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Chemotherapy-Induced Peripheral Neuropathy Education and Assessment

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Doctorate of Nursing Practice

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This Practice Innovation Project is approved as a credible and independent investigation by a candidate for the Doctor of Nursing Practice degree and is acceptable for meeting the project requirements for this degree. Acceptance of this practice innovation project does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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Abstract

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Chemotherapy-induced peripheral neuropathy (CIPN) is a debilitating side effect of most chemotherapeutic agents used to treat cancer. To ensure the best possible care and outcomes for patients, nurses should be at the forefront of CIPN education and patient assessments. The purpose of this project was to evaluate an educational intervention for oncology nurses on CIPN and CIPN patient assessment by assessing the knowledge and confidence level of nurses in assessing CIPN before and after an educational session. The methodology for this project was a quasi-experimental one-group pretest multiple posttest design with a convenience sample of nurses employed by the Cancer Center. Questionnaires with Likert scale measurements for nurses' confidence and multiple choice questions for nurses' knowledge were used to gather data. The mean confidence level increased from pretest to both posttests, and statistical significance was reached in the increase in overall confidence. The nurses showed increased knowledge with statistical significance reached. Further inquiry is suggested with a larger sample size and a confidence and knowledge test that has been tested for validity.

Keywords: *Chemotherapy-induced peripheral neuropathy, neuropathy, nursing education, nursing knowledge, nursing confidence, oncology nurses, infusion nurses, cancer, oncology, professional development, nurse continuing education, nurse assessment.*

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List of Abbreviations

ASCO- American Society of Clinical Oncology

CIPN- Chemotherapy induced peripheral Neuropathy

CNP- Certified Nurse Practitioner

CTC- Common toxicity criteria

EBP- Evidence-Based Practice

EMR- Electronic Medical Record

FACT/GOG-Ntx- Functional Assessment of Cancer Therapy/Gynecologic Oncology Group- neurotoxicity

NCCN- National Comprehensive Cancer Network

NCI-CTC- National Cancer Institute- Common Toxicity Criteria

ONS- Oncology Nursing Society

PN- Peripheral neuropathy

QoL- Quality of Life

SDSU- South Dakota State University

TNS- Total Neuropathy Score

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Chapter I: Introduction and Background

Introduction

Peripheral neuropathy (PN) occurs because of damage or dysfunction of peripheral nerves, which can impair motor, sensory, and autonomic function (Stubblefield et al., 2009). These impairments can lead to decreased quality of life (QoL), decreased ability to manage activities of daily living, decreased physical abilities, and possibly decreased life expectancy (Stubblefield et al., 2009). Many chemotherapeutic agents given to treat cancer can cause PN and most cancer types are treated with neurotoxic chemotherapy (Hershman et al., 2014; Stubblefield et al., 2009). Understanding PN and its early detection are imperative for effective management of chemotherapy-induced peripheral neuropathy (CIPN) (Stubblefield et al., 2009).

Because CIPN is a devastating side effect of many chemotherapy agents, it is essential for nurses to know how to assess for this complication. Historically, CIPN has been more commonly discussed with patients because of voluntary reporting and not clinician query (Stubblefield et al., 2009). Oncology nurses often have a unique relationship with their patients because of the length of time spent with the patients from the time of diagnosis, throughout treatment, and follow up. This gives nurses the opportunity to build a relationship and work closely with patients and conduct thorough assessments. Oncology nurses believe assessments for CIPN are necessary, but lack the confidence to perform them (Binner, Ross & Browner, 2011). More education is needed to enable oncology nurses in performing routine assessments for CIPN in patients receiving neurotoxic chemotherapies.

Significance of the Problem

According to the American Cancer Society (2014), there are nearly 14.5 million cancer survivors in the United States, and this number continues to grow as the aging population grows. For cancer patients treated with multiple agents, the incidence of CIPN is approximately 38% (Hershman et al., 2014). Some patients will return to baseline; however, some patients are never able to improve. Currently, there is no cure for CIPN. Treatment is primarily focused on pain management. Chemotherapy may be manipulated through treatment delays or dose reduction to ameliorate CIPN in certain cases (Stubblefield et al., 2009).

