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An Educational Intervention for Infusion Center Nurses to Improve Their Confidence in Identification and Management of Immunotherapy Adverse Events, Based on Changes in Pre- and Post-test scores: A Quality Improvement Project

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Abstract

BACKGROUND: Immunotherapy is a treatment that uses the body's immune system to fight diseases. It is used for the management of many conditions but is mainly utilized in cancer treatment. Immunotherapy has been shown to improve quality of life and increase survival rates in metastatic disease. A major limitation of immunotherapy are the adverse events (AE), or adverse effects, that may cause a delay in treatment, lead to hospitalization, or in extreme cases, mortality. In this study the terms adverse events and adverse effects will be used interchangeably.

DESIGN: Pre- and post-test survey design.

METHODS: Data was collected from a sample of 23 Infusion Center nurses following an education intervention on identification and management of immunotherapy adverse events, using the Oncology Nurse Immunotherapy Confidence Survey (ONICS) instrument modified for this QI project.

RESULTS: The pre- and post-test scores revealed a 39% increase in Infusion Centers nurses' confidence regarding identification and management of immunotherapy adverse events shown. These findings were established as statically significant ($p > 0.0001$).

CONCLUSIONS: Novice nurses and experienced nurses new to the Oncology specialty would most benefit from this intervention. Department orientation policies can be reviewed and modified based on the data from this project to improve the quality of patient care.

Keywords: Immunotherapy adverse events, adverse effects, early recognition, management

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I. Introduction

According to the World Health Organization (WHO) (2018), cancer is the second leading cause of mortality in the world, accounting for 1 in every 6 deaths, nearly 10 million people, in 2020. The overall risk for developing cancer from 0-74 years of age is 20.2% (Matiuzzi & Lippi, 2019). The most common types of cancer in men are lung, stomach, prostate, and liver. In women, breast, lung, cervical, colorectal, and thyroid cancers are the most common (WHO, 2022). According to Matiuzzi and Lippi (2019), cancer poses the highest economic, clinical, and social burden of all diseases and is projected to become the leading cause of death worldwide by 2060. Conventional cancer treatment involves surgery, chemotherapy, and radiation therapy. Immunotherapy has recently emerged as a crucial component of Oncology treatment plans (Ling et al., 2022).

Traditional systemic treatment modalities for cancer, which are chemotherapy and radiation, involved many unpleasant side effects. Radiation is an effective treatment against cancer, but it causes healthy tissue damage in the process. In a review of the literature conducted by Schirrmacher (2019), it was found that chemotherapy is especially effective against types of lymphoma but does not often carry any curative effects for other types of cancer. Although not given as a cure, chemotherapy may still prolong overall survival (OS) in breast, head and neck, and colon cancers, and offer some palliative effects for many other cancers. The contribution of chemotherapy alone to 5-year survival rates of cancer in general was estimated to be around 2% in a study involving 154,971 patients from the United States (U.S.) and Australia (Schirrmacher, 2019). Surgery has proven effective against tumors early in the disease but loses effectiveness if metastasis occurs (Koury et al., 2018).

Immunotherapy has proven to be an effective treatment against cancer as both a stand-alone therapy and in combination with surgery, chemo, and radiation. It works by using the body's immune system to fight disease and therefore produces less adverse effects than chemotherapy (Ling et al., 2022). According to Ling et al. (2022), immunotherapy has revolutionized cancer care improving progression free survival rates and quality of life (QOL), especially in the elderly who could not tolerate the harsh effects of chemotherapy. Immunotherapy has shown success in treating patients who did not respond to first line treatments, or whose cancer has relapsed or metastasized (Ling et al., 2022).

The main limitation of immunotherapy are immunotherapy related adverse effects (IRAE's), also referred to as or immunotherapy toxicities. The mechanism of action of immunotherapy is to trigger the hosts' immune response. This action can cause overstimulation of the immune system leading to inflammatory adverse effects (Ling et al., 2022). These adverse events (AEs) range from mild to severe and cause discomfort, delays in treatments, cessation of treatment, and hospitalizations (Martins et al., 2019).

Background

According to Koury et al. (2018), the first depictions of cancer date back thousands of years to ancient Egypt. The earliest representation of immunotherapy was in the 19th century when an orthopedic surgeon named William Coley noticed tumor regression in his patients with bone sarcoma that contracted wound infections following surgery (Esfahani et al., 2020). Coley continued to experiment on his patients, injecting them with bacteria to duplicate his prior results. He was able to inject over 1,000 of his patients with what became widely known as "Coley's toxin" and his research achieved successful remission in several types of malignancies. He is considered by many to be the father of immunotherapy (Esfahani et al., 2020).

The human immune system is made up of organs and cells responsible for protecting the body from illness. It does this by recognizing, tagging, and destroying foreign cells that may be harmful to the body. Cancer cells are not always recognized by the immune system as harmful because they start off as healthy normal cells. In other instances, cancer cells are recognized by the immune system, but the immune response is not strong enough to destroy the cells (Schirrmacher, 2018).

Chemotherapy

Chemotherapy can be cytotoxic or cytostatic. Cytostatic drugs stop tumor growth and cytotoxic drugs cause cell death. Many chemotherapy regimens are aimed at disrupting the cell cycle. Cancer cells rapidly divide in the body causing malignancies and body systems malfunction. Because chemotherapy affects the cell cycle, cancer cell growth and division are impeded. Consequently, chemotherapy can affect all cells in the body as they move through the cell cycle with very little differentiation (Schirrmacher, 2018). This results in numerous adverse effects and toxicities that can be observed on the skin and hair, in bone marrow, blood, gastrointestinal tract, kidneys, heart, lungs, and brain. Some of the short-term side effects of chemotherapy are nausea, vomiting, hair loss, diarrhea, loss of appetite, fatigue, mouth sores, cytopenias, infections, bruising, and bleeding. Longterm effects includes paresthesia, secondary malignancies, and infertility (Schirrmacher, 2018).

Immunotherapy

Immunotherapy is used in the treatment of many non-oncology disorders such as Crohn's disease, inflammatory bowel disease, Covid-19, rheumatoid arthritis, psoriasis, lupus, and many

allergic conditions (Nahra et al., 2020). For the purpose of this paper, the focus will be on the use of immunotherapy in cancer treatment.

Immunotherapy was approved for treatment of cancer by the FDA in the 1990's. According to Koury et al. (2018), this form of targeted therapy results in much less adverse effects than traditional chemo and is generally better tolerated. The main classes of immunotherapy are monoclonal antibodies (mAbs), immune checkpoint inhibitors (ICIs), and chimeric antibody receptor (CAR) T-cell therapy (Schirrmacher, 2019).

Monoclonal Antibodies

Antibodies are proteins in the body produced by plasma B cells of the immune system. They can recognize specific antigens on the surface of, or expressed by, foreign cells in the body (Zahavi & Weiner, 2020). According to Zahavi and Weiner (2020), monoclonal antibodies (mAbs) are human antibodies derived from mice or yeast. They work by targeting cancer cells and can both directly kill the cell and/or boost the natural immune response to the cell and promote a long-lasting antitumor microenvironment in the body with minimal side effects, adverse events, and toxicities compared to chemotherapy (Zahavi & Weiner, 2020).

Targeted mAbs act against antigens overexpressed by or unique to cancer cells and can cause direct tumor cell death by blocking growth factor receptor signals (Zahavi & Weiner, 2020). The first mAb approved for treatment against cancer was Rituximab. Rituximab targets CD20 (cluster of differentiate 20), a protein overexpressed on the surface of cancerous B cells. Rituximab is used to treat non-Hodgkins Lymphoma (Zahavi & Weiner, 2020). Another common mAb, Herceptin (Traztuzumab), targets the surface antigen human epidermal growth factor receptor 2 (HER2) (Schirrmacher, 2019). One other example of a common mAb target is

the overexpression of epidermal growth factor receptor (EGFR) by many different types of cancer cells to signal proliferation and migration. Cetuximab, an anti-EGFR monoclonal antibody, induces cell death by blocking these receptors preventing ligand binding. Both HER2 and EGFR targeted mAbs are used widely for breast and colorectal cancers (Zahavi & Weiner, 2020).

