer has the highest average expenditures per person, surpassing other costly conditions, for

instance, heart disease, trauma, mental disorders, and chronic obstructive pulmonary disease in both 2002 and 2012 (Soni, 2015)

In 2016, with the shift toward minimizing preventable hospitalizations and ED visits due to chemotherapy related side effects, the Centers for Medicare and Medicaid Services (CMS) introduced the Admissions and Emergency Department Visits for Patients Receiving Outpatient Chemotherapy measure (OP-35; hereafter, referred to as the chemotherapy measure) to encourage institutions to improve quality of outpatient cancer care, increase transparency, and provide information to the public (Centers for Medicare and Medicaid Services, 2018; 2019b). An ED visit or a hospitalization within 30 days of any outpatient chemotherapy treatment with any of the ten potentially preventable diagnostic codes (anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis) and a cancer diagnosis qualifies for the reporting prompting review and potential payment reduction (Centers for Medicare and Medicaid Services, 2018; 2019b). The chemotherapy measure aligns with the U.S. Department of Health and Human Service National Quality Strategy priorities: patient safety, care coordination, effective prevention and treatment, and care affordability (Agency for Healthcare Research and Quality, 2016).

Nursing performs a vital role in the coordination of the complex care of patients with cancer. Relatively new to the cancer care workforce, the Oncology Nurse Navigator (ONN) has been focused on delivering quality cancer care since its inception. Harold Freeman, MD, initiated the first patient navigation program for patients with breast cancer in 1990 leveraging lay navigators. With this new program, he was able to demonstrate increased access to cancer screening and improved five-year cancer survival

rates (Freeman, 2004). Since that time, the role of the ONN has expanded from cancer prevention to survivorship and end of life care (McMullen et al., 2017).

Although many studies have supported the benefits of the ONN role in cancer care, studies are often limited to certain disease pathways or populations and are methodologically weak. A paucity of research exists to adequately identify standardized metrics for measuring the ONN programs and effectiveness (Battaglia et al., 2011; Johnson, 2015). Additionally, the effect of the ONN on prevention of ED visits and hospital admissions post outpatient chemotherapy is unknown.

Purpose

The primary objective of this study was to examine the contribution of the ONN in ED visits and hospitalizations for adult cancer patients post outpatient chemotherapy. The recruitment sites for this study were selected from the Integrated Network Cancer Program accredited by the American College of Surgeons, the Commission on Cancer, consisting of three acute care hospitals and three hospital-based outpatient infusion centers in Southern California. This study sought to answer the general research question: does the ONN affect ED visits and hospital admissions for adult cancer patient post outpatient chemotherapy?

Research Aims

This study seeks to address the following aims.

Aim 1

Describe patient sociodemographics (age, race, gender, language spoken at home, primary health insurance, cancer diagnosis, and admission source), care site characteristics (outpatient chemotherapy administration location, ED visit facility location, and hospital admission facility location), the ONN's involvement in the care,

ED visits and/or hospital admissions with any of ten conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis).

Aim 2

2a: Examine relationships among sociodemographics, care site characteristics, the ONN involvement, ED visits, and hospitalizations for adult patients with cancer post outpatient chemotherapy.

2b: Describe the difference in ED visits and hospital admissions between the ONN involved group of patients and the non-ONN involved group of patients.

Aim 3

3a: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in ED visits for adult patients with cancer post outpatient chemotherapy.

3b: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in hospitalizations for adult patients with cancer post outpatient chemotherapy.

The three research aims provide a foundation to generate new scientific knowledge towards the improvement of understanding the role of the ONN in ED visits and hospital admissions for adult patients with cancer post outpatient chemotherapy.

Significance to Nursing

Cancer is a burden on the current health care system, and with increasing prevalence and an aging population, the burden is expected to increase. With the development of effective new cancer treatments, more people live with cancer than ever before, and these new treatment modalities are often complex to administer and to manage the side effects. Existing literature has shown the majority of chemotherapy

treatment complications occur within two to four weeks after chemotherapy treatment, and ten conditions (anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis) are the most frequently reported for unplanned and possibly preventable ED visits or hospitalizations (Aprile et al., 2013; Delgado-Guay et al., 2015; Foltran et al., 2014; McKenzie et al., 2011; Rivera et al., 2017). Thus, the importance of cancer care coordination, patient education, and support throughout treatment are the key to prevent those preventable consequences. Consequently, it is imperative to understand and address the gaps in outpatient care for this vulnerable population across their cancer experience.

This study provides an initial step toward understanding the relationship among the sociodemographic factors influencing ED visits and hospitalizations for adult patients with cancer post outpatient chemotherapy and the contribution of the ONN for this population. This study contributes to the growing body of research knowledge explaining factors associated with cancer patients' ED visit and hospital admissions, such as sociodemographic, care site characteristics, and the utilization of existing organizational support systems. While not all ED visits and hospitalizations are preventable, this study provides the framework to identify the opportunities for improvement of the experience of cancer patients who received outpatient chemotherapy.

Conceptual Framework

Transitions middle range theory was incorporated to form the conceptual framework used to guide this study (Meleis et al., 2000). The transitions model depicts components of transition experience including: nature of transition, facilitator and inhibitor conditions, and patterns of response and nursing therapeutics urging to develop

nursing therapeutics that are meeting with unique transition experiences of patients and their families (Meleis et al., 2000). The model was used to identify variables of interest, and to synthesize the conceptual framework which guided the research process and analysis. Receiving outpatient chemotherapy as a nature of transition, individuals' sociodemographics are transition conditions that can facilitate and inhibit transition experience. The ONN is nursing therapeutics which can influence on overall transition experience. Avoiding ED visits and hospitalizations are the positive transition responses of the transition.

Chapter II

Review of the Literature

To establish a thorough review of the literature, the following steps were employed. An electronic search of published journal articles was conducted using the following databases: CINAHL, EBSCO, and PubMed. The keywords used for this literature search included cancer, chemotherapy, oncology nurse navigator, ambulatory, outpatient, chemotherapy measure, combined with ED visit, and hospitalization. The research articles sourced included systemic reviews, quasi-experimental, nonexperimental, qualitative, case studies and reports.

After the initial electronic database searches were completed, manual searches were performed from the citations in the reference list of relevant published articles. This literature review focused on the U.S. cancer care landscape, the chemotherapy measure, the ONN's role in cancer care, characteristics of ED visits or hospitalizations in patients with cancer, facilitating transition of care, and improving outcomes of patients with cancer.

Overview of Cancer in the United States

Cancer is an abnormal growth of cells with potential to invade and spread throughout the body, and if left unchecked can result in death (American Cancer Society, 2020a). Avoiding known carcinogens, obesity, poor nutrition, physical inactivity, infectious agents, and participating in cancer screening activities are recommended strategies for prevention of cancer (American Cancer Society, 2020a). Following heart disease, cancer is the second most common cause of death in the U.S., and the incidence and death rates vary by geographical location and socioeconomic status (Clegg et al.,

2009). Although science has not conquered the battle of cancer, continuous progress has been made resulting in steady declines in death rates for lung, colorectal, breast and prostate cancer (American Cancer Society, 2020a). Older age is the biggest risk factor for cancer. Evidence has shown cancer incidence increases in people 55 years of age or older, and this population experiences increased chemotherapy side effects due to comorbidities and poorer physical and mental health compared to the younger population (American Cancer Society, 2020b; Geddie et al., 2016).

Chemotherapy

Chemotherapy is the application of a chemical agent to treat disease, and these agents apply different mechanisms to control cancer in a systemic manner in the body (The American Cancer Society Medical and Editorial Content Team, 2019). Historically, chemotherapy was delivered to patients in the inpatient hospital setting. Currently, receiving chemotherapy in the outpatient ambulatory setting or patient's home is more prevalent and recommended (Dollinger, 1996; Handley & Bekelman, 2019; Lamkin et al., 2002; Williamson, 2008).

The transition of chemotherapy to the outpatient setting brought benefits to cancer patients with cancer, their family members, hospitals, and payers. These benefits include enhanced access to care, decreased inpatient bed utilization, decreased overall financial burden, lower levels of family member stress, and increased patient satisfaction and overall care experience (Elting et al., 2008; Handley & Bekelman, 2019; Joo et al., 2011; Leff et al., 2006; Leff et al., 2005; McBride et al., 2018; Seal et al., 2015).

However, numerous studies have shown outpatient chemotherapy patients have unmet needs in care which often result in unplanned ED visits and hospitalizations.

According to Arndt et al. (2002), delayed cancer diagnosis and care were observed due to the lack of coordination between specialist and cancer screening site. Increased cancer care disparity is associated with low socioeconomic status, resulting in late-stage cancer diagnoses, avoiding to seek needed care, and unplanned hospitalization (Bottle et al., 2012; Clegg et al., 2009; Subramanian, 2011; Taplin et al., 2004). Suboptimal management of chemotherapy related side effects and comorbidities also lead to avoidable ED visits and hospitalizations (Aprile et al., 2013; Bell et al., 2017; Eskander et al., 2018; Fessele et al., 2017; Hassett et al., 2006; Mayer et al., 2011; Rivera et al., 2017).

Adjournment of the referral to palliative care or hospice care is associated with poor outcomes in cancer care (Brooks et al., 2014; Delgado-Guay et al., 2015). Lastly, low health literacy, and patient and family perception of barriers and facilitators to care, impair the quality of the cancer care experience (Cohen & Botti, 2015; Geddie et al., 2016). Common presentations for chemotherapy complications include nausea, vomiting, pain, dehydration, diarrhea, infection, neutropenia, and fever, which can be adequately managed in the outpatient setting with appropriate care coordination (Hassett et al., 2006; Mayer et al., 2011; McKenzie et al., 2011; Ward Sullivan et al., 2018).

The Chemotherapy Measure

Patients with cancer receiving chemotherapy experience higher utilization of ED and hospitalization compared to other populations (Kolodziej et al., 2011; Soni, 2015). In 2016, CMS proposed an adoption of the chemotherapy measure for the fiscal year 2019 and following years (Centers for Medicare & Medicaid Services, 2016). The chemotherapy measure is intended to assess the quality of outpatient cancer care,

particularly in patients receiving outpatient chemotherapy, and may reduce potentially preventable ED visits, hospital admissions, and improve the quality of care (Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation & Mathematica Policy Research, 2019).

The measure assesses two outcomes. The first outcome is one or more inpatient admissions within 30 days of any chemotherapy treatment in hospital-based outpatient infusion center with at least one of the following diagnoses: anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, or sepsis and cancer diagnoses on the same claim (Centers for Medicare and Medicaid Services, 2019b). The reason for focusing on these ten diagnoses is they are potentially preventable conditions through appropriate support in outpatient care. The second outcome is any ED visit within 30 days of chemotherapy treatment with the same ten diagnoses along with a cancer diagnosis (Centers for Medicare and Medicaid Services, 2019b). Although these two outcomes differ vastly due to the intensity and cost of care, both events represent quality of outpatient cancer care.

Cancer diagnoses are identified using International Classification of Disease Tenth Revision (ICD-10-CM) diagnosis codes. The outcome timeframe is 30-days post chemotherapy treatment, since the literature suggests most of chemotherapy adverse events occur within that timeframe, and it supports the idea the admissions are related to the chemotherapy treatment side effects (Aprile et al., 2013; Foltran et al., 2014; McKenzie et al., 2011). Patients with a leukemia diagnosis are excluded from the measure due to the high toxicity of treatment for this condition, which is not intended for outpatient treatment. Also, patients receiving oral chemotherapy are excluded, due to the

difficulty in the estimation of treatment start time and compliance of patients (Centers for Medicare and Medicaid Services, 2019b).

The measure reports data to the public on the website Hospital Compare (http://www.medicare.gov/hospitalcompare/) along with other hospital outcome measures (Medicare, 2021). CMS classifies facilities into one of three categories based on bootstrapping to a 95% interval estimate for risk-standardized admission rate and risk-standardized emergency department visit rate: 1) Better than the national rate 2) No different than the national rate, and 3) Worse than the national rate (Mathematica Policy Research, 2018)

Oncology Nurse Navigator

The ONN is defined as:

> A professional RN with oncology-specific clinical knowledge who offers individualized assistance to patients, families, and caregivers to help overcome healthcare system barriers using the nursing process. [An] ONN provides education and resources to facilitate informed decision making and timely access to quality health and psychosocial care throughout all phases of the cancer continuum (McMullen et al., 2017, p. 4).

The ONN should possess not only robust clinical oncology knowledge, but also knowledge of insurance reimbursement systems and financial resources. The ONN assesses and addresses barriers to care, provides education, resources, referrals, facilitates shared decision making, promotes advance care planning, and supports palliative care (Canadian Association of Nurse in Oncology/Association Canadienne des Infirmières en Oncologie Board, 2020; McMullen et al., 2017). Their primary role is reducing barriers

in care including the following: financial barriers, communication barriers, medical system barriers, psychosocial barriers, and practical barriers (Agarawal et al., 2020).

Sadek and Willis (2020) conducted a review of the literature investigating the elements of supportive or healing-promoting environment in the context of ambulatory oncology care to advocate and facilitate patient-centered care. Five major themes were identified: 1) stimulating and homely environments; 2) flexibility and environmental enrichment; 3) social support; 4) complementary support and engagement; and 5) physical and sensory support (Sadek & Willis, 2020). The authors noted their literature review identified a scarcity of studies in the ambulatory context, and no validated psychometric instrument available to guide implementing findings in the future studies (Sadek & Willis, 2020).