The National Comprehensive Cancer Network (NCCN) guidelines recommend baseline assessment and continued assessment during treatment, which should include patient grading assessment, pain assessment, and functional assessment (Stubblefield et al., 2009). Treatment and referral must be prescribed by the providers, but nurses can play an integral role in assessing and identifying patients with CIPN. Binner et al. (2011) found that 75% of nurses studied believed their CIPN assessment skills were fair to poor and they lacked confidence in their assessment skills. With proper education, nurses should be appropriately prepared to administer the assessments necessary for CIPN which may increase the identification of and improve outcomes for patients with CIPN. Despite no cure or preventive treatment for CIPN, identification by nurses may benefit the patient through better symptom management and informed decision-making. Patients are more satisfied with treatment decisions when they feel well-informed (Martinez, Schwartz, Freres, Fraze, & Hornik, 2009). Early identification and intervention as able are extremely important; however, there is currently no gold standard for the evaluation

of CIPN (Stubblefield et al., 2009). The available guidelines on CIPN do not offer gold standard recommendations on how to educate nurses and assess patients (Hershman et al., 2014; Stubblefield et al., 2009; Visovsky, Collins, Abbott, Aschenbrenner, & Hart, 2007). The American Society of Clinical Oncology (ASCO) (Hershman et al., 2014) and Oncology Nursing Society (ONS) (Visovsky et al., 2007) guidelines focus on prevention and management of CIPN through pharmacologic and nonpharmacologic interventions. The NCCN guidelines are broader, but still do not suggest a specific protocol for healthcare provider education or patient assessments (Stubblefield et al., 2009).

Additionally, the assessment and documentation of CIPN in the Cancer Center was insufficient. The majority of patients treated at the Cancer Center are treated with neurotoxic chemotherapy, thus putting them at risk for CIPN. There was no formal process for adequate assessment of patients for CIPN in this clinic. All patients are queried about their pain level at every appointment; however, a generic query of pain on a scale of 1-10 is not specific enough for neuropathic pain (Mann, 2008). All cancer patients are asked to fill out the NCCN Distress Thermometer (Appendix A) prior to each appointment, which includes questions regarding symptoms experienced such as pain or tingling in the hands or feet. Albeit useful, this tool is not all encompassing of the aspects needed to fully assess for CIPN, particularly for function, motor, and sensory. A nurse-driven protocol was developed from the ONS PEP card for patients who call in to the Cancer Center with symptoms of CIPN (Visovsky et al., 2007). However, this protocol was not successfully implemented and there had been little to no education for the nurses on this topic. Nurses were requesting more education so they would feel more prepared to care for patients with CIPN.

Population of Interest

The population of interest for this project was oncology nurses in a Midwest outpatient Cancer Center caring for patients who have cancer and receive chemotherapy known to cause peripheral neuropathy. Oncology nurses are distinct because of the close contact they have with patients during a vulnerable period in their life. Oncology nurses often have a very close relationship with patients through which trust and rapport is built throughout cancer diagnosis, treatment, and follow ups, this allowing for open communication, education, and higher quality of care (Maxwell, 2013). Nurses that are educated about side effects and assessment techniques will ensure patients receive the highest quality care (Maxwell, 2013).

Clinical Question

The aim of this project was to evaluate an educational intervention for oncology nurses on CIPN and CIPN patient assessment. The clinical question was as follows: What is the effect of an educational program on oncology nurses knowledge of CIPN and confidence in assessing patients for CIPN over a three month period of time compared to baseline knowledge and confidence level? The following expands on the clinical question of interest in PICOT format.

P: Population of interest. The population of interest was oncology nurses at a Midwest outpatient Cancer Center that care for patients who receive chemotherapy known to cause peripheral neuropathy.