Monoclonal antibodies are now used as a standard treatment for cancer as monotherapy or in combination with surgery, chemo, and radiation (Zahavi & Weiner, 2020). According to Zahavi and Weiner (2020), there are currently over 100 mAbs designated as drug therapy across various specialties and 23 FDA approved to treat cancers as of 2020, not including any drug conjugates.

Immune Check Point Inhibitors

Immune checkpoint inhibitors (ICI) are a subset of monoclonal antibodies that regulate the immune response by activating or inhibiting immune cell-surface receptors, or checkpoints. These checkpoints regulate immuno-editing, which is a process in which immune system components protect the body from tumor development or enhance tumor escape, or both (Esfahani et al., 2020). According to Zhang and Zhang (2020), cancer cells use inhibitory checkpoints to evade immune system surveillance. ICI's interrupt the signaling pathways of these receptors to encourage immune recognition and elimination of cancer cells. Examples of inhibitory immune checkpoint receptors that ICI's work against are programmed cell death ligand-1 (PD-L1), cytotoxic T lymphocyte-associated molecule-4 (CTLA-4), and programmed cell death receptor-1 (PD-1) (Koury et al., 2018). ICI's are currently one of the most important immunotherapies on the market for cancer treatment. (Zhang & Zhang, 2020).

There are six FDA approved ICIs: Ipilimumab (Yervoy), Nivolumab (Opdivo), pembrolizumab (Keytruda), Atezolizumab (Tecentriq), Avelumab (Bavencio), and Durvalumab (Imfinzi). These are indicated for treatment of skin cancers including metastatic melanoma, metastatic urothelial carcinoma, metastatic Merkel cell carcinoma, metastatic non-small cell lung cancer (NSCLC), metastatic gastric and gastroesophageal cancer, colorectal cancer, and refractory Hodgkin lymphoma (Hargadon et al., 2018).

Chimeric Antigen Receptor (CAR) T-cell Therapy

CAR-T cell therapy uses synthetically engineered receptors to direct T-cells towards cells expressing a specific antigen. T-cells are collected from the host via autologous peripheral blood collection and genetically modified to express chimeric antigen receptors (Gueden et al., 2019). Chimeric antigen receptors bind to antigens on a target cell's surface, resulting in a strong antitumor response, in which T-cells recognize and eliminate those cells. CAR-T therapy was approved by the FDA in 2017 for the treatment of relapsed/refractory primary diffuse large B-cell lymphoma (PMBCL) and has shown great success in the treatment of B-cell malignancies (Neelapu, 2019).

Incidence of Immune Related Adverse Effects (IRAEs)

Common AE's of ICI's and mAbs are macular/papular rash, diarrhea/colitis, hepatitis, pneumonitis, neurotoxicity, endocrinopathies, myocarditis, and inflammatory joint disorders (Martins et al., 2019). The incidence of fatal ICI-related adverse events is 0.3% to 1.3%, with colitis being the most frequent cause of death. Colitis accounts for 70% of fatal adverse events observed in patients receiving CTLA-4 inhibitors. In patients receiving PD-1 and PD-L1

inhibitors, the common IRAEs that developed during treatment were pneumonitis (35%), hepatitis (22%), and neurotoxicity (15%). (Martins et al., 2019).

The adverse effects most associated with CAR-T therapy are cytokine release syndrome (CRS) and neurotoxicity. CRS is a systemic inflammatory response characterized by a group of symptoms including fever, myalgias, fatigue, rigors, and eventually multi-organ failure. CRS is caused when CAR-T cells bind to target cells, triggering an immune response, nearby macrophages release inflammatory cytokines causing the symptoms of CRS. Early intervention and management of CRS and neurotoxicity is crucial to avoid fatal outcomes (Neelapu, 2019).

Risk Factors for IRAEs

According to Ling et al. (2022), the risk of IRAEs increases with two or more immunotherapy agents or history or autoimmune disease. High risk factors indicate avoidance of immunotherapy treatment. If avoidance is not possible, then administration with close surveillance is warranted (Martine et al., 2019). According to Martins et al. (2019), high risk factors include connective tissue diseases (systemic lupus erythematosus, psoriasis, systemic sclerosis, rheumatoid arthritis, Sjogren syndrome), vasculitis, treatment related factors, intrinsic factors (cancer type, tumor microenvironment), and other severe autoimmune diseases (Martins et al., 2019). Intermediate risk factors suggest administration of immunotherapy under close monitoring. Intermediate risks include limited or managed autoimmune disease, type 1 diabetes, autoimmune thyroiditis, vitiligo, pernicious anemia, and celiac disease (Martins et al., 2019).

IRAE Surveillance

IRAEs can occur at any point in the treatment regimen. Constant surveillance is recommended for patients with high risk factors. Surveillance recommendations are:

- Height, weight, body mass index (BMI)
- Cardiovascular function: heart rate (HR), blood pressure (BP), electrocardiography (EKG), and echocardiogram
- Kidney function: including estimated glomerular filtration rate (EGFR), urine spot analysis for proteinuria, creatininuria, calciuria, and protein to creatinine ratio
- Liver function: total serum bilirubin, aspartate transaminase (AST), alanine transaminase (ALT), y-glutamyl transferase (GGT) and alkaline phosphatase (ALP) levels)
- Immune function and/or infection status: serum C-reactive protein (CRP), erythrocyte sedimentation rate and complete blood counts, screening for antinuclear antibodies, human immunodeficiency virus (HIV)-1 or HIV-2, hepatitis B virus, hepatitis C virus and/or hepatitis E virus, immunoglobulin G (IgG), IgA and IgM,
- Endocrine function: serum levels of cortisol and adrenocorticotropic hormone (ACTH), luteinizing hormone (LH), follicle-stimulating hormone (FSH), estradiol, testosterone, thyroid-stimulating hormone (TSH) and free T4
- Gastrointestinal function: pretreatment bowel movements (Martins et al., 2019)

Scope of the Problem

Immunotherapy has had a powerful impact on the survival and quality of life of cancer patients (Esfahani et al., 2020). Ling et al. (2022) found that the addition of immunotherapy as monotherapy or in combination with conventional treatment improved quality of life and progression free survival. These benefits were especially apparent in cases where first line therapy had failed (Ling et al, 2022). With continuous success treating various diseases the indications for immunotherapy continue to expand. As immunotherapy is more frequently utilized to treat both oncology and non-oncology diseases, the need to recognize IRAE's by

healthcare professionals becomes imperative (Martins et al., 2019). IRAEs lead to treatment disruption, delay, and cessation. Disruption of treatment regimens can prove fatal in a vulnerable patient population (Myers, 2018).

IRAE's can be difficult to diagnose and differentiate from conditions with similar presentations. Gondal et al. (2016) presents a case of immunotherapy induced colitis mistaken for Clostridium difficile (C. difficile). Immune checkpoint inhibitors (ICI), a type of immunotherapy, are known to cause gastrointestinal toxicity in the form of colitis. ICI-induced colitis mimics inflammatory bowel disease and can occur alongside C. difficile. Differentiating the cause of colitis is paramount because management of each condition is different. ICI induced colitis is managed with steroids as opposed to antibiotic management used in other forms of colitis. Initiation of steroids in the early stages of ICI induced colitis has been shown to result in more favorable outcomes, while late-stage ICI may result in mortality (Gondal et al., 2017).