Various studies have shown the benefits from implementing the ONNs which aligns with findings by Sadek and Willis (2020). First, the ONN was noted to improve the patient experience and oncology staff satisfaction (Campbell et al., 2010; Kagan et al., 2020; Schutt & Woodford, 2020; Yackzan et al., 2019; Zadeh et al., 2020). Second, the ONN ensured timely access to appropriate care by coordinating transitions (Alsamarai et al., 2013; Chavarri-Guerra et al., 2019; Zadeh et al., 2020). Third, the ONN facilitated increased self-management, resulting in decreased cost of care and improved care outcomes (Ladabaum et al., 2015; Rowett & Christensen, 2020; Temel et al., 2010; Yezefski et al., 2018; Zadeh et al., 2020).

A few systemic reviews were done on patient navigation. Paskett et al. (2011) conducted a systemic review using keywords: navigation or navigator and cancer. Thirty-three articles showed some degree of effectiveness of patient navigation in cancer

screening, but the review showed evidence lacking the effect for navigation in cancer treatment and survivorship (Paskett et al., 2011). Baik et al. (2016) completed a systemic review to evaluate patient navigation in women with breast cancer and found minimal evidence available supporting patient navigation being effective during and after cancer treatment. Bernardo et al. (2019) indicated more patient navigation programs have implemented since the systemic review done by Paskett and colleagues in 2011, and some new studies completed assessed the efficacy of patient navigation on cancer continuum and cost-effectiveness in addition to the effectiveness of patient navigation on screening and diagnosis. However, methodological limitations were noted in every systemic review. For example, studies focused on only a subgroup of cancer, such as breast, lung, and colorectal cancer, had a small number of participants, lacked randomization and rigor, and none were conducted across the full cancer continuum from diagnosis (Baik et al., 2016; Bernardo et al., 2019; Johnson, 2015; Paskett et al., 2011)

Lack of standardized outcome measurements of the ONN in addition to the ONN's varied clinical background and education preparation are recognized as challenges, warranting further investigation into valid and reliable outcome measurement instruments and the role delineation (Balaban et al., 2015; Battaglia et al., 2011; Cantril et al., 2019; Johnson, 2015; McMullen et al., 2017; Strusowski et al., 2017). Although there were attempts to provide standard outcome metrics for the ONN, no study was conducted examining the contribution of the ONN in terms of ED visits and hospital admissions post outpatient chemotherapy especially in the community hospital setting (Freund et al., 2008; Strusowski et al., 2017). Yet, the ONN is ideally positioned to develop patient-centered treatment and care coordination plans to improve quality of cancer care.

Characteristics of ED Visits and Hospitalization of Patients with Cancer

A systemic review was conducted for ED usage among cancer patients. The review found the incidence of ED visits among patients with cancer exceed those of general population ED visits, nonetheless further research on population-based estimates for all cancer combined is needed (Lash et al., 2017). McNaughton et al. (2020) conducted a retrospective chart review of 314 patients with advanced cancer of lung, gastrointestinal, genitourinary, and gynecologic origin, measuring their utilization of outpatient support services, and the association with ED and hospital use. The study identified patients with an advanced stage of cancer had higher healthcare utilization, and they received reactive and untimely care that were not effective in reducing ED or hospital visits (McNaughton et al., 2020). A cross-sectional study of nationwide ED sample data from 2006 to 2012 showed cancer related ED visits were different than non-cancer related ED visits (Rivera et al., 2017). Among 696 million adult ED visits, approximately 30 million were patients with a diagnosis of cancer. These cancer patients tended to be older, male, having Medicare insurance, and resulted in higher inpatient admission rates (Rivera et al., 2017). Bekelman et al. (2016) compared site of death, healthcare utilization, and hospital expenditures of patients with cancer among seven developed countries. While the trend of increased hospital expenditure near the end of life was similar, the U.S. had more than twice intensive care unit admissions than other countries (Bekelman et al., 2016).

Multiple studies indicated many ED visits and hospital admissions can be avoidable with alternate site of care and better symptom management (Delgado-Guay et al., 2015; Hong et al., 2019; Oh et al., 2018). In order to reduce those avoidable ED visits

and hospitalizations, Fessele et al. (2017) recommended early identification of high-risk patients, proactive and tailored nursing education, supportive care, and monitoring. Suggestions to reduce unplanned acute care visits include utilizing the ONN program, early involvement with palliative care, establishing oncology urgent care, standardizing clinical pathways and symptom management, and enhancing outpatient appointment access (Bischof et al., 2019; CANO/ACIO Board, 2020; Handley et al., 2018; Hong et al., 2019)

Theoretical Model

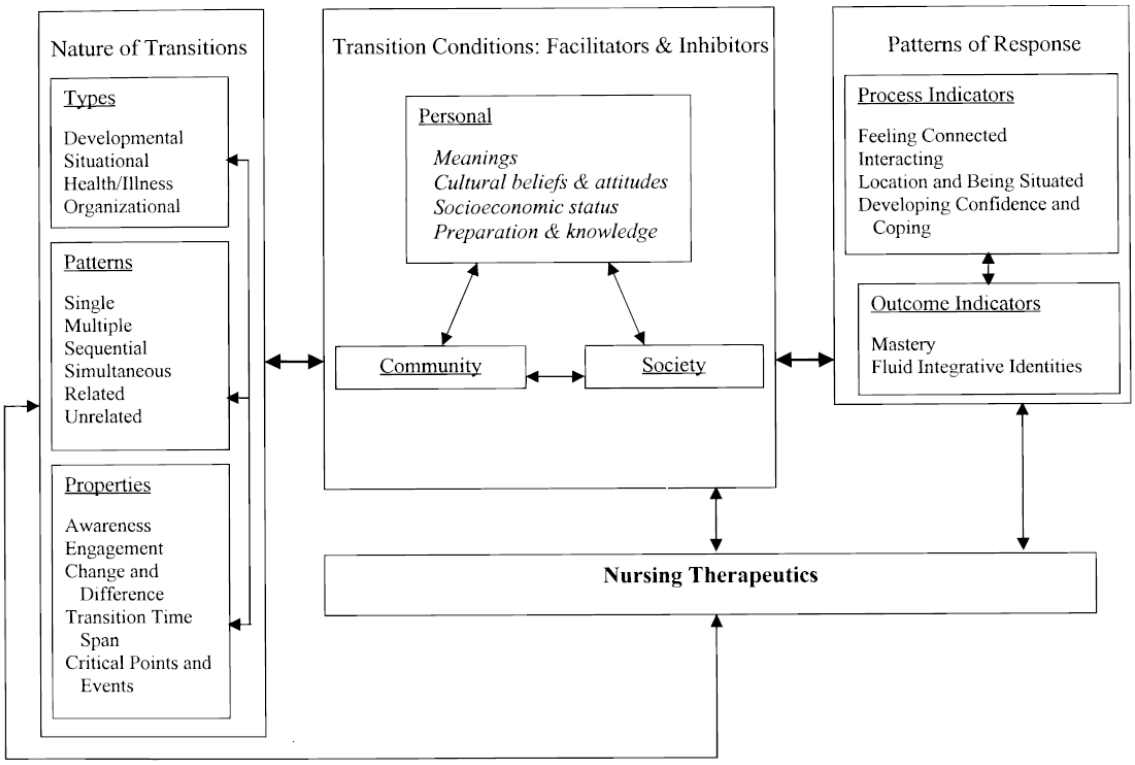
According to Chick and Meleis (1986), transition is defined "as passage from one life phase, condition, or status to another (p. 239)." People in transition are prone to be more vulnerable and susceptible to elements that can adversely affect their health. Thus, Meleis et al. (2000) developed the nursing middle range theory referred to as *transitions*. This theory illustrated common components of transition experience including the following: nature of transition, facilitator and inhibitor conditions, and patterns of response and nursing therapeutics.

Addressing multi-dimensional properties of this transformation phenomenon through the transitions theoretical model, the authors emphasize the role of nurses stating "development of nursing therapeutics that are congruent with the unique experience of clients and their families, thus promoting healthy response to transition" (Meleis et al., 2000, p 27). Specifically, Meleis et al. (2000) asserted that "healthy transition" is depicted by process and outcome indicators. For example, feeling connected, interacting, location and being situated, developing confidence and coping, mastery and fluid

integrative identities are the characteristics of process and outcome indicators as presented in Figure 1 (Meleis et al., 2000).

Figure 1

Transitions: A Middle-Range Theory



Note. From "Experiencing transitions: An emerging middle range theory," by Meleis, A. I., Sawyer, L. M., Im, E. O., Hilfinger Messias D. K., & Schumacher, K., 2000, *Advances in Nursing Science, 23*(1), p.17 (https://doi.org/10.1097/00012272-200009000-00006).

Developing nursing interventions to facilitate a healthy transition process and outcome responses require expertise, identifying patient specific milestones and providing resources and support in appropriate situational and developmental settings. This framework acknowledges universal aspects of nursing and challenges nurses to

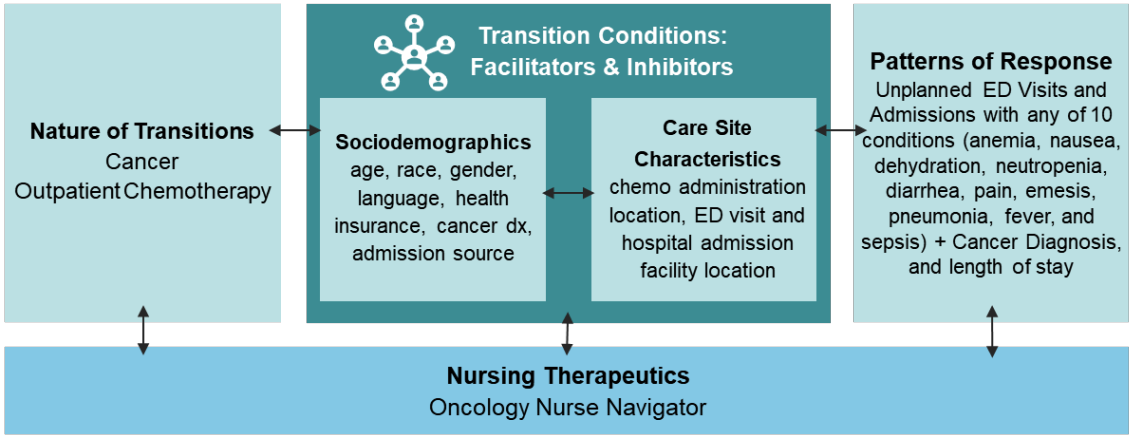
embrace the need of care beyond the transition event congruent to the identified patient milestones.

Research Conceptual Model

A conceptual model is formed by interrelated concepts assembled in an explanatory blueprint to describe their relationships (Polit & Beck, 2017). This study is grounded on an existing middle range theory, the transitions theoretical model, which explains mechanisms of transitions (Meleis et al., 2000). To narrow the scope of the model and to increase the applicability to the study, the research conceptual model is devised to describe the underlying relationships and temporal associations between variables.

In this conceptual framework, experiencing outpatient chemotherapy to treat cancer is the transition event. Conditions in this transition are influenced by the patient's sociodemographics, and further shaped by the care site characteristics that can act as facilitators and inhibitors. The healthy transition experience can be observed through process and outcome indicators such as unplanned ED visits, and hospital admissions. A visualization of the research conceptual model is presented in Figure 2.

Figure 2 *Conceptual Framework: The Effect of the Oncology Nurse Navigator Upon Emergency Department Visits and Hospital Admissions for Adult Patients with Cancer Post Outpatient Chemotherapy*



Chapter III

Method

The purpose of this research was to examine the contribution of the ONN in ED visits and hospital admissions for adult cancer patients post-outpatient chemotherapy. Meleis's transition model informed the research questions and design (Meleis et al., 2000). This study seeks to answer the general research questions: does the ONN affect ED visits and/or hospital admissions for adult cancer patient post outpatient chemotherapy? This chapter describes the study design, study setting, inclusion and exclusion criteria, sample size, sampling procedures, independent variables and operational definitions, dependent variables and operational definitions, data acquisition, data analysis, the protection of human subjects, and limitations.

Research Design

Retrospective descriptive cross-sectional design was employed. Descriptive studies summarize the status of phenomena, and correlational studies examine the relationships between variables without manipulation of independent variables (Polit & Beck, 2017). Data was obtained from the electronic health records of patients with cancer who received outpatient chemotherapy from January 1, 2018 to December 31, 2019.

Study Setting

The study was conducted at a not-for-profit and comprehensive community cancer center. This community cancer center is part of the Integrated Network Cancer Program, accredited by American College of Surgeons, the Commission on Cancer. The cancer center consists of four acute care hospitals and three hospital-based outpatient

infusion centers in Southern California. Three infusion centers are located next to three hospitals (location 1, 2, and 3) and approximately from 12 miles to 17 miles apart.

Inclusion and Exclusion Criteria

The convenience sample included cases meeting the below inclusion and exclusion criteria from January 1, 2018 to December 31, 2019. The criteria were rooted in CMS chemotherapy measure methodology.