I: Intervention of interest. The intervention for this project was an education session for nurses about CIPN. An educational PowerPoint presentation with handouts

was presented to the nurses. Nurses were also educated on how to assess patients for CIPN with hands on demonstrations.

C: Comparison of interest. The project intended to compare nurses' knowledge of CIPN and their confidence level with assessing for CIPN, at baseline, immediately following education, and three months after education.

O: Outcomes of the interest. The intended outcomes for this project were to increase nurses' knowledge of CIPN and their confidence level with assessing for CIPN.

T: Time. The project was conducted over a 3 month period of time.

Purpose of the Project

The purpose of this project was to evaluate the knowledge of nurses regarding CIPN and their confidence level in assessing CIPN before and after an educational session. Without proper education, nurses may not identify patients with or at risk for CIPN so they can be properly managed. Nurses who lack knowledge of CIPN and lack confidence in CIPN assessment may not be able to properly care for patients and give them the best quality care possible. Without this project, there could have been a continued lack of understanding of CIPN and decreased confidence level of oncology nurses regarding CIPN. This could have led to less than ideal care for patients, decreased QoL, and possibly decreased life expectancy. This project has opened the door for ongoing projects aimed at increasing the identification, better staging of, and better management of CIPN.

Research Questions

The following are the research questions this project intended to answer:

1. What is the effect of an educational program about CIPN on oncology nurses' knowledge level?
2. What is the effect of education and hands on demonstration on nurses' confidence level in assessing for CIPN in patients?
3. What is the effect of a three month time lapse on the knowledge and confidence level of nurses in regards to CIPN?

Definitions

Oncology nurses care for patients and families who have or had cancer. The role of an oncology nurse is to monitor symptoms, educate patients, and advocate for the patient and family. During cancer treatments, patients may be seen in the office several times a week, or every few weeks. The oncology nurse may be the only healthcare provider patients see during some of these visits. Often times cancer survivors are monitored for years, or even for their lifetime, through which time patients become very acquainted with the healthcare providers in the Cancer Center.

Infusion nurses are nurses who administer IV medications. In the Cancer Center, infusion nurses administer several types of chemotherapy, biotherapy, hydration, anti-emetics, and many more drugs in an outpatient setting. Infusion nurses are with patients throughout treatment, which may last from several minutes to several hours. This provides a unique opportunity to create a relationship with patients.

Cancer Center refers to the local oncology clinic where the project took place, the setting. The Cancer Center is an adult outpatient medical oncology center and infusion center where office visits are conducted and chemotherapy, other infusions, and injections are administered.

Chemotherapy-induced peripheral neuropathy is a common side effect of some chemotherapy, known as neurotoxic chemotherapy, caused from damage or dysfunction of the peripheral nerves. Motor, sensory, and autonomic dysfunction can result from peripheral neuropathy (Stubblefield et al., 2009). Some of the signs and symptoms of CIPN include numbness, tingling, pain, gait disturbance, difficulty picking objects up or holding onto objects, diarrhea, constipation, urinary retention, impotence, and hypotension. Decreased QoL, disability, and possibly even shorter survival may result from CIPN. The exact cause of CIPN is not known. CIPN may also be referred to by the drug of cause- taxane induced peripheral neuropathy, or oxaliplatin induced peripheral neuropathy.

Neurotoxic chemotherapies are drugs given to patients, most commonly cancer patients, known to cause neurologic dysfunction, such as CIPN. It is not well-known why neurotoxic chemotherapies damage peripheral nerves and pathogenesis may vary with the drug used. Neurotoxic chemotherapies may damage sensory axons, causing deterioration and dying back of axons and myelin sheaths (Wickham, 2007). Cumulative doses of neurotoxic chemotherapy seem to cause more CIPN. Common neurotoxic chemotherapies include taxanes, platinums, vinca alkaloids, bortezomib, and thalidomide (Stubblefield et al., 2009).