According to Ling et al. (2022), one in every five patients receiving immunotherapy will experience an IRAE and the risk increases if the patient is on more than one immunotherapy product or has an autoimmune disease. These IRAEs include dermatologic, endocrine, pulmonary, cardiac, and gastrointestinal (GI) toxicities. Immunotherapy AE's are complicated to manage (Ling et al., 2022). They vary in onset and resolution and are influenced by the type of immunotherapy used, its mechanism of action, and the route of administration. In contrast, chemotherapy and radiation adverse effects are predictable and occur in a cyclic pattern following treatment.

Significance to Nursing

Many immunotherapy regimes are given intravenously in a doctor's office, clinic, or outpatient Infusion Center (Immunotherapy, 2022). Oncology nurses administer direct care to these patients and are in a unique position to assess for immune related toxicities before administering the next dose. Immunotherapy is a newer treatment modality than chemotherapy in Oncology. Much of the training in the Infusion Center focuses on the adverse effects of chemotherapy. Early recognition and treatment of IRAEs are vital to prevent severe, irreversible damage (Farid et al., 2020).

Knowledge Gaps

Most education established in cancer care is geared towards the identification and management of chemotherapy adverse effects. In addition, many articles use the term chemotherapy as a blanket term to represent patients receiving both chemotherapy and immunotherapy, even though mechanism of action, chemical makeup, adverse effects, and management of adverse events differ between the two. Additional information focused on the identification and management of immunotherapy adverse events for Infusion Center nurses needed.

Furthermore, additional information was needed on how many Oncology and non-Oncology patients using immunotherapy experience immunotherapy related adverse events (IRAEs). No clear statistical data on the subject was found. Moreover, most literature focuses on the IRAEs reported from Immune Checkpoint Inhibitors solely. This may be because more ICIs are approved for and are being used as treatment for more diseases than other classes of immunotherapy. Additional information on the incidence of AEs in administration of

monoclonal antibodies and the recently approved chimeric antibody receptor (CAR) T-cell therapy, is needed.

II. Summary of the Literature

A review of the literature was conducted using The Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Medline, Elton B. Stephens Company (EBSCO) host, and google scholar databases. The search strategy applied was the Boolean method in which simple operators, such as "AND", "OR", and "NOT", are used to combine or exclude terms in a search producing more focused results. The goal of this review was to analyze the current literature on the definition of immunotherapy, what specialties utilize immunotherapy, and for what specific diseases. The adverse effects (AE) and toxicities associated with immunotherapy use, the prevalence and incidence of theses AE's, which scales, if any, are available to determine level of toxicity, the validity of those scales, tools to assess nurses' knowledge of immunotherapy AE's, nurse's barriers to knowledge, what gaps in knowledge pertaining to immunotherapy AE's exist, and the benefits of educational interventions for healthcare providers were also evaluated. The keywords used for this search were immunotherapy, adverse effects, toxicities, screening tools, scale, gaps, and barriers. Synonyms of keywords were allowed.

Inclusion Criteria

A search was performed of works published between 2017 and 2022 of the most relevant and recent peer reviewed, evidence-based articles, and clinical resources in the English language. No geographic limitation was used. The articles had to include the word immunotherapy, uses for immunotherapy, toxicities or AE's of immunotherapy, statistics pertaining to immunotherapy

AE's, screening tools for immunotherapy AE's, and instruments to measure nurses' knowledge, attitude, or confidence toward immunotherapy administration or AE's.

Exclusion Criteria

Articles were excluded if they did not include information pertaining to immunotherapy, its uses, toxicities, and adverse effects. Duplicate articles, articles specific to only pediatric populations, in a language other than English, not full text, opinion, or editorial articles were also excluded.

The search generated a total of 85 articles: CINAHL (n = 25), Google Scholar (n = 25), Ebscohost (n = 15), Pubmed (n = 10), Medline (n = 10). After the exclusion and inclusion criteria were applied 9 full text articles were utilized for this review, including 4 quantitative, 4 qualitative, and 1 systematic review.

Immunotherapy Related Adverse Events (IREAs)

For this review seven articles were identified as relevant regarding information on IRAEs. El Majzoub et al. (2019) performed a review of the literature about ICI related adverse events and found diarrhea, colitis, nephritis, pneumonitis, dermatologic side effects (rash, erythema, pruritis, photosensitivity), pancreatitis, hepatitis, hypohysitis, myocarditis, thyroiditis, vasculitis, adrenalitis, hematologic, and ophthalmologic adverse effects to be the most reported AE's. Information was collected from the medical charts of 1,994 patients in an Oncology Center over a five-year period. Hargadon et al. (2018) reported colitis as the most frequent adverse effect with 40% of patients experiencing this AE. Less common AE's reported were pneumonitis, hepatitis, and endocrinopathies. Rarely experienced AE's included renal toxicity, myocarditis, neurotoxicity, hematologic, and ocular toxicities.

Jaswani et al. (2017) presents a case study of a patient developing colitis after four cycles of ICI therapy, initially mis-diagnosed as C. difficile and eventually determined to be ICI related. In 2018, Koury et al. reported that 10-15% of patients receiving immune checkpoint inhibitors develop adverse events categorized as severe. The most common being colitis in 31% of patients receiving ICI therapy followed by skin rash, endocrinopathies, and hepatitis. Martins et al. (2019) noted that ICI-associated adverse effects are fatal in 0.3%-1.3% of cases, which is still lower than the rate of chemotherapy adverse effect related fatalities at 0.9%-15%. If toxicities with immunotherapy occur, they tend to happen within the first few cycles, with a median time to fatal toxic event being 14.5 days for combination therapy and 40 days with monotherapy. Rate of toxicities are also higher in patients receiving more than one immunotherapy agent or in combination with chemotherapy and radiation therapy. Fatalities differ between agents. CTLA-4 ICI's highest fatalities are caused by colitis. PD-1 and PD-L1 fatalities are mostly from pneumonitis, neurotoxicity, and hepatitis. Colitis is also the most frequent toxicity in combination therapy (Martins et al., 2019).

CAR-T cell therapy products are associated with cytokine release syndrome (CRS) and neurotoxicity. Neelapu (2019) utilized the American Society for Blood and Marrow Transplantation (ASBMT) grading system for management criteria of CRS. The ASBMT also refined a scale for assessment of neurologic symptoms, referred to as immune effector cell-associated neurotoxicity syndrome (ICANS), called the ASBMT ICANS. IRAEs at grades one or two are usually managed with supportive care and grades three or four may require pharmacologic management, dose reductions, cessation of treatment, and/or hospitalizations (Neelapu, 2019). In 2018, Srinivasan et al. documented a fatal case of ICI related pneumonitis

and reiterated the importance of clinician assessment of symptoms for timely treatment of IRAEs.

Nurse's Knowledge

Infusion Center nurses are key providers in the care of cancer patients (Parajuli et al., 2021). Offner and Rinke (2022) found that there was a lack of knowledge among Oncology nurses regarding immunotherapy administration. Immunotherapy is changing the complexity and standard of care for Oncology patients. There is a need for ongoing education necessary for this treatment modality (Offner & Rinke, 2022). Due to the growing use of immunotherapy in Oncology, clinicians would benefit from increased knowledge on the clinical presentation, diagnosis and management of associated toxicities (Martins et al., 2019).

Nurse's Confidence

Offner and Rinke (2021) established a positive correlation between nurse's knowledge and confidence related to administration and monitoring of patients receiving immunotherapy, and in the identification and management of immune related adverse events (IRAE). In a study performed in 2021, Oncology nurse's confidence regarding immunotherapy administration, monitoring, and IRAE management increased 51% following an educational intervention. Parajuli et al. (2021) found that Oncology nurses perceived higher confidence the more experience and training they had. Continuing education is essential to optimal nursing care and has been linked to increased confidence among healthcare providers (Ling et al., 2022).