Inclusion criteria were:

- Being aged 18 years or older
- having a cancer diagnosis
- receiving chemotherapy in one of three outpatient infusion centers

Exclusion criteria were:

- a diagnosis of leukemia
- a planned hospital admission (e.g. transplant, maintenance chemotherapy)
- receiving chemotherapy to treat conditions other than cancer
- receiving only oral chemotherapy

Sample Size

The sample size calculation was done a priori, and it showed a well-powered sample size. The effect size of the ONN intervention is unknown from previous studies. According to Polit and Beck (2017) most nursing studies have small effect sizes. Therefore, estimated conservative effect size of 0.2 was used to calculate the sample size considering regression analysis. With an alpha 0.05 and power 0.80, the total projected sample size needed with 0.2 effect size is approximately 788. Thus, this study's sample

size of 1,370 was adequate to address study aims (Polit & Beck, 2017). All statistical analysis was performed using IBM SPSS Statistics 26 software.

Sampling Procedures

Study cases were extracted from the institution's electronic health record. All chemotherapy visit records from three outpatient infusion center locations, qualifying ED visits, and qualifying hospital admissions were identified from January 1, 2018 to December 31, 2019. Those patients' sociodemographic data and the ONN's involvement were queried for retrieving data. International Classification of Disease Tenth Revision (ICD-10-CM) diagnosis codes per Centers for Medicare and Medicaid Services (2019a) 2019 Chemotherapy Measure Data Dictionary were utilized to identify qualifying cancer diagnoses and exclusion criteria. Although the chemotherapy measure only targets Medicare beneficiaries, this study included all insurance types (private, Medi-Cal and Medicare) to accurately reflect patient population in this geographical area. To ensure data accuracy, the principal investigator validated the completeness and quality of the abstracted data.

Independent Variables and Operational Definitions

Independent variables for this research study were categorized in four types: patient sociodemographic, care site characteristics, the ONN's involvement in the care, and ten chemotherapy measure qualifying diagnosis. Age, race, gender, language spoken at home, primary health insurance (private, Medicare, and Medi-Cal), and nine categories of cancer diagnosis (Breast, Lung, Colorectal, Hematological, Lymphoma, Urology, Gynecology, GI [non-colorectal], and other), and admission source were included for sociodemographics. Outpatient chemotherapy administration location, visit types (no ED

visit or hospital admission, ED visit, and hospital admission), ED visit facility location, and hospital admission facility location were included care site characteristics. The ONN's involvement in the care (yes/no), and ten chemotherapy measure qualifying diagnoses, were included: anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, and sepsis. See Appendix A for the detailed variable table.

Dependent Variables and Operation Definitions

Dependent variables are ED visits with any of ten conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis) with cancer diagnosis, hospital admissions with any of ten conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis) with cancer diagnosis, and their length of stay (LOS). See Appendix A for the detailed variable table.

For the purpose of this research study, the operational definition of qualifying ED visits is one or more visits within 30 days of any outpatient chemotherapy treatment with any of the ten qualifying conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis) either in the principal diagnosis or as a secondary diagnosis with cancer diagnosis (Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation & Mathematica Policy Research, 2019). The operational definition of qualifying inpatient admissions includes one or more hospital admissions within 30 days of any outpatient chemotherapy treatment with any of the ten qualifying conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis) either in the principal diagnosis or as a secondary diagnosis with cancer diagnosis (Yale New Haven Health

Services Corporation – Center for Outcomes Research and Evaluation & Mathematica Policy Research, 2019). LOS defined as the duration of stay in days.

Although in 2019, Chemotherapy Measure Version 3.0 was introduced with Annual Updates and Specification Report which included stand-alone observation stays to the ED visits, observation stays were not included in this study, because the study data period started in 2018 prior to the change (Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation & Mathematica Policy Research, 2019)

Data Acquisition

The study data were collected from electronic health record from January 1, 2018 to December 31, 2019. The organization data analyst pulled the data from the electronic health record, and it was shared with principal investigator via secured email.

Data Analysis

Descriptive and inferential statistical approaches were used to analyze the data. Aim 1: Describe patient sociodemographics (age, race, gender, language spoken at home, primary health insurance, cancer diagnosis, and admission source), care site characteristics (outpatient chemotherapy administration location, ED visit facility location, and hospital admission facility location), the ONN's involvement in the care, ED visits and/or hospital admissions with any of ten conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis). To describe those variables, descriptive statistics utilized frequencies, mean (SD), and percentage.

Aim 2: 2a: Examine relationships among sociodemographics, care site characteristics, the ONN involvement, ED visits, and hospitalizations for adult patients

with cancer post outpatient chemotherapy. 2b: Describe the difference in ED visits and hospital admissions between the ONN involved group of patients and the non-ONN involved group of patients. To describe relationships of those variables, Chi-square, independent samples t-test, Mann-Whitney U test, Kruskal-Wallis H, Pearson's product-moment and Spearman's rho correlations were applied to identify statistically significant ($p < 0.05$) variables to be included in the model.

Aim 3: 3a: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in ED visits for adult patients with cancer post outpatient chemotherapy. 3b: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in hospitalizations for adult patients with cancer post outpatient chemotherapy. Simultaneous multiple regression was used to examine the accuracy of the independent variables in predicting number of ED visits and hospital admissions for adult patients with cancer post outpatient chemotherapy. The standard multiple regression strategy was appropriate, because all independent variables are viewed as having equal importance, and there was no a priori hypothesis.

Protection of Human Subjects

The principal investigator completed The Collaborative Institutional Training Initiative training including Human Subject Research and Good Clinical Practice modules. Study approval was obtained from the study organization, and the University of San Diego IRB. Study data was stored in a password-protected computer using an encrypted wireless network. The dataset contains personal health identifiers, and thus was stored on a password-protected storage device. The principal investigator substituted

personal health identifiers with consecutive numbers for identifications. Only de-identified data was shared with statistical analysis resource personnel outside of the hospital during the analysis phase.

Limitations

Because this study was a retrospective data analysis, there were missing data elements which could influence the study findings. Other variables not included in the study could be the contributor of the hospital admissions or ED visits for this population. For example, certain types of chemotherapeutics such as alkylating agents are known for severe toxicities compared to other types of chemotherapeutics (Geddie et al., 2016). History of receiving multiple chemotherapy regimens can leave long-term side effects for patients with cancer (Geddie et al., 2016). Patients' comorbidities, especially respiratory disorders, renal disease, GI disorders, and metastatic cancer, are associated with more frequent ED visits and hospitalizations (Himelhoch et al., 2004; Mayer et al., 2011). In addition to the ONN, the study target population encountered infusion nurses and oncology social workers, and their intervention may have influenced the study dependent variables. Lastly, the interventions provided by the ONNs were not standardized. The intervention contents and time element of the interventions were varied.

Polit and Beck (2017) discussed limitations of correlational research including self-selection bias, inability to establish causal relationships, and preexisting conditions which could be the reason for the outcome differences. Generalizability may be limited, since this study is a cross-sectional observational study. Nevertheless, this study examined the contribution of the ONN in ED visits and hospital admissions for adult patients with cancer post outpatient chemotherapy which was unknown before.

Therefore, the findings provided new evidence to the growing body of nursing knowledge.

Summary

This study examined the relationship of the ONN to ED visits and hospitalizations for adult patients with cancer post outpatient chemotherapy via a retrospective descriptive correlational research design method within a specific time frame (January 1, 2018 to December 31, 2019). Descriptive and inferential statistics including Chi-square tests, independent samples t-test, Mann-Whitney U test (non-parametric version of the t-test), Spearman correlations, one-way analysis of variance, Kruskal-Wallis H, Pearson Product-moment, Spearman Rank-Ordered Correlations, and multiple linear regression were applied to address the aims of the proposed study.

Chapter IV

Study Results

The purpose of this research was to examine the contribution of the ONN upon ED visits and hospitalizations for adult cancer patients post outpatient chemotherapy. This sample is from comprehensive community cancer center of a not-for-profit health system. This community cancer center is part of the Integrated Network Cancer Program, accredited by American College of Surgeons, the Commission on Cancer. Specific Aims of the study were:

Aim 1

Describe patient sociodemographics (age, race, gender, language spoken at home, primary health insurance, cancer diagnosis, and admission source), care site characteristics (outpatient chemotherapy administration location, ED visit facility location, and hospital admission facility location), the ONN's involvement in the care, ED visits and/or hospital admissions with any of ten conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis).

Aim 2

2a: Examine relationships among sociodemographics, care site characteristics, the ONN involvement, ED visits, and hospitalizations for adult patients with cancer post outpatient chemotherapy.

2b: Describe the difference in ED visits and hospital admissions between the ONN involved group of patients and the non-ONN involved group of patients.

Aim 3

3a: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in ED visits for adult patients with cancer post outpatient chemotherapy.

3b: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in hospitalizations for adult patients with cancer post outpatient chemotherapy.

Characteristics of the Sample

Any patients who were 18 years or older, had a cancer diagnosis, and received chemotherapy in one of three outpatient infusion centers from January 1, 2018 to December 31, 2019 were included in the study sample. The total number of the patients who received chemotherapy from January 1, 2018 to December 31, 2019 was 1,370.

Each patient could have received more than one chemotherapy infusion and have had multiple ED visits and hospital admissions during the study period. In order to align the data analysis to the cross-sectional study design, a decision was made to use a specific set of qualifying study timepoints of the variables. The timepoints of the variable were as follows:

1. First chemo visit (study entry point): age, race, gender, primary language, insurance, Medicare, cancer diagnosis, chemo location and ONN involvement.
2. First ED visit or first hospital admission: visit type, admission source, admission facility location.
3. Two-year study period: total number of ED visits, total number of hospital admissions, average LOS of all ED visits, average LOS of all hospitalizations,

and absence or presence of the ten qualifying conditions during the entire study period.

Research Aim 1

The first aim is to describe variables of the study sample. Variables included patient sociodemographics (age, race, gender, language spoken at home, primary health insurance, cancer diagnosis, and admission source), care site characteristics (outpatient chemotherapy administration location, ED visit facility location, and hospital admission facility location), the ONN's involvement in the care, ED visits and/or hospital admissions with any of ten conditions (anemia, nausea, dehydration, neutropenia, diarrhea, pain, emesis, pneumonia, fever, and sepsis).

Sociodemographic characteristics, care site characteristics, chemotherapy related conditions, and number of ED visit and hospital admissions of the 1,370 study participants overall and by ONN results are presented in Appendix B. Sociodemographics of the study population are presented in Table 1. The sample was diverse 59.9% (n = 760) White, 22.4% (n = 288), Other race; 12% (n = 154) Asian, and 4.9% (n = 63) Black, African American. Study participants had private insurance approximately 50%, Medicare 45.6% and Medi-Cal 4.5%. Approximately two-thirds (63.3%, n = 867) had experienced at least one ONN assessment during the 2-year study period. Additionally, the most common types of cancer were breast (26.1%, n = 357), lymphoma (12.3%, n = 168), and lung (11.2%, n = 154) (see Table 1).

Table 1

Sociodemographics of Study Population Overall and by the Oncology Nurse Navigator During 2-Year Study Period (N = 1,370)

	Total		*ONN*		*Non-ONN*			
Characteristic	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*	*p*
Age	62.55	13.35	61.35	13.13	64.61	13.49	4.39	**< .001**
	n	*%*	*n*	*%*	*n*	*%*	χ^2	*p*
Gender							12.01	**.001**
Male	552	40.3	319	57.8	233	42.2		
Female	818	59.7	548	67.0	270	33.0		
Race							27.60	**< .001**
White	760	59.9	502	66.1	258	33.9		
Other race	288	22.4	152	52.8	136	47.2		
Black, African American	63	4.9	37	58.7	26	41.3		
Asian	154	12.0	111	72.1	43	27.9		
Hawaiian, Pacific Islander	14	1.1	13	92.9	1	7.1		
American Indian, Alaska Native	5	0.4	4	80.0	1	20.0		
Primary language							42.36	**< .001**
English	1190	87.7	790	66.4	400	33.6		
Spanish	82	6.0	25	30.5	57	69.5		
English & Other	70	5.2	40	57.1	30	42.9		
Other language	15	1.1	9	60.0	6	40.0		
Medical Insurance							60.49	**< .001**
Private coverage	684	49.9	493	72.1	191	27.9		
Medicare	625	45.6	355	56.8	270	43.2		
Medi-Cal	61	4.5	19	31.1	42	68.9		
Medicare Insurance							20.80	**< .001**
Yes	625	45.6	355	56.8	270	43.2		
No	745	54.4	512	68.7	233	31.3		
Cancer Diagnosis							168.27	**< .001**
Breast	357	26.1	282	79.0	75	21.0		
Lung	154	11.2	91	59.1	63	40.9		
Colorectal	142	10.4	101	71.1	41	28.9		