Educational program for nurses on CIPN included a one-hour class with a PowerPoint presentation (Appendix B) and discussion conducted by the primary project lead. Information included in the educational program consisted of neurological pathophysiology, prevalence of CIPN, signs and symptoms of CIPN, and strategies to manage CIPN. Nurses were also educated through discussion and hands on demonstration on how to assess patients for CIPN. Handouts were given to the nurses covering information on how to assess patients for CIPN. The setting for the educational program was the Cancer Center break room as there was audiovisual equipment, adequate seating, and tables. One contact hour of continuing education credit was offered to participants. The Cancer Center manager applied for and was approved for one contact hour through the Washington State Nurses Association Continuing Education Approval & Recognition Program, which is accredited by the American Nurses Credentialing Center's Commission on Accreditation.

Confidence is the state of feeling comfortable or the belief in one's ability to do something (Merriam-Webster, n.d.). Confidence, or comfort, in performing CIPN assessments is a subjective measure expressed by each individual nurse, which this program intended to increase through education and practice.

Chapter II: Review of Literature and Model of Evidence-Based Care

Introduction

A comprehensive review of available research was performed for current literature on CIPN assessment recommendations, practice guidelines, nurses' role in assessment, and nurses' knowledge of CIPN. Search engines included CINAHL, EBSCOHost, Medline, Health Source, and OVID to search articles from 2004-2015 with combinations of the following terms: "cancer," "neoplasms," "oncology," "antineoplastic," "peripheral," "neuropathy," "peripheral nervous system," "chemotherapy induced peripheral neuropathy," "screening," "guideline," "nursing knowledge," "professional development," "nurse continuing education," "staff development," "competency assessment," "professional competence," "nurse assessment." Examination of referenced articles also revealed useful literature.

Exclusion criteria included any literature that focused on medication and interventions alone or were written in a language other than English. The Johns Hopkins evidence rating scale was used to evaluate the level of evidence in the journal articles reviewed (Dearholt & Dang, 2012). The Johns Hopkins rating scale was used to determine the strength and quality of evidence. Strength was rated level one through five: level one was an experimental study, randomized controlled trial, or a meta-analysis of a randomized controlled trial; level two was a quasi-experimental study; level three was non-experimental, qualitative, or meta-synthesis; level four was an article of opinion by experts based on research such as systematic reviews; level five is opinions not based on research such as personal experience or clinical expertise.

The quality of evidence was rated A for high, B for good, and C for low quality or major flaws. An explanation was given for what qualifies as research, summative reviews, organizational, and expert opinion within the quality rating. The AGREE II appraisal tool was used to evaluate the clinical practice guidelines (AGREE, 2014). This tool is a 23 item questionnaire used to assess the methodological rigor and transparency of practice guidelines with six domains: scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. An evidence table is provided in appendix C.

The review of literature suggests that CIPN is under-addressed, knowledge deficits do exist, and standardized, reliable assessments are needed (Binner et al., 2011; Kiser, Greer, Wilmoth, Dmochowski, & Naumann, 2010; Mann, 2008; Paice, 2009; Postma & Heimans, 2000; Stubblefield et al., 2009; Visovsky et al., 2007). Furthermore, research indicates that CIPN identification is a safety and QoL issue that needs to be more adequately addressed (Cavaletti et al., 2009; Kiser, et al., 2010; Lavoie Smith, 2013; Mols, et al., 2013; Stubblefield et al., 2009; Tofthagen, 2010). At minimum, the review of literature strongly supported the need for further research in CIPN and nurses' roles in assessment of CIPN.

Guideline Development

The NCCN, ASCO, and ONS have all published information on CIPN. Despite these publications, no specific guidelines, or gold standard, for CIPN assessment have been established in cancer care. These organizations offer key points to include in CIPN assessments but do not recommend one specific screening tool. Recommendations

include active assessment for CIPN on the part of healthcare workers at baseline and throughout treatment, and standardization of assessment to include objective reports, neuropathic pain specific scale, functional assessment, and patient questionnaires (Griffith, Merkies, Hill, & Cornblath, 2010; Stubblefield et al., 2009; Wickham, 2007). Assessment should include a discussion of symptoms along with a numeric scale (Hershman et al., 2014).