Oncology Nursing Society (ONS) Infusion Nurse Certification

The Oncology Nursing Society provides continuing education (CE) courses and general information on chemotherapy and immunotherapy for healthcare professionals. Oncology nurses

and healthcare professionals can gain certification as a chemotherapy/biotherapy provider after completing the beginner or intermediate course on this topic. The ONS/ONCC chemotherapy immunotherapy certification course is 16.30 contact hour. This CE reinforces critical information for safe administration of chemotherapy and biotherapy and the use of evidence-based research to manage acute side effects and adverse events related to chemotherapy and immunotherapy (ONS).

The Oncology Nurse Immunotherapy Confidence Survey (ONICS)

In 2021, Offner and Rinke created the Oncology Nurse Immunotherapy Confidence Survey (ONICS) to gauge Oncology nurse's confidence on administration of immunotherapy and management of immunotherapy related adverse events (IRAEs). The survey was created to boost confidence of nurses in the Infusion Center administering immunotherapy through offering an educational intervention on immunotherapy. According to Offner and Rinke (2021), Oncology nurses often lack the knowledge of how immunotherapy works. Immunotherapy IRAEs are complex, and many new immunotherapy drugs have emerged in the 20th century. Continuous education on immunotherapy administration and immune related adverse effects would benefit clinicians working in the infusion center (Offner & Rinke, 2021). Validity of the Oncology Nurse Immunotherapy Confidence Survey (ONICS) was confirmed using five expert volunteers and reliability was confirmed using a test-retest reliability analysis with a separate group of five experts. The ONICS measured 28 confidence points of ten ONS chemotherapy/biotherapy certified nurses in an Oncology Center. Post-education results showed a 51% increase in nursing confidence in management after the educational intervention compared to the pre-test (Offner & Rinke, 2021).

IRAE Grading System

The National Cancer Institute Common Terminology Criteria for Adverse Events (NCI-CTCAE) is an assessment tool organized by anatomical or physiological system or etiology, that aids clinicians in determining severity of common adverse events seen in Oncology. Created by the National Cancer Institute (NCI), primarily for the evaluation of patients with cancer, this tool has been adapted across specialties as a reference tool in classifying the severity of symptoms. This document defines an adverse event as an unintended sign or symptom, including abnormal laboratory findings. The NCI-CTAE promotes uniformity in medical reporting, documentation, and management of the adverse effects experienced by patients receiving Oncology and non-Oncology treatments. Grades 1 is asymptomatic to mild symptoms, not indicating a need for intervention. Grade 2 is mild to moderate toxicity with local noninvasive intervention warranted as supportive care. Grade 3 suggests severe symptoms that are not immediately life-threatening, but medical intervention warranted, including the need for possible hospitalization. Grade 4 indicates life threating symptoms with urgent intervention needed, and grade 5 is death related to adverse events of treatment (U.S. Department of Health and Human Services, 2022).

Barriers to Clinicians Assessing IRAEs

Immunotherapy is a newer treatment modality in Oncology (Koury et al., 2018). As it gains popularity, the focus of research is to improve early detection and appropriate interventions to control the severity of IRAEs. There is currently no universal standard of care for IRAEs, and strategies for both early detection and effective interventions are still being explored (Hargadon et al., 2018). Many immunotherapy regimens for Oncology are available as infusions or injections, usually administered in an Infusion Center (ONS). No validated IRAE screening tool could be found for use in outpatient centers.

The NCI CTCAE (National Cancer Institute Common Terminology Criteria for Adverse Events) is a 146-page grading system used to standardize documentation of adverse events in oncology but is used across specialties (USDHHS, 2022). In 2019, Tan et al. reported discrepancies between patient reported severity of symptoms and clinician reported severity while using the NCI CTCAE tool. The discrepancies correlated with clinician time constraints, verifying that this tool may be too hefty to use as a quick reference guide in a fast-paced Infusion Center (Tan et al., 2019).

Furthermore, immunotherapy adverse effects are complex and similar in appearance to other diseases (Offner & Rinke, 2021). The comorbidities of many Oncology patients make the origin of their symptoms difficult to distinguish.

Summary

According to the literature, more IRAEs are reported by patients taking immune checkpoint inhibitors than in any other immunotherapy class. Colitis is the most common and fatal toxicity reported with onset between 14 to 40 days after initiation of treatment. Prompt recognition and management of IRAEs have resulted in favorable outcomes (Martine et al., 2019).

Immunotherapy is a complex treatment with many drug classes and mechanisms of action. Each drug class has special considerations for assessment. As immunotherapy was not approved for cancer treatment until recently, most Oncology nursing education is geared towards education and management of chemotherapy and radiation (Koury et al., 2018). More knowledge is needed on assessment and management of adverse effects of immunotherapy drugs. Infusion Center nurses are vital in the assessment of these IRAE's (Offer & Rinke, 2021).

III. Purpose/PICO Clinical Question/SMART Goals

Will an educational intervention improve confidence of Infusion Center nurses regarding identification and management of adverse events of immunotherapy based on pre and post test scores?

(P)-In Infusion Center nurses, (I)-an education intervention, (C)-Pre + Post test scores, (O)-improved confidence regarding identification and management of adverse effects of immunotherapy.

Purpose

The purpose of this study was to determine if an educational presentation would increase Infusion Center nurses' confidence regarding identification and management of immunotherapy adverse effects. As a result, the Infusion Center nurses' confidence regarding identification and management of adverse effects of immunotherapy will improve by the end of the training session.

SMART Goal

The goal of this study was to educate Infusion Center nurses on identification and management of adverse effects of immunotherapy. Using SMART (Specific, Measurable, Achievable, Relevant, and Timed) criteria, the quality of the formulated goal was assessed.

Specific: Improvement in confidence regarding identification and management of adverse effects of immunotherapy is a specific goal that the educational intervention was designed to meet.

Measurable: The DNP student measured the improvement in confidence regarding identification and management of adverse effects of immunotherapy using the same survey as a pretest-posttest questionnaire on the same participants.

Attainable: The education intervention will include information on identification and management of adverse effects of immunotherapy. This information should increase Infusion Center nurses' confidence towards identification and management of immunotherapy adverse events.

Relevant: Improvement in confidence of identification and management of adverse effects of immunotherapy aided infusion nurses in everyday assessment of their oncology patients.

Time-bound: This goal was met immediately after the education workshop on identification and management of adverse effects of immunotherapy was complete.

IV. Organizational Assessment and SWOT Analysis

Organizational Assessment

The site of this QI project is a cancer center, recognized by the National Cancer Institute (NCI) as a cancer center of excellence, focused on developing new and better approaches to cancer prevention, diagnosis, and treatment through research. This facility contains several outpatient clinics including a pediatric oncology clinic, a radiation oncology suite, a Mohs surgery center, psychosocial oncology suite, a comprehensive treatment center with infusion unit, and a 40-bed inpatient unit. The cancer center is a part of a larger organization that includes a private university and hospital. It is in a large metropolitan area and has 10 satellite clinics within a 35-mile radius of the facility. The mission statement of this institution is to reduce the burden of cancer and promote well-being in the community through increased access to research

and clinical trials. The goal of this organization is to attract outstanding cancer care providers to provide exceptional patient experience and quality cancer care.