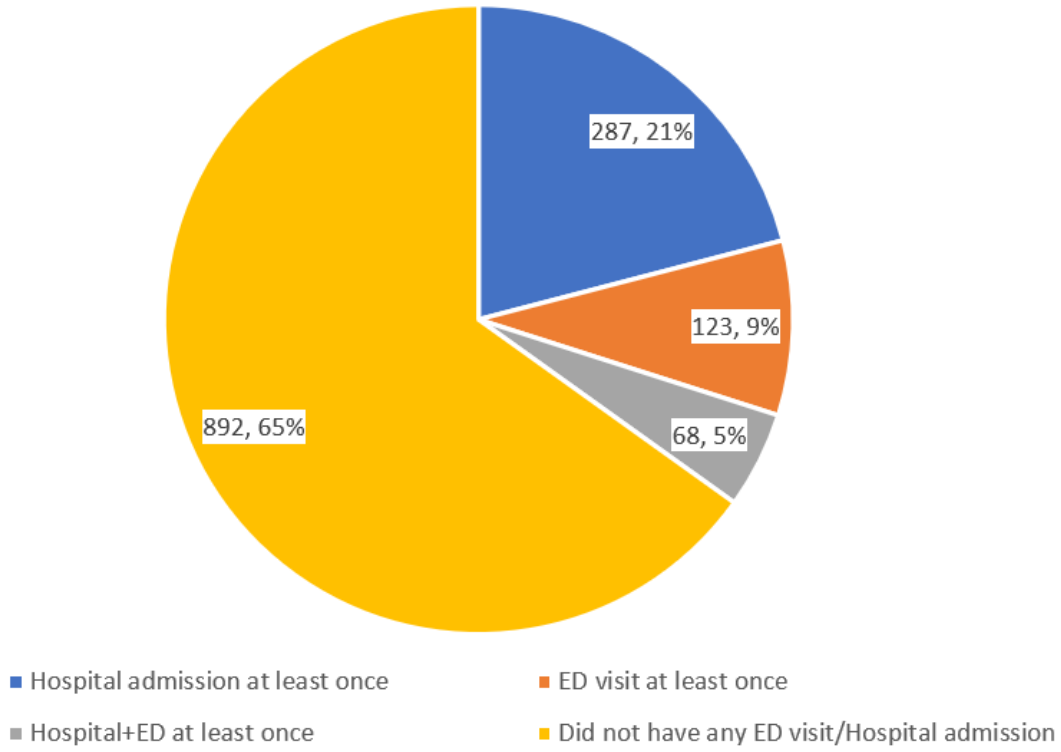
Hematological	66	4.8	12	18.2	54	81.1
Lymphoma	168	12.3	63	37.5	105	62.5
Urology	134	9.8	73	54.5	61	45.5
Gynecology	111	8.1	74	66.7	37	33.3
GI (non-colorectal)	87	6.4	53	60.9	34	39.1
Other cancer	151	11.0	118	78.1	33	21.9

Note. Fisher's Exact Test, unless otherwise specified.

Distribution of patients for ED visits and hospital admissions showed the following findings. Over one-third of the patients (34.9%, n = 478) visited the ED and/or had a hospital admission during the two-year study period; 65.1% (n = 892) did not have an ED visit and/or hospital admission. Of the approximately 35% (n = 478) of patients who did have an ED visit and/or hospital admission, 60% (n = 287) were hospitalized at least once during the 2-year study period, 38.7% (n = 123) had at least one ED visit, and 14.2% (n = 68) had both at least one hospital admission and at least one ED visit (see Figure 3).

Figure 3

Distribution of Patients for ED Visits and Hospital Admissions During the 2-Year Study Period (N = 1,370)



The care site characteristics showed following results. Eight hundred ninety-five (65.4%) patients received chemotherapy at location 3 (65.4%, *n* = 895). For patients who had ED visits during the 2-year study period, 84.6% (*n* = 154) were admitted from their home, 14.3% (*n* = 26) admitted from a hospital (acute care, inpatient, or ambulatory surgery), two (1.1%) admitted from a skilled nursing facility, assisted living facility, or home health program, and 9 missing data (4.8%). Patients who had been hospitalized during the 2-year study period, 83.1% (*n* = 295) were referred from the ED, 13.8% (*n* =

49) were admitted to the hospital directly from home; 1.7% (*n* = 6) were admitted to the hospital from another hospital and 1.4% (*n* = 5) from a skilled nursing facility, assisted living facility, or home health program (see Appendix B).

About 40% of all ED visits (*n* = 77) occurred at location 2, but over two-thirds of the patients (69.9%, *n* = 248) were hospitalized at location 3. Sixty-five percent (*n* = 891) did not experience any conditions during the 2-year study period. Among those who did experience a condition, anemia was the most common condition (18.5%, *n* = 253), followed by dehydration (13.8%, *n* = 189), and pain (13.1%, *n* = 180) during the study period. Patients (*n* = 1370) had an average of 0.17 ED visits (SD = 0.46) and 0.33 hospital admissions (SD = 0.64) during the 2-year study period (see Appendix B).

The study design was a retrospective descriptive cross-sectional research design, and the study aims were written to describe the phenomenon for patients. In order to be congruent with the study design, a set of specific qualifying study timepoints of the variables was followed. However, a patient could have multiple outpatient chemotherapy visits and multiple qualifying ED visits and/or hospital admissions over 2-year period. Descriptive statistics were computed to depict the full picture of the study data (see Table 2). Figure 4 represents the volume of chemotherapy infusions compared to the volume of ED visits and hospital admissions.

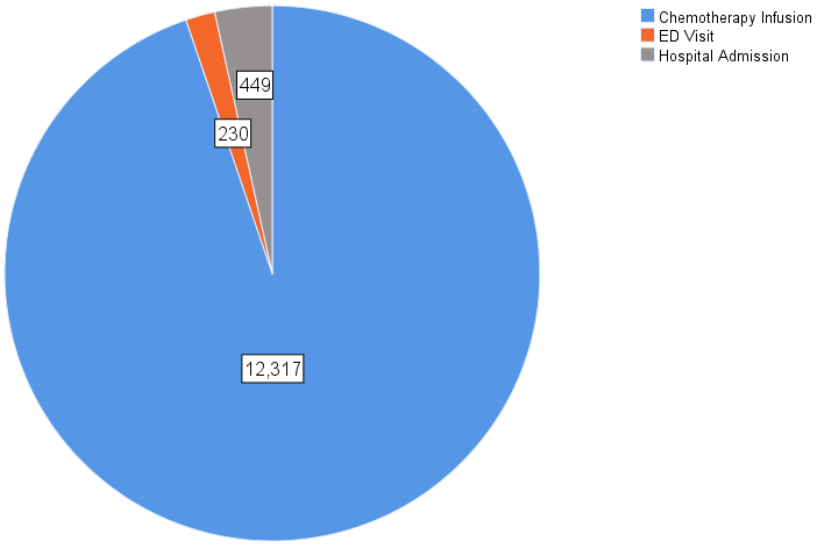
Table 2

All Visit for All Patients During The 2-Year Study Period

Types of Visit	Frequency	Percent	Cumulative Percent
Chemotherapy Infusion	12,317	94.8%	94.8%
ED visit	230	1.8%	96.5%
Hospital admission	449	3.5%	100.0%
Total	12,996	100.0%	

Figure 4

All Visits for All Patients During The 2-Year Study Period



Research Aim 2

The second study aim was 2a: Examine relationships among sociodemographics, care site characteristics, the ONN involvement, ED visits, and hospitalizations for adult patients with cancer post outpatient chemotherapy; and 2b: Describe the difference in ED visits and hospital admissions between the ONN involved group of patients and the non-ONN involved group of patients.

A chi-square test of independence, an independent sample t-test, a Mann-Whitney U test, a Person or Spearman correlation were conducted between patients' sociodemographic and clinical characteristics, care site characteristics, chemotherapy related conditions, number of ED visits and hospital admissions, and LOS at ED visits and hospital admissions during the study period by the ONN's involvement, number of ED visits and number of hospital admissions in the sample of 1,370 patients.

Not all expected cell frequencies were greater than five. Therefore, Fisher's Exact Tests were reported for all variables including those with expected cell frequencies less than five.

2a: Bivariable Analysis of Variables by the ONN

A Chi-square test, an independent sample t-test, and Mann-Whitney U test were performed, and to explore the relationship between the ONN and the study continuous variables.

There was a statistically significant association between patient's ONN involvement and: gender, Fisher's $\chi^2 = 12.01$, $p = .001$, *Phi* = -.094 small effect (Cohen, 1988); race, Fisher's $\chi^2 = 27.71$, $p < .001$, *Cramer's V* = .147, small effect; primary language, Fisher's $\chi^2 = 42.36$, $p < .001$, *Cramer's V* = .180, small effect; medical insurance, Fisher's $\chi^2 = 60.49$, $p < .001$, *Cramer's V* = .211, small effect; Medicare insurance (yes/no), Fisher's $\chi^2 = 60.49$, $p < .001$, *Cramer's V* = -.123, small effect; cancer diagnosis, Fisher's $\chi^2 = 168.27$, $p < .001$, *Cramer's V* = .350, moderate effect; chemotherapy location, Fisher's $\chi^2 = 213.20$, $p < .001$, *Cramer's V* = .396, moderate effect; Hospital admission location, Fisher's $\chi^2 = 18.47$, $p < .001$, *Cramer's V* = .228, small effect; and Condition: Anemia, Fisher's $\chi^2 = 7.62$, $p = .007$, *Cramer's V* = -.075, small effect; (see Appendix B).

Cancer diagnosis and chemotherapy location had a moderate effect size on patients involved in ONN vs. non-ONN groups. To identify what variables were driving the significance, adjusted residuals were reviewed. The largest adjusted residuals for cancer diagnosis were hematological (adjusted residual 7.8), Lymphoma (adjusted residual = 7.4), and breast cancer (adjusted residual 7.2). Most breast cancer patients had

the ONN involvement while most hematological and lymphoma cancer patients did not have the ONN involvement (see Figure 5).

In terms of chemotherapy location, the largest adjusted residual was for location 3 (adjust residual = 14.4) and most of the patients who received chemotherapy at location 3 were involved with the ONN (see Figure 6). Location 3 is the largest outpatient infusion center among 3 infusion center locations and has the greatest number of the ONNs.

Figure 5

The Oncology Nurse Navigator's Involvement of Care per Cancer Diagnosis

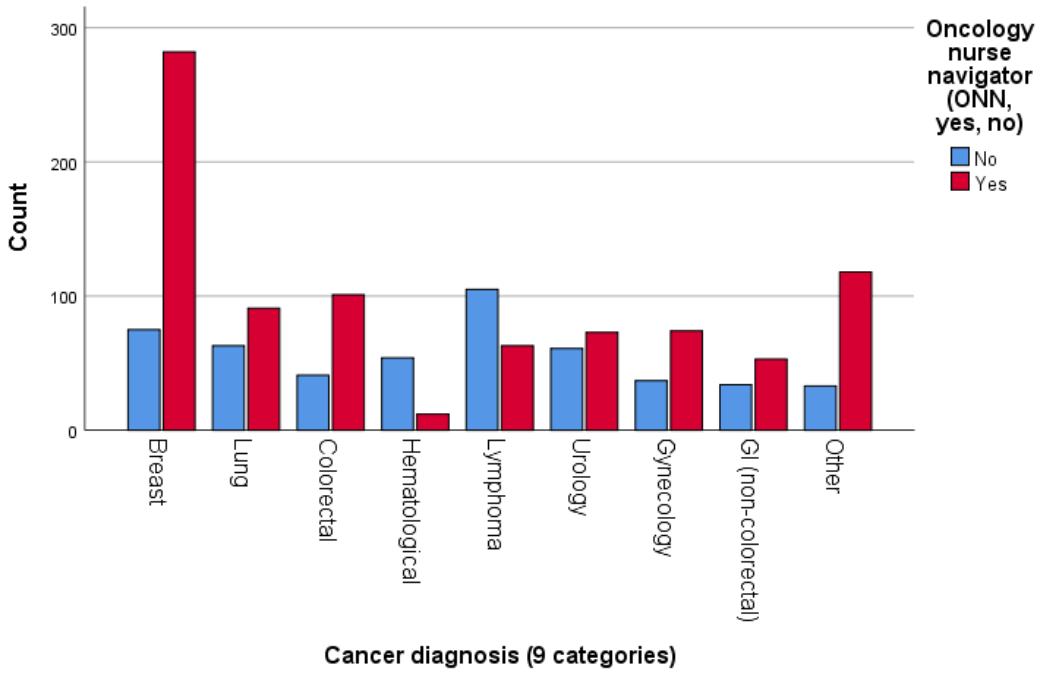
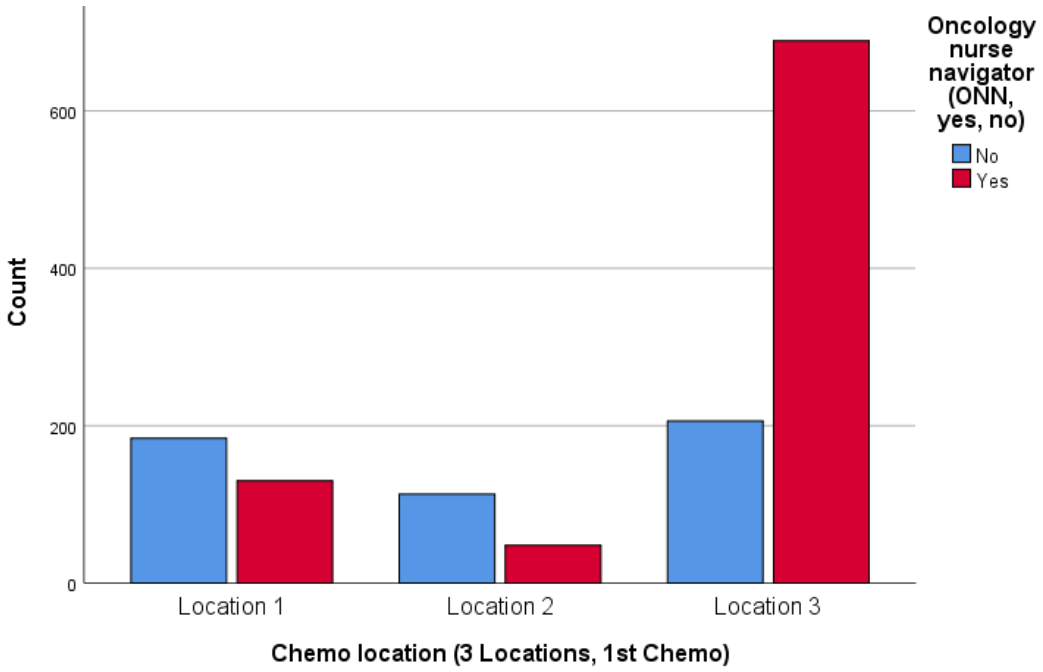


Figure 6

The Oncology Nurse Navigator's Involvement per Chemotherapy Location



2a: Bivariable Analysis of Variables by the Number of ED Visits

Bivariable analysis was run to examine the relationship between the number of ED visits and all other study variables. A Pearson or Spearman correlation was conducted for continuous variables and Kruskal-Wallis test or Mann-Whitney U test were conducted for categorical variable. If there were significant differences, post hoc tests were completed to determine which groups were significantly different. For categorical variables, if significant differences were found, effect size for significant differences (eta squared) was calculated.