A usable screening tool must be easy for healthcare workers to use and have minimal cost (Griffith et al., 2010). Binner et al. (2011) discuss that guidelines should be developed, but must be efficient and manageable in an already demanding setting. Cavaletti et al. (2010) broke down the different CIPN measures into four groups: the common toxicity criteria (CTC) scales, functional assessment tools, QoL tools, and composite scales. CTC scales include the World Health Organization scale, Eastern Cooperative Oncology Group scale, National Cancer Institute- Common Toxicity Criteria (NCI-CTC), and the Ajani scale. Currently, if a scale is used by the providers the NCI-CTC is used. However, not all providers are grading CIPN. The NCI-CTC is commonly referred to in drug insert instructions for use, which is one main reason this scale is used.

Functional assessment tools include the Functional Assessment of Cancer Therapy/Gynecologic Oncology Group- neurotoxicity (FACT/GOG-Ntx), Peripheral Neuropathy Scale, Oxaliplatin-Associated Neuropathy Questionnaires, Scale for Chemotherapy-Induced Long Term Neurotoxicity, and the Patient Neurotoxicity Questionnaire. The only Quality of Life assessment tool specific for CIPN is the European Organization of Research and Treatment of Cancer QLQ-CIPN20. Composite scales include the Total Neuropathy Score (TNS) and variants of this scale- TNSr, TNSc.

The data on all the available tools was limited and not robust (Cavaletti et al., 2010). The literature recommends combining available tools to cover objective, functional, sensory, pain, and patient reported assessments (Cavaletti et al., 2010; Griffith et al., 2010; Stubblefield et al., 2009; Wickham, 2007). While awaiting more research on CIPN, education for healthcare workers and patients is necessary (Stubblefield et al., 2009).

Nurses should be at the forefront of CIPN screening with the use of validated tools (Lavoie Smith, 2013). A study of gynecologic oncologists who screened patients for CIPN noted a lack of standardization and consistency in grading and reporting of CIPN by providers (Kiser et al., 2010). These gaps could be mitigated if nurses were leaders in identifying CIPN. Research shows that oncology nurses should be knowledgeable about CIPN and play a lead role in educating patients. This may lead to improved QoL and appropriate treatments for patients. Because oncology nurses have such a vital role in the assessment and management of CIPN, an algorithm was developed for nursing (Tofthagen, Visovsky, & Hopgood, 2013). This algorithm was developed from current literature and clinical expertise and could be utilized by oncology nurses in the outpatient setting. The basis of this method is to query patients at baseline and with every visit regarding numbness, tingling, and/or discomfort. Additional assessment is warranted based on changes from the previous assessment.

Symptom Management and Quality of Life

Patients (n=14) were surveyed regarding neuropathic symptoms experienced while receiving chemotherapy. Information was gathered on non-painful symptoms,

painful symptoms, and effects on daily life. The results indicate that there is a vast array of symptoms that are not always easy to describe (Tofthagen, 2010). The most common non-painful symptoms included numbness (100%), loss of balance (57%), muscle weakness (57%), and tingling (50%). More than half (57%) of the patients reported that symptoms interfere with daily life. The majority (71%) also reported pain; however, the description of pain varied with the most common responses of burning, muscle aches, and pins and needles. Of concern, half of the patients surveyed reported falls or injuries related to reduced sensation.