This facility has over 400 cancer-focused providers and administers care to patients from over 84 countries, domestic and international. There are 15 "site-disease" groups made up of multidisciplinary teams of experts in that Oncology specialty area. This QI project will be performed in the Infusion Center of this facility. The terms Infusion Center and infusion unit are used interchangeably in this project. The Infusion Unit contains 41 chairs and 7 private rooms. It is open to all outpatient specialties but focuses on providing care to Oncology patients. The Infusion Center consists of 23 staff registered nurses (RNs), 4 charge RNs, 3 advanced practice registered nurses (APRNs), and 7 certified nursing assistants (CNAs). The RNs on the unit are males and females between the ages 25 to 75 with at least 2 years of experience in nursing and specialty certification from the ONS to administer chemotherapy/biotherapy products.

SWOT Analysis

A strengths, weakness, opportunities, and threats (SWOT) analysis is used to evaluate the internal and external environment of an organization. Internal aspects are features within an organization's control and external aspects are not. Strengths are internal components that further the goals of the organization. Weaknesses, also internal, inhibit the organization's success. Opportunities and threats are external elements of an organization. Opportunities are factors that can help an organization reach its goals, and threats are barriers to success (Benzaghta et al., 2021).

Strengths

The strengths of this organization are its distinguished reputation as a top tier cancer center of excellence, renowned Oncology providers, and an esteemed research designation from the NCI. The Infusion Center is the only NCI designated and nationally ranked cancer center in the region. The NCI designation provides millions in research funding, increased access to novel cancer therapies, survivorship programs, and clinical trials. The facility is highly invested in research and continuing education for professionals involved in patient care. The manager and staff of the unit were friendly, cooperative, and receptive towards participating in this project. The infusion unit is fast paced, and the nurses need to quickly assess whether a patient's symptoms are immunotherapy related or not. Further education on the subject was warranted in this environment. These factors supported the need for this QI project.

Weaknesses

Weaknesses of the organization include overbooked schedules, under-staffed units, inadequate time for comprehensive assessment of each patient, and insufficient time for nurses to participate in continuing education activities. The popularity of the cancer center leads to a steady influx of patients. To accommodate the number of patients, the clinic staff must move fast, leaving little time for comprehensive assessments. Nurses must be knowledgeable of the drugs being given and assess for AEs quickly. Due to the fast pace of the unit, many nurses may be interested in participating in the intervention but may not be able to find the time to participate in between caring for patients.

Opportunities

With the large patient base, this organization could expand to add more satellite clinics, reaching a larger area, which would also relieve the patient load on the main center. There are not currently any established standard tools for the assessment of immunotherapy adverse effects. This facility created and added a simple immunotherapy AE tool in the EMR earlier this year. This facility could be the first to establish a standard assessment tool that may be adopted for use in other organizations.

Threats

The threat to this organization is rapid expansion and losing the quality of care that it is known for. Under-staffing and overbooking the schedule contributes to this threat. If the quality-of-care drops in this center, it may lose the funding and accommodations its known for. This QI project will benefit the facility in maintaining the high standards of care on the unit.

Table 1. SWOT Analysis

SWOT Analysis of Infusion Center	
Strengths • Distinguished reputation • NCI research designation • Cancer center of excellence accolade • Renowned oncology specialists • Oncology certified nurses • Receptive towards educational intervention	**Weaknesses** • Fast paced, busy environment • Inadequate time for staff participation • Under-staffed • Overbooked schedule
Opportunities • Develop standardized immunotherapy AE assessment tool • Expand number and locations of satellite clinics	**Threats** • Decreased of quality of care • Inadequate assessment protocols

V. Definition of Terms

The following terms for definition in the QI project include:

- Adverse effects- An unexpected medical problem that happens during treatment with a drug or other therapy (Cancer, n.d)
- Centers for Disease Control (CDC) - government agency whose mission is to prevent and control disease, injury, and disability (NCI, 2022)
- Chemotherapy- Treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing (Cancer, n.d)
- Confidence- a feeling or belief that you can do something well or succeed at something (The Britannica Dictionary, n.d)
- Cytopenia- condition of lower-than-normal number of blood cells (Cancer, n.d)
- Immunotherapy- type of cancer treatment that helps your immune system fight cancer (Cancer, 2019)
- Microenvironment- the cells, molecules, and structures (such as blood vessels) that surround and support other cells and tissues (cancer, n.d)
- Oncology Nursing Society (ONS)- professional association made up of over 100,000 members. Goal of education Oncology nurses and keeping high standard of care (ONS, n.d)
- Overall Survival (OS)- The percentage of people in a study or treatment group who are still alive for a certain period of time after they were diagnosed with or started treatment (Cancer, n.d)
- Quality of Life - an individual's perception of their position in life in the context of the culture and value systems in which they live (WHO, n.d)

- Radiation therapy- The use of high-energy radiation from x-rays, gamma rays, neutrons, protons, and other sources to kill cancer cells and shrink tumors (NCI, n.d.)
- Screening tool- identify patients early to provide intervention and avoid or reduce symptoms and other consequences, to improve health outcomes of the population (Iragorri & Eldon, 2018)
- U.S. Department of Health and Human Services (HHS) -government agency tasked with the health and well-being of all Americans, by providing effective health and human services (USDHHS, 2022)
- World health organization (WHO)- part of the United Nations that deals with major health issues. Sets standards for disease control and healthcare. Conducts education and research programs; and publishes scientific papers and reports. Goal of improving access to health care for people in developing countries (Cancer, n.d)

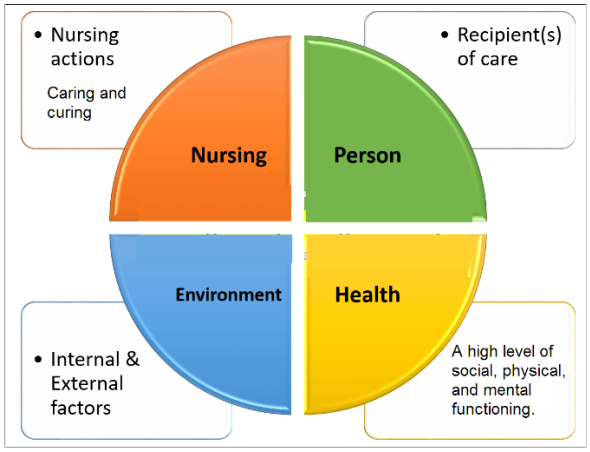
VI. Conceptual Underpinning and Theoretical Framework

Jean Watson's Model of Transpersonal Caring (1997) was the framework used to guide this project. This theory is concerned with how nurses express care to their patients. Her theory stresses the humanistic aspect of nursing and how it contributes to the healing process. The Transpersonal caring model states that nursing is "promoting health, preventing illness, caring for the sick, and restoring health" (Gonzalo, 2021). According to Watson, caring is central to nursing practice and promotes better health than purely medical interventions. The elements of her theory focus on human beings, health, and nursing. Human beings are to be valued, respected, nurtured, and understood. She saw humans as greater than just the sum of their parts. Health is defined in this context as overall physical, mental, and social functions, and absence of illness (Gonzalo, 2021). Watson presents 10 carative Factors" that nurses need to address with

their patients in order to have a caring environment. The 10 carative factors are: Watson's 10 carative factors are: forming humanistic-altruistic value systems, instilling faith-hope, cultivating a sensitivity to self and others, developing a helping-trust relationship, promoting an expression of feelings, using problem-solving for decision-making, promoting teaching-learning, promoting a supportive environment, assisting with the gratification of human needs, and allowing for existential-phenomenological forces (Gonzalo, 2021).

Watson's caring model (1997) can be applied to Oncology nursing as a reminder to always treat the patient holistically and not just the disease. Nursing care is just as important as pharmaceutical intervention. The purpose of many treatments in oncology are to preserve quality of life, as opposed to curative (Ling et al, 2022) According to this model in managing cancer treatment symptoms and improving quality of life patient prognosis should be improved as every aspect of the human is linked. Early detection and management of IRAEs are important to preserve quality of life for oncology patients (Ling et al., 2022). Watson's theory of caring supports the purpose of this DNP project.