Reviewing the data, many continuous variables had unbalanced sample sizes, a small number of participants (<50 cases), and had multiple outliers. Given the violation

of normality assumptions and significant outliers, a Kruskal-Wallis test or Mann-Whitney U test was conducted instead of one-way analysis of variance between number of ED visits and the study categorical variables. Looking at pyramid charts, the distribution of the number of ED visits by the categorical variable groups had different shapes comparing medians. Therefore, mean ranks were compared for gender, race, language, insurance, Medicare, cancer diagnosis, chemotherapy location, visit type, ED admission source, ED admission location, hospital admission source, hospital admission location, the ONN, anemia, dehydration, diarrhea, Emesis, fever, nausea, neutropenia, pain, pneumonia, sepsis, and conditions combined.

A Kruskal-Wallis H test was conducted to determine if there were significant differences in the number of patients' ED visits during the 2-year study period in terms of race, language, insurance, cancer diagnosis, chemo location, visit type, ED admission source, ED admission location, hospital admission source, hospital admission locations, and medical conditions combined. The number of ED visits varied according to different chemotherapy locations: location 1 (n = 43), location 2 (n = 34), and location 3 (n = 114). Distributions of the number of ED visits were not similar for all chemo locations, as assessed by visual inspection of a boxplot. The mean ranks for the number of ED visits were significantly different between groups, $\chi^2(2) = 7.00$, $p = .030$, $\varepsilon^2 = .037$ (small effect size). Pairwise comparisons were performed using Dunn (1961) procedure with a Bonferroni correction for multiple comparisons. Adjusted p-values were presented. The post hoc analysis revealed statistically significant differences in the number of ED visits between location 2 (*Mean rank* = 108.57) and location 3 (*Mean rank* = 90.85), Adjusted $p = .034$; no other group combination was significantly different (see Appendix C).

For medical conditions combined: Anemia (n = 25), Pain (n = 66), Dehydration (n = 8), Anemia plus Pain (n = 12), Anemia plus Dehydration (n = 2), and other combinations of conditions (n = 78). Values are mean ranks unless otherwise stated. Distributions of the number of ED visits were not similar for all chemo locations, as assessed by visual inspection of a boxplot. The mean ranks for the number of ED visits were significantly different between groups, $\chi^2(5) = 15.35$, $p = .00930$, $\varepsilon^2 = .081$ (moderate effect size). Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Adjusted p-values were presented. The post hoc analysis indicated statistically significant differences in the number of ED visits between Pain (*Mean rank* = 87.24) and other combinations of medical conditions (*Mean rank* = 107.12), Adj. $p = .019$, $\varepsilon^2 = .081$ (moderate effect size); no other group combination was significantly different (see Appendix C).

A Mann-Whitney U test was run to determine if there were significant differences in the number of patients' ED visits during the 2-year study period in terms of gender, Medicare insurance, the ONN, as well as the following medical conditions: anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia and sepsis. Distributions for patients' number of ED visits for all variables were dissimilar. Distribution scores for gender (U = 4568.5, z = 0.903, p = .367), anemia (U = 4898.0, z = 1.406, p = .160), fever (U = 2895.5, z = 1.900, p = .057), nausea (U = 2153.0, z = 1.371, p = .171), pain (U = 4999.5, z = 1.893, p = .058), pneumonia (U = 2283.0, z = 1.699, p = .089), sepsis (U = 1885.0, z = 1.693, p = .091), and ONN (U = 4053.5, z = -1.053, p = .292) were not significantly different between groups, using an Asymptotic sampling distribution for U (see Appendix C); distributions for Medicare insurance (U = 5040.0, z

= 1.980, p = .048, r = .143 small effect), dehydration (U = 4515.0, z = 2.544, p = .011, r = .184 small effect), diarrhea (U = 1796.0, z = 2.247, p = .025, r = .163 small effect), emesis (U = 587.5, z = 3.009, p = .003, r = .218 small effect), and neutropenia (U = 2538.5, z = 2.774, p = .006, r = .201 small effect) were significantly different (see Table 3).

Table 3

Significant Sociodemographic and Chemotherapy-Related Conditions of Study Population Overall and by Average Number of ED Visits During 2-Year Study Period (N = 1,370)

Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Medicare Insurance	191		5040.0	**.048**	. 143
Yes	91	101.38			
No	191	91.10			
Condition: Dehydration	191	--	4515.0	**.011**	.184
Yes	60	105.75			
No	131	91.53			
Condition: Diarrhea	191	--	1796.0	**.025**	.163
Yes	17	114.65			
No	174	94.18			
Condition: Emesis	191	--	587.5	**.003**	.218
Yes	4	149.38			
No	187	94.86			
Condition: Neutropenia	191	--	2538.5	**.006**	.201
Yes	25	114.54			
No	166	93.21			

Pearson's product-moment or Spearman's rho correlations were run to assess the relationship between the number of ED visits during the 2-year study period and: patients

age at discharge, average LOS for all ED visit, number of hospital admissions, and average LOS for all hospital admission during the study period. Results showed none of the variables evaluated was significantly associated with patients' average number of ED visits during the study period (see Table 4); patients age at discharge (p = .294), average LOS for all ED visit (p = .198), number of hospital admissions (p = .441), and average LOS (p = .422), for all hospital admission during the study period. The only significant association occurred between the average number of hospital admissions and patients' average LOS at the hospital (r = .126, p = .018, small effect, explaining 1.59% of the variation in the number of hospital admissions). As the average number of hospital admission increase, so does the average LOS at the hospital.

Table 4

Intercorrelations for Sociodemographic and Care Site Characteristics of Study Population (N = 1,370)

Characteristic	1	2	3	4	5
1. Age at discharge	--				
2. No. ED visits	0.08	--			
3. Avg. LOS at ED	-0.20**	0.09	--		
4. No. HOSP Admissions	-0.06	0.10	-0.08	--	
5. Avg. HOSP LOS	-0.01	-0.10	-0.19	0.13*	--

Note. ED = emergency department; HOSP = hospital; LOS = length of stay.

* $p < .05$. ** $p < .01$.

2a: Bivariable Analysis of Variables by the Number of Hospital Admissions

Bivariable analysis was run to examine the relationship between the number of hospital admissions and all other study variables. A Pearson or Spearman correlation was conducted for continuous variables, and a Kruskal-Wallis test or Mann-Whitney U test were conducted for categorical variable. If there were significantly differences, post hoc tests were completed to determine which groups were significant different. For categorical variables, if significant differences were found, effect size for significant differences (eta squared) was calculated.

Many continuous variables had unbalanced sample sizes, a small number of participants (<50 cases), all groups had multiple outliers in reviewing boxplots. Given the violation of normality assumptions and significant outliers, a Kruskal-Wallis test or Mann-Whitney U test was conducted instead of one-way analysis of variance between number of hospital admissions and the study categorical variables. The distribution of the number of hospital visits by the categorical variable groups had different shapes reviewed by pyramid charts. Therefore, mean ranks were compared for gender, Medicare, the ONN, anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, sepsis, and conditions combined.

A Kruskal-Wallis H test was conducted to identify significant differences in the number of patients' hospital admissions during the 2-year study period in terms of race, language, insurance, cancer diagnosis, chemo location, visit type, ED admission source, ED admission location, hospital admission source, hospital admission location, and medical conditions combined. For condition combined: anemia (n = 38), pain (n = 43), dehydration (n = 19), anemia plus pain (n = 11), anemia plus dehydration (n = 17), and

other combinations of conditions (n = 227). Values are mean ranks unless otherwise stated. Distributions of the number of hospital admissions were not similar for all variables, as assessed by visual inspection of a boxplot. The mean ranks for the number of hospital admissions were significantly different between conditions combined groups, $\chi^2(5) = 31.48$, $p < .001$, $\varepsilon^2 = .089$ (moderate effect size). Pairwise comparisons were performed using Dunn (1961) procedure with a Bonferroni correction for multiple comparisons. Adjusted p-values were presented. The post hoc analysis revealed statistically significant differences in the number of hospital admissions between anemia (*Mean rank* = 145.93) and other combination of conditions (*Mean rank* = 193.82), Adjusted p = .003; and between pain (*Mean rank* = 154.07) and other combination of conditions (*Mean rank* = 193.82), Adjusted p = .020; (see Appendix D).

A Mann-Whitney U test was run to determine if there were significant differences in the Number of patients' ED visits during the 2-year study period in terms of gender, Medicare insurance, the ONN, as well as the following medical conditions: anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia and sepsis. Distributions for patients' number of hospital admissions for all variables were dissimilar. Distribution scores for gender (U = 17073.5, z = 2.043, p = .041, r = .108 small effect), anemia (U = 16955.5, z = 2.807, p = .005 r = .149 small effect), dehydration (U = 17733.5, z = 3.034, p = .002, r = .161 small effect), fever (U = 10994.5, z = 2.530, p = .011, r = .134 small effect), nausea (U = 7110.0, z = 2.952, p = .003, r = .157 small effect), neutropenia (U = 12377.0, z = 2.794, p = .005, r = .148 small effect), pain (U = 16345.0, z = 3.586, $p < .001$, r = .190 small effect), pneumonia (U = 13318.5, z = 3.527, $p < .001$, r = .187 small effect) and sepsis (U = 16008.5, z = 3.469, p = .001, r = .184

small effect) were significantly different between groups, using an asymptotic sampling distribution for U; distributions for the other variables evaluated were not significantly different (see Table 5).

Table 5

Significant Sociodemographic and Chemotherapy-related Conditions of Study Population Overall and by Average Number of Hospital Admissions During 2-Year Study Period (N = 1,370)

Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Gender	355	--	17073.5	.041	.108
Male	166	186.35			
Female	189	170.66			
Condition: Anemia (*N* = 1370)	355	--	16955.5	.005	.149
Yes	165	190.48			
No	190	167.17			
Condition: Dehydration	355	--	17733.5	.002	.161
Yes	165	190.48			
No	190	167.17			
Condition: Fever	355	--	10994.5	.011	.134
Yes	67	198.10			
No	288	173.32			
Condition: Nausea	355	--	7110.0	.003	.157
Yes	37	211.16			
No	318	174.14			
Condition: Neutropenia	355	--	12377.0	.005	.148
Yes	78	198.18			
No	277	172.32			
Condition: Pain	355	--	16345.0	< .001	.190
Yes	119	197.35			
No	236	168.24			
Condition: Pneumonia	355	--	13318.5	< .001	.187
Yes	83	202.46			
No	272	170.53			

Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Condition: Sepsis	355	--	16008.5	.001	.184
Yes	115	197.20			
No	240	168.20			

Pearson's product-moment or Spearman's rho correlations was run to assess the relationship between the number of hospital admissions during the 2-year study period and: patients age at discharge, number of ED visits, average LOS for all ED visit, and average LOS for all hospital admission during the study period. Results showed that the number of hospital admissions was significantly associated with hospital LOS (r = .126, p = .018, small effect, explaining 1.59% of the variation in the number of hospital admissions). As the average number of hospital admissions increase, so does the average LOS at the hospital (see Table 4).

2b: Difference in ED visits and hospital admissions ONN VS. non-ONN groups

The primary study purpose was to describe the difference in ED visits and hospital admissions between the ONN involved group of patients and the non-ONN involved group of patients. To identify if a difference exists between the means of patients who are involved in ONN versus those who are not in terms of the ED visits and hospital admissions, A Mann-Whitney test was conducted, because the variables did not meet t-test assumptions. The number of ED visits, ED LOS, number of hospital admissions, and hospital admission LOS were not normally distributed and had significant outliers. Examining the shape of pyramid chart for each of the continuous variables, the distribution of continuous variables for the two ONN groups (ONN vs. Non-ONN) had similar distributions for all four variables. Therefore, inferences could be made about the difference in medians between two groups.