Not all side effects of chemotherapy and cancer can be completely mitigated, but great effort must be put towards the best symptom management available as to give patients the best QoL. A higher number of neuropathy symptoms reported correlates to worse functional status and lower QoL (Mols et al, 2013). Griffith et al. (2010) believe CIPN is the primary dose-limiting toxicity for numerous chemotherapeutic agents, leading to decreased physical functioning and QoL. Pain management and strategies to maximize physical function must be incorporated into patient care, especially considering there is no current prevention or treatment options for CIPN (Tofthagen et al., 2013). Additionally, neuropathic pain is often resistant to typical pain management strategies (Mann, 2008). Close attention should be given to CIPN to avoid any unnecessary suffrage in cancer patients.

Patients may not even know they have CIPN. Subtle clinical signs of CIPN, such as decreased vibratory sense, change in temperature sensations, and pinprick sensation exist prior to patient reported symptoms and physical disabilities (Lavoie Smith, 2013). Limited patient awareness of symptom emphasizes the need for clinical assessment for

early detection of CIPN. Considering that CIPN can be a long lasting side effect of chemotherapy (Mols et al, 2013; Tofthagen, 2010), the intent of treatment, palliative versus cure, must be determined as this may help determine the acceptable level of CIPN and resultant side effects. Patients may tolerate more CIPN if the tradeoff is a disease free state (Wickham, 2007). Additionally, patients may be reluctant to discuss CIPN due to fear of dose limitations which may affect overall survival (Paice, 2009). Education of patients, open discussions with providers, and mutual decision-making can alleviate these fears. Simply listening to the patients and trusting their concerns is empowering to patients and breaks down barriers for proper assessment, early detection, and management (Hershman et al., 2014; Mann, 2008).

Nurses and Education

The literature shows that nurses need more education regarding CIPN, how it affects patients, and how to screen patients. Binner et al. (2011) indicate that there is a knowledge gap regarding CIPN, and nurses have low confidence in their ability to accurately perform CIPN assessments. Only fifteen percent of the nurses in the study believed they received previous instruction on how to perform an assessment for CIPN (Binner et al., 2011). Lavoie Smith (2013) believes nurses are aware that CIPN is an issue for patients, but unaware how to act on this knowledge. Nurses should be educated on CIPN and should take an active role in assessment and management.

Although comprehensive assessments and diagnosis by nurses are out of the scope of practice, short and concise assessments, education, and symptom management are all roles that nurses can undertake (Mann, 2008; Maxwell, 2013; Paice, 2009;

Wickham, 2007). Therefore, nurses were the ideal modality for education and assessment for CIPN. Some elements of CIPN assessment are not as widely known by nurses. For example, nurses generally do not have adequate training on the use of a tuning fork and assessing muscle strength (Lavoie Smith, Beck & Cohen, 2008). Following specialized training, oncology nurses could learn to screen for CIPN in patients. Further education for nurses and research on the accuracy of nurse assessments for CIPN is needed (Lavoie Smith et al., 2008). Educating nurses can improve the care and outcomes of patients (Maxwell, 2013).

Nurses are also ideally suited for assessment of patients for CIPN given that they are the frontline managers of care prior to receiving chemotherapy (Maxwell, 2013). Nurses must assess patients prior to administration of chemotherapy and report any concerning findings to the provider. This allows for one last check that may avoid worsening CIPN due to the administration of neurotoxic chemotherapy.

Gaps in Evidence

Stubblefield et al. (2009) believe CIPN is an under-researched, adverse event made more difficult by multi-agent chemotherapy regimens, pre-existing conditions, lack of standardized screening, and inadequate patient education. The NCCN task force also believes research has focused on treatment response and survival, rather than side effect issues such as CIPN. The gap in data makes it difficult to define the prevalence of CIPN (Kiser et al., 2010). Lavoie Smith (2013) notes the incidence of CIPN is somewhere between eight and 83% in phase III clinical trials with taxane administration, a known neurotoxic chemotherapy, indicating the prevalence of CIPN is not well established.