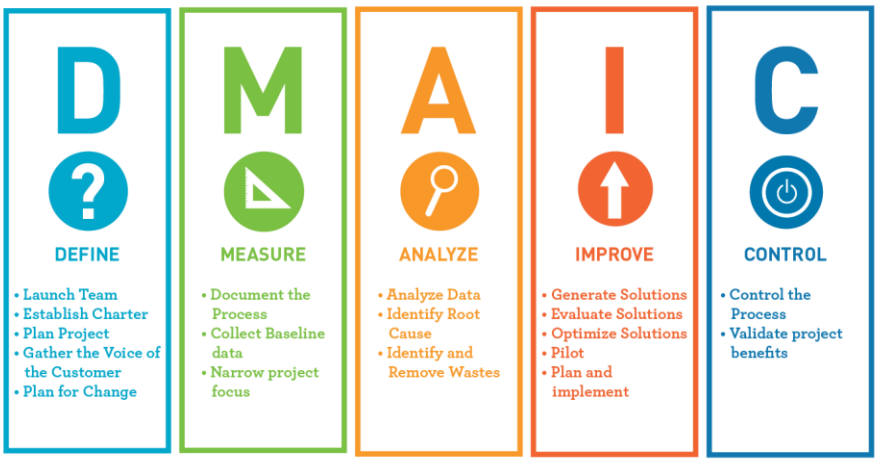
Figure 1. Watson's Theory of Transpersonal Caring



VII. Methodology

The Six Sigma method is a quality improvement model that was developed by Bill Smith in 1986 while working at Motorola. It was first applied in manufacturing companies but is now widely used by medical facilities and departments. The goal is to control variation in an organization's processes for improved outcomes (Mckay, 2017). According to Shen et al. (2022) Six Sigma is used in healthcare to point out the issues related to clinical practice and find solutions. It has been demonstrated to reduce adverse events, improve infusion nursing satisfaction, and reduce incidence of dispute events (Shen et al., 2022). The central tool of this model is the DMAIC (define, measure, analyze, improve, control) (Mckay, 2017) Figure 2.

Figure 2. DMAIC Model



Define

The first step in this model is to define the problem (Palghat, 2020). The problem in this project is the lack of knowledge and confidence among infusion nurses regarding

immunotherapy adverse effects. This is also the stage where goals are set. The goal of this project is to improve nurse confidence of immunotherapy adverse effects. The stakeholders are the Infusion Center staff nurses, the nurse manager, and the nursing educator.

Measure

In the measure stage, the projects metrics are defined, and data is collected (Palghat, 2020). A search and summary of the literature was performed in order to ascertain the scope of the problem and what gaps in knowledge exist among nurses and the barriers to them seeking more knowledge. The project measured nurse confidence using a pretest-posttest design, with posttest immediately after the educational workshop.

Analyze

The analyze stage is used to analyze data, identify efficiency of the process, identify variations and remove waste (Palghat, 2020). The change in nurses' confidence was assessed using pre-test and post-test scores. The test scores were analyzed using paired t-tests.

Improve

The improvement stage is used to optimize solutions but also to discover relationships between variables (Palghat, 2020). During the improvement of this QI project, the relationship between knowledge and confidence was discovered.

Control

In the control stage, benefits are validated (Palghat, 2020). The benefit was an increase in infusion center nurses' confidence regarding identification and management of immunotherapy

adverse events. This project was successful as there was an increase in infusion center nurses' confidence.

Plan

Study Design

This quality improvement (QI) project was based on a pretest/posttest design.

Setting

This QI project was conducted in an outpatient Infusion Center that serves patients from all specialties, the majority being Oncology patients, many of whom receive immunotherapy.

Sample

There were 23 Infusion Center nurses that participated in this project.

Intervention

A 35 minute in person education workshop on how to identify and manage immunotherapy adverse events was presented.

Instruments

A Demographic and Professional Data Form with participant's age, gender, ethnicity, position, and years of experience was used. A modified Oncology Nurse Immunotherapy Confidence Survey (ONICS) was used as the pretest and posttest.

Data Analysis

Paired t-tests were used to analyze results of the modified ONICS pre and post tests completed by participants before and after the education presentation. Descriptive statistics were

used to analyze the data of the Demographic and Professional Data Form. The ONICS pretest/posttest survey data was uploaded to GraphPad Prism for data analysis using the DNP candidate's password protected computer. The data from both surveys were scored individually and a mean score was calculated. Scores were analyzed using paired t-tests to compare mean confidence scores of each set and of the total scores before and after the intervention. Using the paired t-test, p-values were obtained. A significance level of 0.05 was used for all statistical data.

Data Collection and Management

A flyer informing staff RNs in the Infusion Center about the project, including type of educational intervention and contact information for the DNP candidate, was posted in the unit break room and all nursing stations and common areas.

At the time of the education workshop a written consent form, The Demographic and Professional Data Form, and the Modified Oncology Nurse Immunotherapy Confidence Survey (ONICS) pretest/posttest was distributed to all participants in person and collected the same day. All study data was stored in a locked file cabinet in the locked office of the DNP candidate. For analysis, data was entered into an encrypted, password protected computer, only accessible by the DNP candidate. Data will be destroyed after completion of the study.

Protection of Human Subjects

The DNP candidate made it clear to participants that participation in the project was voluntary and that participants were entitled to withdraw from the project at any time without negative consequences. To maintain confidentiality, all forms and questionnaires were anonymous with no personal information or identifiers.

VIII. RESULTS

Demographics and Professional Data

Twenty-three registered nurses consented to participate in this quality improvement project. Of the 23 participants, 14 (61%) identified as female, and 9 (39%) identified as male. Participants fell between the age ranges of 25-35 (9%), 36-45 (35%), 46-55 (30%), and 56-65 (26%). Seventy percent of the participants identified as Hispanic, followed by African American (13%), White (13%), and Caribbean (4%). Most of the participants had over 10 years of experience in nursing (65%). Regarding Oncology nursing experience, 10 (43%) of the participants had over 10 years, 5 (22%) of the participants 5-10 years, 2 (9%) of the participants had 3-5 years, and 6 (26%) of the participants had less than 3 years of Oncology nursing experience. Over 80% of the participants had a bachelor's degree or higher. All demographic and professional data can be found in **Table 1**.

Table 1. Demographic and Professional Data of QI Project

	Count	Percent
Age *(n=23)*		
25-35	2	9%
36-45	8	35%
46-55	7	30%
56-65	6	26%
>65	0	0%
Gender *(n=23)*		
Male	9	39%
Female	14	61%
Other	0	0%
Ethnicity *(n=23)*		
African American/Black	3	13%
Asian/Pacific Islander	0	0%
Native American	0	0%
Hispanic	16	70%
White	3	13%
Caribbean	1	4%
Years of experience: nursing *(n=23)*		
3 or less	3	13%
3 to 5	2	9%
5 to 10	3	13%
10 or more	15	65%
Years of experience: oncology nursing *(n=23)*		
3 or less	6	26%
3 to 5	2	9%
5 to 10	5	22%
10 or more	10	43%
Highest earned nursing degree *(n=23)*		
Associate	3	13%
Bachelor	14	61%
Master	5	22%
Doctorate	0	0%
Other	1	4%