A Mann-Whitney U test was run to identify differences in the ONN involvement (ONN vs. non-ONN) in terms of number of ED visits, ED LOS, number of hospital admissions, and hospital LOS. Median scores for number of ED visits ($U = 4053.5$, $z = -1.053$, $p = .292$), average ED LOS ($U = 4449.5$, $z = 0.529$, $p = .597$), number of hospital admissions ($U = 15472.5$, $z = 0.322$, $p = .747$), and average hospital admission LOS ($U = 15385$, $z = 0.135$, $p = .892$) were not significantly different between patients with ONN vs. non-ONN involvement, using an asymptotic sampling distribution for U (see Table 6).

Table 6

Oncology Nurse Navigation Involvement of Study Population by Number of ED Visits (N = 191) and Hospital Admissions (N= 355) During 2-Year Study Period

Number of ED Visits	*N*	*Mean Rank*	*U*	*p*	*r*
Oncology Nurse Navigator (ONN)	191	--	4053.5	.292	--
Yes	118	93.85			
No	73	99.47			
Average LOS at ED	*N*	*Mean Rank*	*U*	*p*	*r*
Oncology Nurse Navigator (ONN)	191	--	4449.5	.597	--
Yes	118	97.21			
No	73	94.05			
Number of HOSP admissions	*N*	*Mean Rank*	*U*	*P*	*r*
Oncology Nurse Navigator (ONN)	355		15472.5	.747	--
Yes	209	179.03			
No	146	176.52			
Average LOS at HOSP	*N*	*Mean Rank*	*U*	*P*	*r*
Oncology Nurse Navigator (ONN)	355		15385.0	.892	--
Yes	209	178.61			
No	146	177.12			

Note. ED = emergency department, LOS = length of stay, ONN = oncology nurse navigator.

Research Aim 3

Data analysis was conducted to address research aim 3a: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in ED visits for adult patients with cancer post outpatient chemotherapy; and 3b: Identify factors (sociodemographics, care site characteristics, and the ONN) that explain the amount of variance in hospitalizations for adult patients with cancer post outpatient chemotherapy.

3a: Multiple Regression Model for Number of ED Visits

Multiple regression analysis was conducted to predict the number of ED visits in oncology patients who received outpatient chemotherapy at one of three infusion centers in southern California based on patients' age at discharge, gender, Medicare insurance, chemotherapy location, anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, and sepsis. Although age and gender did not show significant relationships with number of ED visits, literature review suggested they are associated with number of ED visits, therefore, they were added to in the model. Also, while not all of 10 conditions were significantly associated with number of ED visits, they were was added to the model, because ten conditions were identified by the chemotherapy measure.

There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.702. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance

values less than 0.1 (VIF < 10). There were several cases with studentized deleted residuals greater than ±3 standard deviations (less than 5%), no leverage values were greater than 0.2, and no values for Cook's distance were greater than 1. Normality of residuals departed slightly from normality, as assessed by a Q-Q Plot.

The multiple regression model significantly predicted the number of ED visits, $F(15,175) = 2.531$, $p = .002$, adjusted $R^2 = .108$. This model accounts for 11% of the variance of ED visits. A summary of the regression coefficients in Table 7 indicate insurance: Medicare, Non-Medicare ($p = .028$), and chemotherapy location 3: yes, no ($p = .012$) significantly contributed to the model. Diarrhea: yes, no ($p = .059$) approached significance. Regression coefficients and standard errors can be found in Table 7.

Table 7

Regression Analysis Summary for Sociodemographic and Clinical Characteristics, Care Site Characteristics, and Chemotherapy-Related Conditions of Study Population Predicting the Number of ED Visits During 2-Year Study Period (N = 191)

		95% CI for B				
Variable	*B*	*LL*	*UL*	*Beta*	*t*	*p*
Age at discharge	0.00	-0.01	0.00	-0.11	-1.16	.246
Gender: Male	0.03	-0.11	0.17	0.03	0.46	.649
Medicare insurance: Medicare	0.22	0.02	0.41	0.22	2.21	**.028**
Chemotherapy location: location 1	-0.19	-0.43	0.06	-0.16	-1.49	.138
Chemotherapy location: location 3	-0.28	-0.50	-0.06	-0.27	-2.53	**.012**
Anemia	-0.11	-0.30	0.09	-0.08	-1.05	.295
Dehydration	0.15	-0.07	0.38	0.11	1.33	.184
Diarrhea	0.43	-0.02	0.87	0.14	1.90	.059
Emesis	0.98	-0.17	2.13	0.12	1.68	.095
Fever	0.12	-0.21	0.45	0.06	0.71	.481
Nausea	0.17	-0.22	0.56	0.06	0.86	.389
Neutropenia	0.23	-0.10	0.57	0.11	1.37	.172

Variable	*B*	*95% CI for B*		*Beta*	*t*	*p*
		LL	*UL*			
Pain	0.09	-0.12	0.30	0.06	0.85	.397
Pneumonia	0.08	-0.23	0.38	0.04	0.51	.611
Sepsis	-0.08	-0.36	0.21	-0.04	-0.52	.606

Note. β = standardized coefficient. *B* = unstandardized regression coefficient; *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit. ***Reference categories:*** Medicare insurance, No-Medicare; Gender, Female; Chemotherapy location, location 2; Anemia, No; Dehydration, No; Diarrhea, No; Emesis, No; Fever, No; Nausea, No; Neutropenia, No; Pain, No; Pneumonia, No; and Sepsis, No.

Since the study's primary purpose was to examine the contribution of the ONN, ONN was added to the regression model predicting the number of ED visits in oncology patients who received outpatient chemotherapy, however, there was no improvement of the model fit.

3b: Multiple Regression Model for Number of hospital admissions

A multiple regression was run to predict the number of hospital admissions for oncology patients who received outpatient chemotherapy from: patients' age at discharge, gender, anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, and sepsis. Again, predictors were selected from bivariable analysis and literature review results.

There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.702. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values less than 0.1 (VIF < 10). Several cases had studentized deleted residuals greater

than ±3 standard deviations (less than 5%), leverage values greater than 0.2, and Cook's distance greater than 1. Normality of residuals departed slightly from normality, as assessed by a Q-Q Plot.

The multiple regression model significantly predicted the number of hospital admissions, $F(12,342) = 4.311$, $p < .001$, adjusted $R^2 = .101$. This model accounts for 10% of the variance in hospital admissions. A summary of the regression coefficients in Table 8 indicate nausea ($p = .021$), pain ($p = .006$), and pneumonia ($p = .034$) significantly contributed to the model. Regression coefficients and standard errors can be found in Table 8.

Table 8

Regression Analysis Summary for Sociodemographic and Clinical Characteristics, Care Site Characteristics, and Chemotherapy-Related Conditions of Study Population Predicting the Number of Hospital Admissions During 2-Year Study Period (N = 355)

		95% CI for B				
Variable	*B*	*LL*	*UL*	*Beta*	*t*	*p*
Age at discharge	0.00	-0.01	0.00	-0.07	-1.39	.166
Gender: Male	0.13	0.00	0.26	0.10	1.94	.053
Anemia	0.00	-0.19	0.18	0.00	-0.01	.991
Dehydration	-0.03	-0.24	0.18	-0.02	-0.30	.768
Diarrhea	-0.09	-0.50	0.33	-0.02	-0.40	.686
Emesis	0.24	-0.83	1.31	0.02	0.44	.661
Fever	-0.01	-0.31	0.30	0.00	-0.05	.958
Nausea	0.43	0.07	0.79	0.13	2.33	**.021**
Neutropenia	0.30	-0.02	0.61	0.11	1.87	.062
Pain	0.28	0.08	0.48	0.15	2.79	**.006**
Pneumonia	0.31	0.02	0.59	0.12	2.13	**.034**
Sepsis	0.24	-0.03	0.51	0.11	1.78	.076

Note. β = standardized coefficient. *B* = unstandardized regression coefficient; *CI* = confidence interval; *LL* = lower limit; *UL* = upper limit. ***Reference categories:*** Gender, Female; Anemia, No; Dehydration, No; Diarrhea, No; Emesis, No; Fever, No; Nausea, No; Neutropenia, No; Pain, No; Pneumonia, No; and Sepsis, No.

There were several unusual datapoints in the dataset, therefore, sensitivity analysis was run to ensure those influential points (outliers, leverage, and influential points) were not impacting the study results. Data was examined and three outliers removed from the analysis. Removing those influential points did not have a significant impact on the model or coefficients p-waves.

Since the study's primary purpose was to examine the contribution of the ONN, the ONN was added to the regression model predicting the number of hospital admissions in oncology patients who received outpatient chemotherapy. However, the regression model did not improve the model fit.

Chapter V

Conclusions, Implications and Recommendations

Summary of the Problem

Cancer is the second leading cause of death in the United States and a global health problem. Patients with cancer face many challenges in cancer care. High cost of care, care fragmentation, shortage of skilled care professionals, and quality of cancer care are the examples of the issues in the current United States care delivery system (Institute of Medicine, 2013). CMS introduced the chemotherapy measure to encourage institutions to improve quality of outpatient cancer care, increase transparency, and provide information to the public (Centers for Medicare and Medicaid Services, 2018, 2019b)

The core role of the ONN is to assist with care access and reduce barriers to health care for patients, families, and their caregivers (Agarawal et al., 2020; McMullen et al., 2017). Their wide spectrum of roles in cancer care includes cancer prevention, access to care, advance care planning, psychosocial support, care coordination, care transitions, patient advocacy and education, survivorship care, and discussion and implementation of end of life care (Bernardo et al., 2019; McMullen et al., 2017; ONS Board of Directors, 2015; Paskett et al., 2011). Nonetheless, there is no established standardized outcome measurements of the ONN including those related to cancer treatment clinical outcomes (Freund et al., 2008; ONS Board of Directors, 2015; Strusowski et al., 2017).

Clinical outcomes are familiar metrics to healthcare professionals with the success of care often measured through what happens with the patient as opposed to a multitude of process measures. Reducing avoidable ED visits and hospital admissions are often

used to track clinical outcomes for various target populations (Koehler et al., 2009; Raven et al., 2016). There is a natural tendency to apply whether the ONN outcomes align with traditional patient clinical measures. However, it is a fallacy to suppose traditional patient clinical measures, such as readmission or ED visits, are applicable to the ONN metrics as there is no supporting evidence. The reasons why these clinical outcome measures should not be the ONN metrics are discussed in the following sections.

Summary of the Purpose

It has been challenging to quantify the impact of the ONN program in organizations. Patient navigation is a nonbillable service and often healthcare institutions do not have a system to capture the information for data analysis (Agarawal et al., 2020). Therefore, budgetary approval and ongoing justification for patient navigators could potentially be strengthened with standardized ONN metrics. However, a paucity of evidence exists for this supposition. The purpose of this study was to examine the contribution of the ONN in preventing ED visits and hospitalizations for adult cancer patients post outpatient chemotherapy. Data were obtained from a not-for-profit and comprehensive community cancer center in Southern California from January 1, 2018 to December 31, 2019. Study variables including sociodemographics, care site characteristics, the ONN's care involvement, ED visits and hospital admissions and their relationships. Descriptive and inferential statistics were analyzed to explain the variance in ED visits and hospital admissions for adult patients with cancer post outpatient chemotherapy.

Discussion of Findings

Suboptimal management of chemotherapy related side effects and comorbidities lead to avoidable ED visits and hospitalizations (Aprile et al., 2013; Bell et al., 2017; Eskander et al., 2018; Fessele et al., 2017; Hassett et al., 2006; Mayer et al., 2011; Rivera et al., 2017). In order to better understand factors for ED visits and hospital admissions, the study was conducted, and the results identified the several important findings.

About 35% of patients who had outpatient chemotherapy had at least one ED visit and/or a hospital admission during the two-year study period due to the chemotherapy measure qualified diagnoses. This finding is similar to Kolodziej et al. (2011) who reported chemotherapy related admissions accounted for 40% of hospitalizations of patients with cancer receiving chemotherapy. Among ten conditions, anemia was the most common condition followed by dehydration and pain for ED visit and hospital admission. While many previous studies recognized anemia was one of the reasons for ED visits and hospital admissions, it had not been identified as the most common condition (Aprile et al., 2013; Foltran et al., 2014; Hassett et al., 2006; Mayer et al., 2011; McKenzie et al., 2011). According to Lash et al (2017), since the systemic review revealed that studies used different criteria to categorize ED visit diagnoses, this difference may be due to the diagnosis categorization. Additionally, there were no studies adopting the chemotherapy measure defined diagnosis criteria for their classification method.

Cancer diagnosis and chemotherapy location had a moderate effect size for patients in ONN vs. non-ONN groups. This finding can be explained by location 3 having

navigators specifically working with breast cancer patients and was the largest outpatient oncology infusion site in the health system.

Having Medicare insurance, chemotherapy location, dehydration, diarrhea, emesis, and neutropenia were significantly different in number of ED visits. Gender, anemia, dehydration, fever, nausea, neutropenia, pain, pneumonia, and sepsis were significantly different in number of hospital admissions. Although CMS does not specify which ten conditions are more prominent in ED visits and hospital admissions post chemotherapy for ED visits and hospital admissions, our study results showed different sets of conditions were playing roles in ED visits and hospital admissions.