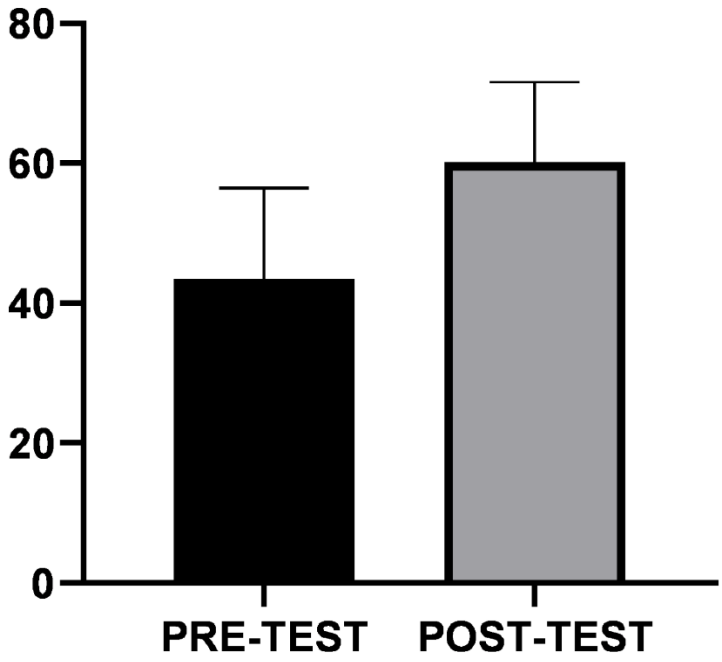
Pre-and-Post Test Data

The scores of the ONICS pre- and post-intervention surveys were analyzed in GraphPad. A two tailed paired sample t-test was performed, and the results are shown in **Table 2**. The pretest/posttest data p value was < 0.0001, indicating a statistically significant difference based on an alpha value of 0.05. A graph representing the mean scores of the pre- and post-intervention results is shown in **Figure 3**.

Table 2. Statistics of Confidence Scores

	Pre-Intervention	Post-Intervention	
Mean	43.522	60.174	*p*
SD	12.922	11.388	<0.0001

Figure 3. Graph of Mean Pre and Post-test Data Scores



IX. DISCUSSION

According to Ling et al. (2022), immunotherapy has improved the progression free survival rates and quality of life for patients undergoing treatment for Cancer. The main limitation of immunotherapy is immunotherapy related adverse effects (Ling et al., 2022). Early recognition and management of these adverse effects could prevent severe, irreversible damage, and unnecessary hospitalizations (Farid et al., 2020). This quality improvement (QI) project examined whether an education workshop regarding identification and management of Immunotherapy adverse events would increase Infusion Center nurses' confidence towards identification and management of Immunotherapy adverse events. According to Offner and Rinke (2021), continuous education in emerging cancer treatments produces an improvement in nurse knowledge, attitudes, and confidence. The modified ONICS pre- and –posttest contains two sections. The first section analyzes nurse's confidence towards management of immunotherapy adverse events. The second analyzes nurse's confidence towards identification of immunotherapy adverse events. The percentage of improvement in confidence for each section of the pre-and posttest surveys were analyzed, along with the overall improvement of confidence for both sections combined, for which the results are displayed in **Table 3**.

The pre-test/post-test data displayed an overall improvement in confidence of 39% for both sections combined. There was slightly more improvement of confidence in the management (41%) of immunotherapy adverse events, than in the identification (38%) of immunotherapy adverse events. The paired t-test findings suggested the education workshop's effect on infusion center nurses' confidence regarding identification and management of immunotherapy adverse events was statistically significant ($p<0.0001$). The pre- and -post test data supports the review of

the literature, which showed that nurses' confidence tends to increase when they are supplied with education and training (Offner & Rinke, 2021).

Over 65% of the registered nurses that participated in the QI project reported having over 10 years of nursing experience and 43% had over 10 years of experience in oncology according to data from the Demographics and Professional Data Form. Of the 23 participants, 15 of them scored a starting confidence level of over 60%, reflected from the pre-test scores. It could be assumed that there would have been an even greater increase in confidence if the QI project included more novice nurses. In a qualitative study conducted in 2023, Najafi and Nasiri reported that novice nurses expressed a lack of knowledge that affected their self-confidence and that a lack of self-confidence reduces the quality of care. They concluded that nursing experience should be considered when presenting nursing education (Najafi & Nasiri, 2023).

Table 3. **ONICS Pre-and-Posttest Data**

	ONICS: Management	ONICS: Identification	ONICS: Overall
Pretest	484	505	989
Posttest	686	699	1385
Improvement	41%	39%	40%

X. LIMITATIONS

Several limitations were encountered by the DNP candidate during the planning and implementation of the QI project. The initial limitation was finding a scale with established reliability and validity that measured nurses' knowledge of immunotherapy treatment and management. The Oncology Nurse Immunotherapy Confidence Survey by Offner and Rinke (2021) was ultimately selected as it had been tested for reliability and validity and also contained specific sections related to immunotherapy identification and management.

Participant availability was another limitation as the Infusion Center is very busy and nurses had to find coverage for over 30 minutes to participate in the QI project. The QI project was also limited to one unit of the Infusion Center as each unit has a separate nurse manager and would require individual clearance and nursing coverage coordination.

The QI project being restricted to one unit limited the number of new nurses that could participate in the QI project. Additionally, orientation at the Infusion Center is done in groups and a group of at six nurses who were new to Oncology was set to start on the unit one month after the scheduled date of the education workshop.

XI. IMPLICATIONS FOR ADVANCED PRACTICE NURSING

This DNP QI project presents the benefits of an education workshop on the confidence of Infusion Center nurses. Moreover, it reveals the need to train Infusion Center clinical staff on how to recognize and manage immunotherapy adverse events. Furthermore, it implements an educational program that should help educate the nursing staff, increase their clinical skills, and equip them to accurately screen and manage patients for immunotherapy toxicities. According to Offner and Rinke (2021), oncology nurses' confidence improves when provided with treatment-

related, drug class–specific education. The success of this project demonstrates the positive role of nurse practitioners in improving healthcare practices.

XII. DISSEMINATION

The QI project will be submitted for a poster presentation to the National Comprehensive Cancer Network (NCCN) 2024 Annual Conference. The conference is set to be held in Orlando from April 5th to April 7th, 2024.

The QI project results were shared with administration and nursing staff at the site of the intervention. The PowerPoint slides were printed and added to the unit's education resource binder at the nursing station. The binder is available to all nurses as a reference and contains unit policies and pharmaceutical information on some of the most common treatments given on the unit.

XIII. CONCLUSION

Immunotherapy is an important treatment modality in medicine today. It is utilized across many specialties for the treatment of Oncology and non-Oncology patients (Martins et al., 2019). Immunotherapy is a main treatment staple in Oncology and has been shown to improve progression free survival rates and quality of life for patients with cancer. Due to the few infusion reactions and side effects of immunotherapy it is an option for elderly patients, patients with serious co-morbidities, and others who aren't candidates for surgery, chemotherapy, or radiation (Ling et al., 2022). The main limitation of immunotherapy are immunotherapy-related adverse events (IRAE's). Early recognition and management of Immunotherapy adverse events is instrumental in avoiding hospitalization, delay in treatment, and poor health outcomes for those on this treatment (Martins et al., 2019). This QI project established that an education

intervention resulted in an increase in the confidence of Infusion Center nurses in identifying and managing Immunotherapy adverse events. It can be assumed that similar education interventions would benefit novice and experienced nurses when being transitioned into an oncology specialty unit.

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XV. APPENDICES

FIU | Research & Economic Development
FLORIDA INTERNATIONAL UNIVERSITY

MEMORANDUM

To: Dr. Deborah Sherman

CC: Susan Demming

From: Carrie Bassols, BA, IRB Coordinator CeB

Date: March 28, 2023

Proposal Title: "An Educational Intervention for Infusion Center Nurses to Improve Their Confidence in Identifying and Managing Immunotherapy Adverse E_{vents}, Based on Changes in Pre and Post-test Scores: A Quality Improvement Project"

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #: IRB-23-0139 **IRB Exemption Date:** 03/28/23 **TOPAZ Reference #:** 112837

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.

1) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

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ADULT CONSENT TO PARTICIPATE IN A RESEARCH STUDY

An educational intervention for Infusion Center nurses to improve their confidence in identifying and management of immunotherapy adverse events, based on changes in pre and post-test scores: A quality improvement project

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** The purpose of the study is to increase nurses' confidence regarding identification and management of immunotherapy adverse events.
- **Procedures**: If you choose to participate, you will be asked to fill out a Demographic and Professional Data form, A modified Oncology Nurse Immunotherapy Confidence Scale (ONICS) pretest questionnaire, sit for a 20-minute education PowerPoint, and fill out the Modified ONICS post-test.
- **Duration:** This will take about approximately 35 minutes.
- **Risks**: The main risk or discomfort from this research is brief interruption of workflow on the nursing unit.
- **Benefits:** The main benefit to you from this research is increased confidence regarding identification and management of immunotherapy adverse events.
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

PURPOSE OF THE STUDY

The purpose of this study is to determine if an educational intervention for Infusion Center nurses would improve their confidence in identification and management of immunotherapy adverse events, based on changes in pre and post-test scores.

NUMBER OF STUDY PARTICIPANTS

If you decide to be in this study, you will be one of approximately 20 people in this research study.

DURATION OF THE STUDY

Your participation will involve 35 minutes of your time.

PROCEDURES

If you agree to be in the study, we will ask you to do the following things:

1. Participants will be asked to sign the written informed consent.
2. Following the signing of the consent, candidates will be asked to complete the Demographics and Professional Data form and the modified ONICS pre-test.
3. The educational workshop to increase confidence in identifying and management of immunotherapy adverse events will be conducted immediately after completion of the modified ONICS pretest.
4. Following the education workshop participants will be asked to complete the modified ONICS post-test.

RISKS AND/OR DISCOMFORTS

The study has the following possible risks to you: Brief disruption in workflow as the education workshop will be during work hours. The infusion center manager and nurse educator will aid in scheduling coverage and sending participants in shifts in order to mitigate this risk.

BENEFITS

The study has the following possible benefits to you: Increase in nurses' confidence regarding identification and management of immune related adverse events in patients receiving immunotherapy.

ALTERNATIVES

There are no known alternatives available to you other than not taking part in this study Any significant new findings developed during the course of the research which may relate to your willingness to continue participation will be provided to you.

CONFIDENTIALITY

The records of this study will be kept private and will be protected to the fullest extent provided by law. In any sort of report we might publish, we will not include any information that will make it possible to identify you. Research records will be stored securely, and only the researcher team have access to the records. However, your records may be inspected by authorized University or other agents who will also keep the information confidential.

- All study data will be stored in a locked file cabinet in a locked office only accessible by the DNP candidate.

The U.S. Department of Health and Human Services (DHHS) may request to review and obtain copies of your records. The Food and Drug Administration (FDA) may request to review and obtain copies of your records.

USE OF YOUR INFORMATION

- Identifiers about you might be removed from the identifiable private and that, after such removal, the information could be used for future research studies or distributed to another investigator for future research studies without additional informed consent from you or your legally authorized representative; or
- Your information collected as part of the research will not be used or distributed for future research studies even if identifiers are removed.

COMPENSATION & COSTS

There is no compensation provided to the subject. There are no costs to you for participating in this study.

RIGHT TO DECLINE OR WITHDRAW

Your participation in this study is voluntary. You are free to participate in the study or withdraw your consent at any time during the study. You will not lose any benefits if you decide not to participate or if you quit the study early. The investigator reserves the right to remove you without your consent at such time that he/she feels it is in the best interest.

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research study you may contact Susan Demming, MSN. APRN, FNP-BC at (954)-479-7160, and/or sdemm002@fiu.edu.

IRB CONTACT INFORMATION

If you would like to talk with someone about your rights of being a subject in this research study or about ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

PARTICIPANT AGREEMENT

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. I understand that I will be given a copy of this form for my records.

_____ _____

Signature of Participant Date

_____

Printed Name of Participant

_____ _____

Signature of Person Obtaining Consent Date

Recognizing Immunotherapy Adve Events: A Quality Improvement Project

Attention Infusion Center Nurses:

To provide excellent patient care, this quality improvement project will help in the early recognition of immunotherapy adverse events and minimization of related complications.

You are invited to an in-person education workshop regarding immunotherapy adverse events which will be available to both day and night shift nurses. All participants will be asked to complete a Demographic and Professional Data Form, and pretest and posttest Confidence Survey regarding immunotherapy adverse events.

Increasing your knowledge regarding immunotherapy demonstrates your commitment to the safety and well-being of your patients with cancer.

For interested participants, please contact Doctor of Nursing Practice Candidate, Susan Demming MSN, APRN, FNP-BC at (954) 479-7160 or sdemm002@fiu.edu

Demographics and Professional Data Form

Age range

☐ 25-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ 65 and older

Gender

☐ Male ☐ Female ☐ Other

Ethnicity

_____ African American/Black

_____ Asian/Pacific Islander

_____ Native American

_____ Hispanic

_____ White

_____ Caribbean

_____ Other

Years of experience in nursing

☐ 3 or less ☐ 3-5 ☐ 5-10 ☐ 10 or more

Years of experience in Oncology nursing

☐ 3 or less ☐ 3-5 ☐ 5-10 ☐ 10 or more

Highest earned nursing degree

☐ Associate ☐ Bachelor ☐ Master ☐ Doctorate ☐ Other

_____

Modified Oncology Nurse Immunotherapy Confidence Survey

Part I: Nurse confidence with management of the patient receiving immunotherapy in cancer treatment, including monoclonal antibodies, immune checkpoint inhibitors, cancer treatment vaccines, and other non-specific immunotherapies. Please indicate your confidence level using the scale below for each of the following statements:

1. My understanding of the mechanism of action of monoclonal antibodies used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
2. My understanding of the mechanism of action of immune checkpoint inhibitors used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
3. My understanding of the mechanism of action of cancer vaccines used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
4. My understanding of the mechanism of action of other non-specific immunotherapies used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
5. My ability to educate the patient and appropriately answer their questions on how monoclonal antibodies work:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
6. My ability to educate the patient and appropriately answer their questions on how immune checkpoint inhibitors work:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
7. My ability to educate the patient and appropriately answer their questions on how cancer treatment vaccines work:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
8. My ability to educate the patient and appropriately answer their questions on how other nonspecific immunotherapies used in cancer treatment work:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident

Part II: Nurse confidence with the identification and management of immune related adverse events associated with monoclonal antibodies, immune checkpoint inhibitors, cancer treatment vaccines, and other non-specific immunotherapies in cancer treatment. Please indicate your confidence level using the scale below for each of the following statements:

9. My understanding of the mechanism behind how immune related adverse events develop:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
10. My understanding of how to obtain an appropriate baseline assessment of my patients, as it relates to immune related adverse events:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
11. My ability to recognize patient deviations from baseline that could identify the potential development of an immune related adverse event:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
12. My understanding of the appropriate treatment that is needed with immune related adverse event management:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
13. My ability to educate my patients on immune related adverse events that may occur with monoclonal antibodies used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
14. My ability to educate my patients on immune related adverse events that may occur with immune checkpoint inhibitors used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
15. My ability to educate my patients on immune related adverse events that may occur with cancer treatment vaccines:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident
16. My ability to educate my patients on immune related adverse events that may occur other non-specific immunotherapies used in cancer treatment:	Not Confident	Somewhat Confident	Confident	Very Confident	Extremely Confident