The multiple regression model significantly predicted the number of ED visits, $F(15,175) = 2.531$, $p = .002$, adjusted $R^2 = .108$. Two parameters: Medicare insurance: Medicare, Non-Medicare ($p = .028$), and chemotherapy location 3: yes, no ($p = .012$) significantly contributed to the prediction; Diarrhea: yes, no ($p = .059$) approached significance. The multiple regression model significantly predicted the number of hospital admissions, $F(12,342) = 4.311$, $p < .001$, adjusted $R^2 = .101$. Three parameters: Nausea ($p = .021$), pain ($p = .006$), and pneumonia ($p = .034$) significantly contributed to the predictive model. While patients' sociodemographic variables (such as having Medicare and receiving chemotherapy at location three) were significantly affecting the number of ED visits, a few of ten conditions post chemotherapy affect the largest number of hospital admissions.

It must be pointed out, both models only explained 10-11% of the variance in ED visits and hospitalizations. According to Lash et al. (2017), it is challenging to identify significant predictors of ED use from the literature, because limited research has been

done on population-based estimation predictors of ED use among oncology patients. The results add additional understanding of specifically what clinical conditions and demographic factors may result in the return to the hospital. Given the higher number of ED visits in location 2, where the population generally is of a lower socioeconomic status with multiple minority communities, it is likely that healthcare disparities contribute to study results. Additional study should be conducted in these populations in the future.

The factors associated with ED visits and hospital admissions for adult cancer patients post outpatient chemotherapy were complex with some opportunities for prevention outside of the scope of the ONN. The lack of standard national metrics and ONN financial reimbursement could jeopardize the efficacy and sustainability of the ONN program in organizations if patient clinical outcomes were the sole evaluation metric. The study data showed there was no difference in ED visits and hospital admissions for adult cancer patients post outpatient chemotherapy between the ONN involved group of patients and the non-ONN involved group of patients.

From one perspective, these findings are not a surprise given the scope of the ONNs' role and their work patterns. The primary role of the ONN is reducing barriers of care in complex healthcare delivery system, whereas close symptom management post outpatient chemotherapy is outside their scope (Cook et al., 2013; Felipe Pautasso et al., 2018; McMullen et al., 2017; ONS Board of Directors, 2015). Interpreting these findings as evidence for the value of the ONN may be inappropriate and would not align with direct and indirect activities on behalf of the patient. In addition, the details of the ONN intervention were not included in this study. Further research is needed to explore the

relationships of categories of the ONN interventions to the clinical outcomes leveraging electronic health records.

The ONNs practicing in the study did not belong to a specific oncology provider, and the institution does not have an oncology urgent care service. Consequently, the ONNs were not providing interventions involving provider orders or able to provide on-demand symptom management even if they identified the patient's need. Literature suggests that oncology urgent care would be more directly related to preventing ED visits and hospital admissions for this population (Eskander et al., 2018; Foltran et al., 2014; Geddie et al., 2016; Handley et al., 2018; Whitney et al., 2018).

The study findings supported that the chemotherapy measure metrics of ED visits and hospital admissions for adult cancer patients post outpatient chemotherapy were not appropriate clinical outcomes to measure the ONN's efficacy. Other process measures would be more appropriate to capture the impact of the ONN. Examples include adherence to institutional treatment pathways, reducing delays from cancer diagnosis to initial oncology consult or first treatment, and navigating patients with abnormal cancer screening (Strusowski et al., 2017). As another option, studies have identified the ONNs play a crucial role in guiding patients through psychosocial distress (Campbell et al., 2010; Fiscella et al., 2012; Muñoz et al., 2018; Rousseau et al., 2014). In conclusion, the findings broadened the understanding of how the ONN may impact to ED visits and hospital admissions. This novel finding adds to the emerging body of knowledge to the ONN science and suggests further inquiry and research.

Study Limitations

The findings of this study should be viewed in the context of study limitations.

First, the ONN involvements were varied based on chemotherapy locations and cancer diagnosis. For example, the location three facility is located near the largest oncology office and had the greatest number of the ONNs. This location had the greatest number of chemotherapy infusions and has a robust breast cancer navigation program, in contrast the other two locations. Most patients with hematological cancers or lymphomas did not receive the ONN involvement in their care, while most of breast cancer patients were involved with the ONN. Most ONN studies focus on specific cancers unlike the current study, and this limitation may have skewed the study results.

Second, the ONN interventions were not standardized. The number and timing of interventions were varied and not included in the study variables. For instance, a patient could have a one-time interaction with the ONN and others had multiple interactions. There was no standardized practice among the ONNs. Additionally, the ONNs began documenting their assessment in the electronic health records starting in 2018. Therefore, their documentation practice rigor and compliance could be questionable.

Third, as the study was a retrospective non-experimental descriptive cross-sectional research design, the findings are not generalizable across organizations and cannot establish causal relationships. Future studies should employee more methodologically strong design especially as this was repeatedly pointed out as weaknesses of the ONN studies (Baik et al., 2016; Bernardo et al., 2019; Johnson, 2015; Paskett et al., 2011). Additionally, longitudinal study design is recommended for the future studies to reflect the full cancer journey which usually takes several months to

years from diagnosis and to survivorship (Bernardo et al., 2019; Johnson, 2015; McMullen et al., 2017; Paskett et al., 2011).

Gathering information on this population's ED utilization pattern (day of week and time of ED admission) would be helpful to describe if the issue lies with the access to provider office after business hours. Other variables (infusion nurses and oncology social workers) that are not included in the study may have influenced and confounded study results. Despite these limitations, the findings of this study provide new knowledge in our understanding the contribution of the ONN in ED visits and hospital admissions for adult cancer patients post outpatient chemotherapy.

Implications for Nursing Research

The ONN plays an integral role in today's complex cancer care. The findings of this study provided preliminary evidence of the relationship of the ONN, ED visits, and hospital admissions among adult patients with cancer post outpatient chemotherapy. There is a clear opportunity for healthcare organizational leadership to understand the role of the ONN and choosing appropriate metrics to evaluate their impact.

There is not a significant body of research on patient financial toxicity and the oncology financial navigator. Financial toxicity associated with cancer care is another challenge patients with cancer face frequently. Its etiology and risk factors are multifaceted causing lasting impacts on these patients' lifetime financial health (Agarawal et al., 2020; National Cancer Institute, 2019). A few studies explored the contribution of the ONNs on reducing financial barriers among patients with cancer and showed promising outlook, there are more opportunities to learn about the role of oncology financial navigators (Agarawal et al., 2020; Hong et al., 2020; Steelquist et al.,

2019; Yezefski et al., 2018). Further role delineation research and exploring ways to partner with patient access and finance service to address the financial toxicity are needed work since little evidence is available.

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Appendix A

Study Variable Table

Category of Variable	Variables	Operational Definition	Level of measurement
Independent variables: Sociodemographics (Time point: at the first outpatient chemotherapy)	Age, race, gender, language spoken at home, primary health insurance, Medicare insurance, cancer diagnosis, admission source	Age: length of time that a person has lived Race: self-identified category of people Gender: biological sex Language spoken at home: primary language spoken at home with family Primary health insurance: primary insurance of the person (private, Medicare, Medical) Cancer diagnosis: defined ICD-10-CM diagnosis codes per 2019 Chemotherapy Measure Data Dictionary Admission source: source of the referral for visit for ED and hospital admissions	Age: Ratio Race: White, other race, Black, African American, Asian, Hawaiian, Pacific Islander, American Indian, Alaska Native Gender: 1=Female and 2=Male Language spoken at home: English, Spanish, English & Other, Other language Primary health insurance: Private coverage, Medicare, Medi-Cal Medicare insurance: yes/no Cancer diagnosis: Breast, Lung, Colorectal, Hematological, Lymphoma, Urology, Gynecology, GI (non-colorectal), and Other
Independent variables: Care site characteristics	Outpatient chemotherapy administration location, visit types (no ED visit and hospital admission, ED visit, and hospital admission), ED visit facility location, and hospital admission facility location	Outpatient chemotherapy administration location: outpatient chemo administration charge generated encounter location Visit type: categories of patient hospital visit types ED visit facility: location of ED Hospital admission facility location: location of hospital	Locations: Nominal (Categorical) Visit source: Nominal (Categorical) ED, Home, physician referral Hospital (acute care, inpatient, or ambulatory surgery) SNF, assisted living, home health
Independent variables: Oncology Nurse Navigator	The ONN's involvement in the care	The ONN's involvement in care: The presence Oncology Navigator Assessment PowerForm documentation on the patient.	Nominal (Categorical) 0: yes 1: no
Independent Variable	Ten chemotherapy measure qualifying diagnoses	anemia, dehydration, diarrhea, emesis, fever, nausea, neutropenia, pain, pneumonia, and sepsis	Nominal (Categorical) 0: yes 1: no
Dependent variable	ED visits	The chemotherapy measure qualifying OPE encounters	Nominal (Categorical) 0: yes 1: no
Dependent variable	ED visit length of stay	the duration of stay in days	Length of stay: ratio
Dependent variable	hospital admissions	The chemotherapy measure qualifying inpatient encounters	Nominal (Categorical) 0: yes 1: no
Dependent variable	Hospital admission length of stay	the duration of stay in days	Length of stay: ratio

Note. Data source: Cerner and Centericity

Appendix B

Sociodemographic and Clinical Characteristics, Care Site Characteristics, and Chemotherapy-Related Conditions of Study Population Overall and by the Oncology Nurse Navigator During 2-Year Study Period (N = 1,370)

	Total		*ONN*		*Non-ONN*			
Characteristic	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*	*p*
Age	62.55	13.35	61.35	13.13	64.61	13.49	4.39	**< .001**
	n	*%*	*n*	*%*	*n*	*%*	χ^2	*p*
Gender							12.01	**.001**
Male	552	40.3	319	57.8	233	42.2		
Female	818	59.7	548	67.0	270	33.0		
Race							27.60	**< .001**
White	760	59.9	502	66.1	258	33.9		
Other race	288	22.4	152	52.8	136	47.2		
Black, African American	63	4.9	37	58.7	26	41.3		
Asian	154	12.0	111	72.1	43	27.9		
Hawaiian, Pacific Islander	14	1.1	13	92.9	1	7.1		
American Indian, Alaska Native	5	0.4	4	80.0	1	20.0		
Primary language							42.36	**< .001**
English	1190	87.7	790	66.4	400	33.6		
Spanish	82	6.0	25	30.5	57	69.5		
English & Other	70	5.2	40	57.1	30	42.9		
Other language	15	1.1	9	60.0	6	40.0		
Medical Insurance							60.49	**< .001**
Private coverage	684	49.9	493	72.1	191	27.9		
Medicare	625	45.6	355	56.8	270	43.2		
Medi-Cal	61	4.5	19	31.1	42	68.9		
Medicare Insurance							20.80	**< .001**
Yes	625	45.6	355	56.8	270	43.2		
No	745	54.4	512	68.7	233	31.3		
Cancer Diagnosis							168.27	**< .001**
Breast	357	26.1	282	79.0	75	21.0		
Lung	154	11.2	91	59.1	63	40.9		
Colorectal	142	10.4	101	71.1	41	28.9		
Hematological	66	4.8	12	18.2	54	81.1		

Lymphoma	168	12.3	63	37.5	105	62.5		
Urology	134	9.8	73	54.5	61	45.5		
Gynecology	111	8.1	74	66.7	37	33.3		
GI (non-colorectal)	87	6.4	53	60.9	34	39.1		
Other cancer	151	11.0	118	78.1	33	21.9		
	Total		*ONN*		*Non-ONN*			
Characteristic	*N*	*%*	*n*	*%*	*n*	*%*	χ^2	*p*
Chemotherapy Location							213.20	**< .001**
Location 1	314	22.9	130	41.4	184	58.6		
Location 2	161	11.8	48	29.8	113	70.2		
Location 3	895	65.3	689	77.0	206	23.0		
Visit Type							4.04	.132
No ED or HOSP visit	892	65.1	577	64.7	315	35.3		
ED Visits	123	9.0	81	65.9	42	34.1		
Hospital Admission	287	20.9	172	19.8	115	22.9		
ED & HOSP visits	68	5.0	37	4.3	31	6.2		
ED Admission Source							2.94	.248
Home	154	84.6	97	63.0	57	37.0		
Hospital (acute care, inpatient, or ambulatory surgery)	26	14.3	17	65.4	9	34.6		
SNF, assisted living, home health	2	1.1	0	0.0	2	100.0		
ED Admission Location							0.66	.988
Location 1	38	20.0	23	60.5	15	39.5		
Location 2	77	40.5	48	62.3	29	37.7		
Location 3	74	38.9	45	60.8	29	39.2		
Location 4	1	0.5	1	100.0	0	0.0		
HOSP Admission Source							4.91	.176
ED	295	83.1	175	59.3	120	40.7		
Home	49	13.8	31	63.3	18	36.7		
Hospital (acute care, inpatient, or ambulatory surgery)	6	1.7	2	33.3	4	66.7		
SNF, assisted living, home health	5	1.4	1	20.0	4	80.0		
HOSP Admission Location							18.47	**< .001**
Location 1	58	16.3	26	44.8	32	55.2		
Location 2	47	13.2	18	38.3	29	61.7		
Location 3	248	69.9	164	66.1	84	33.9		

Location 4	2	0.6	1	50.0	1	50.0		
Oncology Nurse Navigator							--	--
Yes	867	63.3	--	--	--	--		
No	503	36.7	--	--	--	--		

	Total		*ONN*		*Non-ONN*			
Characteristic	*N*	*%*	*n*	*%*	*n*	*%*	χ^2	*p*
Condition: Anemia (*N* = 1370)							7.62	**.007**
Yes	253	18.5	141	55.7	112	44.3		
No	1117	81.5	726	65.0	391	35.0		
Condition: Dehydration							0.07	.808
Yes	189	13.8	867	63.3	503	36.7		
No	1181	86.2	749	63.4	432	36.6		
Condition: Diarrhea							0.11	.865
Yes	38	2.8	25	65.8	13	34.2		
No	1332	97.2	842	63.2	490	36.8		
Condition: Emesis							0.02	.879
Yes	5	0.4	867	60.0	503	40.0		
No	1365	99.6	864	63.3	501	36.7		
Condition: Fever							0.94	.348
Yes	82	6.0	56	68.3	477	31.7		
No	1288	94.0	811	63.0	477	37.0		
Condition: Nausea							< 0.00	.998
Yes	49	3.6	31	63.3	18	36.7		
No	1321	96.4	836	63.3	485	36.7		
Condition: Neutropenia							0.07	.816
Yes	84	6.1	52	61.9	32	38.1		
No	1286	93.9	815	63.4	417	36.6		
Condition: Pain							1.72	.213
Yes	180	13.1	106	58.9	74	41.1		
No	1190	86.9	761	63.9	429	36.1		
Condition: Pneumonia							3.24	.089
Yes	90	6.6	49	54.4	41	45.6		
No	1280	93.4	818	63.9	462	36.1		
Condition: Sepsis							1.36	.266
Yes	115	8.4	67	58.3	48	41.7		
No	1255	91.6	800	63.7	455	36.3		
Conditions Combined							4.66	.590
None	891	65.0	577	64.8	314	35.2		
Anemia	61	4.5	36	59.0	25	41.0		
Pain	102	7.4	64	62.7	38	37.3		
Dehydration	27	2.0	18	66.7	9	33.3		

Anemia + Pain	18	1.3	10	55.6	8	44.4		
Anemia + Dehydration	18	1.3	13	72.2	5	27.8		
Other combinations of conditions	253	18.5	149	58.9	104	41.1		

	Total		*ONN*		*Non-ONN*			
Characteristic	*N*	*%*	*n*	*%*	*n*	*%*	χ^2	*P*
Conditions: No. of responses generated by $n = 478$ patients with ED -HOSP visits							--	--
Anemia	253	23.3	141	55.7	112	44.3	--	--
Dehydration	189	17.4	118	62.4	71	37.6	--	--
Diarrhea	38	3.5	25	65.8	13	34.2	--	--
Emesis	5	0.5	3	60.0	2	40.0	--	--
Fever	82	7.6	56	68.3	26	31.7	--	--
Nausea	49	4.5	31	63.3	18	36.7	--	--
Neutropenia	84	7.7	52	61.9	32	38.1	--	--
Pain	180	16.6	106	58.9	74	41.1	--	--
Pneumonia	90	8.3	49	54.4	41	45.6	--	--
Sepsis	115	10.6	67	58.3	48	41.7	--	--

Note. Fisher's Exact Test, unless otherwise specified.

Appendix C

Sociodemographic and Clinical Characteristics, Care Site Characteristics, and Chemotherapy-related Conditions of Study Population Overall and by Average Number of ED Visits During 2-Year Study Period (N = 1,370)

Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Gender	191	--	4568.5	.367	--
Male	75	98.91			
Female	116	94.12			
	N	*Mean Rank*	*H (df)*	*p*	ε^2
Race	179	--	1.58 (3)	.663	--
White	103	91.40			
Other race	50	88.15			
Black, African American	13	95.38			
Asian	13	80.65			
Hawaiian, Pacific Islander	--	--			
American Indian, Alaska Native	--	--			
Primary language	187	--	0.86 (3)	.836	--
English	162	94.70			
Spanish	16	90.28			
English & Other	6	93.08			
Other language	3	78.00			
Medical Insurance	191	--	3.95 (2)	.139	--
Private coverage	93	90.94			
Medicare	91	101.38			
Medi-Cal	7	93.21			
Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Medicare Insurance	191		5040.0	**.048**	. 143
Yes	91	101.38			
No	191	91.10			
Characteristic	*N*	*Mean Rank*	*H (df)*	*p*	ε^2
Cancer Diagnosis	191	--	4.48 (5)	.483	--
Breast	39	90.28			
Lung	30	102.10			
Colorectal	20	98.50			

Lymphoma	26	87.12			
Urology	16	104.09			
Other cancer	60	97.53			
Characteristic	*N*	*Mean Rank*	*H (df)*	*p*	ε^2
Chemotherapy Location	191	--	7.00 (2)	**.030**	.037
Location 1	43	99.72			
Location 2	34	108.57			
Location 3	114	90.85			
Visit Type	191	--	9.51 (1)	**.002**	.050
No ED or HOSP visit	--	--			
ED Visit	123	90.05			
Hospital Admission	68	106.76			
ED Admission Source	182	--	1.51 (2)	.471	--
Home	154	91.24			
Hospital (acute care, inpatient, or ambulatory surgery)	26	90.77			
SNF, assisted living, home health	2	120.75			
ED Admission Location	190	--	1.19 (3)	.756	--
Location 1	38	99.68			
Location 2	77	92.84			
Location 3	74	96.33			
Location 4	1	79.50			
HOSP Admission Source	68	--	1.34 (2)	.512	--
ED	60	34.01			
Home	7	40.07			
Hospital (acute care, inpatient, or ambulatory surgery)	1	25.00			
SNF, assisted living, home health	1	20.00			
HOSP Admission Location	68	--	2.13 (2)	.345	--
Location 1	10	38.75			
Location 2	10	38.75			
Location 3	48	32.73			
Location 4	--	--			
Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Oncology Nurse Navigator (ONN)	191	--	4053.5	.292	--
Yes	118	93.85			
No	73	99.47			
Condition: Anemia (*N* = 1,370)	191	--	4898.0	.160	--

Yes	91	99.82			
No	100	92.52			
Condition: Dehydration	191	--	4515.0	**.011**	.184
Yes	60	105.75			
No	131	91.53			
Condition: Diarrhea	191	--	1796.0	**.025**	.163
Yes	17	114.65			
No	174	94.18			
Condition: Emesis	191	--	587.5	**.003**	.218
Yes	4	149.38			
No	187	94.86			
Condition: Fever	191	--	2895.5	.057	--
Yes	32	106.98			
No	159	93.79			
Condition: Nausea	191	--	2153.0	.171	--
Yes	23	105.61			
No	168	94.68			
Condition: Neutropenia	191	--	2538.5	**.006**	.201
Yes	25	114.54			
No	166	93.21			
Condition: Pain	191	--	4999.5	.058	--
Yes	103	100.54			
No	88	90.69			
Condition: Pneumonia	191	--	2283.0	.089	--
Yes	24	107.63			
No	167	94.33			
Condition: Sepsis	191	--	1885.0	.091	--
Yes	19	109.21			
No	172	94.54			
Characteristic	*N*	*Mean Rank*	*H (df)*	*p*	ε^2
Conditions Combined	191	--	15.35	**.009**	.081
Anemia	25	87.40			
Pain	66	87.24			
Dehydration	8	80.00			
Anemia + Pain	12	103.13			
Anemia + Dehydration	2	80.00			
Other combinations of conditions	78	107.12			

Note. Fisher's Exact Test, unless otherwise specified.

Appendix D

Sociodemographic and Clinical Characteristics, Care Site Characteristics, and Chemotherapy-related Conditions of Study Population Overall and by Average Number of Hospital Admissions During 2-Year Study Period (N = 1,370)

Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Gender	355	--	17073.5	**.041**	.108
Male	166	186.35			
Female	189	170.66			
	N	*Mean Rank*	*H (df)*	*p*	ε^2
Race	342	--	5.07 (5)	.407	--
White	200	168.37			
Other race	88	170.00			
Black, African American	16	220.22			
Asian	32	170.44			
Hawaiian Native, Pacific Islander	5	205.50			
American Indian, Alaska Native	1	14.50			
Primary language	354	--	0.96 (3)	.810	--
English	308	178.31			
Spanish	23	173.28			
English & Other	3	171.90			
Other language					
Medical Insurance	355	--	0.40 (2)	.819	--
Private coverage	142	178.52			
Medicare	195	178.07			
Medi-Cal	18	173.14			
Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Medicare Insurance	355	--	15421.0	.791	--
Yes	195	177.08			
No	160	179.12			
Characteristic	*N*	*Mean Rank*	*H (df)*	*p*	ε^2
Cancer Diagnosis	355	--	3.62 (5)	.605	--
Breast	52	166.95			
Lung	53	167.37			
Colorectal	37	194.82			

Lymphoma	35	152.03			
Urology	45	183.76			
Other cancer	133	186.76			
Characteristic	*N*	*Mean Rank*	*H (df)*	*p*	ε^2
Chemotherapy Location	355	--	0.22 (2)	.894	--
Location 1	80	165.78			
Location 2	59	183.81			
Location 3	216	180.94			
ED Admission Source	60	--	--	--	--
Home	60	30.50			
Hospital (acute care, inpatient, or ambulatory surgery)	0	--			
SNF, assisted living, home health	0	--			
ED Admission Location	67	--	2.95 (2)	.229	--
Location 1	11	34.86			
Location 2	10	21.90			
Location 3	46	36.42			
Location 4					
HOSP Admission Source	355	--	2.88 (3)	.410	--
ED	295	179.43			
Home, physician referral	49	172.72			
Hospital (acute care, inpatient, or ambulatory surgery)	6	181.92			
SNF, assisted living, home health	5	140.50			
HOSP Admission Location	355	--	1.93 (3)	.587	--
Location 1	58	171.03			
Location 2	47	185.48			
Location 3	248	178.77			
Location 4	2	109.00			
Characteristic	*N*	*Mean Rank*	*U*	*p*	*r*
Oncology Nurse Navigator (ONN)	355	--	15472.5	.747	--
Yes	209	179.03			
No	146	176.52			
Condition: Anemia (*N* = 1370)	355	--	16955.5	**.005**	.149
Yes	165	190.48			
No	190	167.17			
Condition: Dehydration	355	--	17733.5	**.002**	.161

Yes	165	190.48			
No	190	167.17			
Characteristic	*N*	*Mean Rank*	*U*	*p*	*R*
Condition: Diarrhea	355	--	5095.0	.323	--
Yes	29	190.69			
No	326	176.87			
Condition: Emesis	355	--	448.5	.348	--
Yes	2	225.75			
No	353	177.73			
Condition: Fever	355	--	10994.5	**.011**	.134
Yes	67	198.10			
No	288	173.32			
Condition: Nausea	355	--	7110.0	**.003**	.157
Yes	37	211.16			
No	318	174.14			
Condition: Neutropenia	355	--	12377.0	**.005**	.148
Yes	78	198.18			
No	277	172.32			
Condition: Pain	355	--	16345.0	**< .001**	.190
Yes	119	197.35			
No	236	168.24			
Condition: Pneumonia	355	--	13318.5	**< .001**	.187
Yes	83	202.46			
No	272	170.53			
Condition: Sepsis	355	--	16008.5	**.001**	.184
Yes	115	197.20			
No	240	168.20			
Characteristic	*N*	*Mean Rank*	*H (df)*	*P*	ε^2
Conditions Combined	355	--	31.48 (5)	**< .001**	.089
Anemia	38	145.93			
Pain	43	154.07			
Dehydration	19	141.50			
Anemia + Pain	11	141.50			
Anemia + Dehydration	17	163.38			
Other combinations of conditions	227	193.82			

Appendix E

USD IRB

Nov 4, 2020 1:31:42 PM PST
Sunny Stirling
Hahn School of Nursing & Health Science

Re: Exempt - Initial - IRB-2021-81, Emergency Department Visits and Hospital Admissions for Adult Cancer Patients Post Outpatient Chemotherapy: Does the Oncology Nurse Navigator Make a Difference?

Dear Sunny Stirling:
The Institutional Review Board has rendered the decision below for IRB-2021-81, Emergency Department Visits and Hospital Admissions for Adult Cancer Patients Post Outpatient Chemotherapy: Does the Oncology Nurse Navigator Make a Difference?.

Decision: Exempt

Selected Category: Category 4. Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:
(i) The identifiable private information or identifiable biospecimens are publicly available;
(ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;
(iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "health care operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or
(iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for nonresearch activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section 208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C. 552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 et seq.

Findings:

Research Notes:

Internal Notes:

The USD IRB requires annual renewal of all active studies reviewed and approved by the IRB. Please submit an application for renewal prior to the annual anniversary date of initial study approval.
If an application for renewal is not received, the study will be administratively closed.

Note: We send IRB correspondence regarding student research to the faculty advisor, who bears the ultimate responsibility for the conduct of the research. We request that the faculty advisor share this correspondence with the student researcher.

The next deadline for submitting project proposals to the Provost's Office for full review is N/A. You may submit a project proposal for expedited or exempt review at any time.

Sincerely,

Eileen K. Fry-Bowers, PhD, JD
Administrator, Institutional Review Board

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