ASCO supports the need for more reliable research with larger sample sizes, especially given that it was unable to identify consistent or definitive evidence to support prevention or treatment strategies (Hershman et al., 2014). Evidence-based recommendations by the ONS regarding CIPN interventions support that there are no recommended nursing prevention or treatment strategies supported by research (Visovsky et al., 2007). The ONS believes there needs to be more research with rigor, standardization, and adequate sample size. In the meantime, nursing interventions of patient education and support in the following areas are recommended: signs and symptoms of PN, communication with provider, personal safety, foot care, risk for ischemia and thermal injury, and management of autonomic dysfunction.

Numerous screening tools have been developed, yet no gold standard exists for evaluation of CIPN (Stubblefield et al., 2009). There is a great need for more robust studies on the measurement of CIPN and standardized screening (Griffith et al., 2014; Hershman et al., 2014; Visovsky et al., 2007). Many articles support CIPN assessments done by nurses (Binner et al., 2011; Kiser et al., 2010; Lavoie Smith, Cohen, Pett, & Beck, 2011; Lavoie Smith, 2013; Mann, 2008; Maxwell, 2013; Tofthagen, 2010; Tofthagen et al., 2013), yet there is little evidence to support that nurses are knowledgeable and trained to do so (Binner et al., 2011; Lavoie Smith et al., 2008). There is also minimal research available on how to increase nurses' confidence in performing CIPN assessments. Experts agree that CIPN is an issue that needs to be addressed; however, the practice incorporation of screening is lacking (Binner et al., 2011).

Implications for Practice

Based on available literature, it is recommended that all oncology nurses receive training on CIPN. Nurses are educated as generalists to care for all ages and conditions. Specialties, such as oncology, must train nurses to care for specific populations and conditions. Training may occur within a practice or through national organizations and certifying bodies. Because CIPN affects such a large number of patients in the oncology setting, CIPN-specific training should be offered. This important education was missing in the education of oncology nurses in the Cancer Center.

It is also recommended that all patients be assessed at baseline, with subsequent treatments, and with every oncology follow up after receiving neurotoxic chemotherapy. Nurses should screen patients with an approved tool that is reliable and valid. Because nurses cannot diagnose or manage CIPN, a notification system should be in place to alert the providers of the assessment results.

Model of Evidence-Based Care

Clinical practice decisions are not solely based on research, but rather experience from healthcare workers and patients also contribute to determining best practice. The combination of research and experience is called evidence-based practice (EBP) (Dearholt & Dang, 2012). EBP involves improving efficacy, efficiency, and effectiveness of healthcare while analyzing the risks, benefits and costs. The desire of this project was to develop an EBP change through the education of nurses on CIPN to improve the care and outcomes of oncology patients. As indicated in the literature review, the available research is somewhat limited for this topic. However, the expert opinions presented

within the research do support the need for identification of CIPN and for nurses to perform the assessment (Binner et al., 2011; Kiser et al., 2010; Lavoie Smith et al., 2011; Lavoie Smith, 2013; Mann, 2008; Maxwell, 2013; Tofthagen, 2010; Tofthagen et al., 2013). The providers within the Cancer Center of interest also desire the implementation of this project. Therefore, the combination of the available literature on CIPN and a desire to improve care are the basis for this EBP change.

The Iowa Model of Evidence-Based Practice was used to guide this innovation project. This model was chosen because of its widely recognized use by healthcare organizations in the process of implementing EBP changes to improve healthcare outcomes. The Iowa model was comprised of a series of trigger questions. These trigger questions follow a stepwise approach to determine the relevance to an organization, if there is research evidence to support a practice change, if a pilot change is appropriate, practice wide change, and continued monitoring of outcomes (Burns & Grove, 2005, p. 626-631). This model was also well suited for the evaluation of knowledge, abilities, and attitudes of those involved in EBP changes. Nurses desire the highest quality of care for patients, but believe they need more education and time to convert evidence into practice (Brown, 2014). The Iowa model's stepwise approach can be used by nurses to implement EBP changes (Figure 1). This project was merely the beginning steps in the implementation of EBP change.

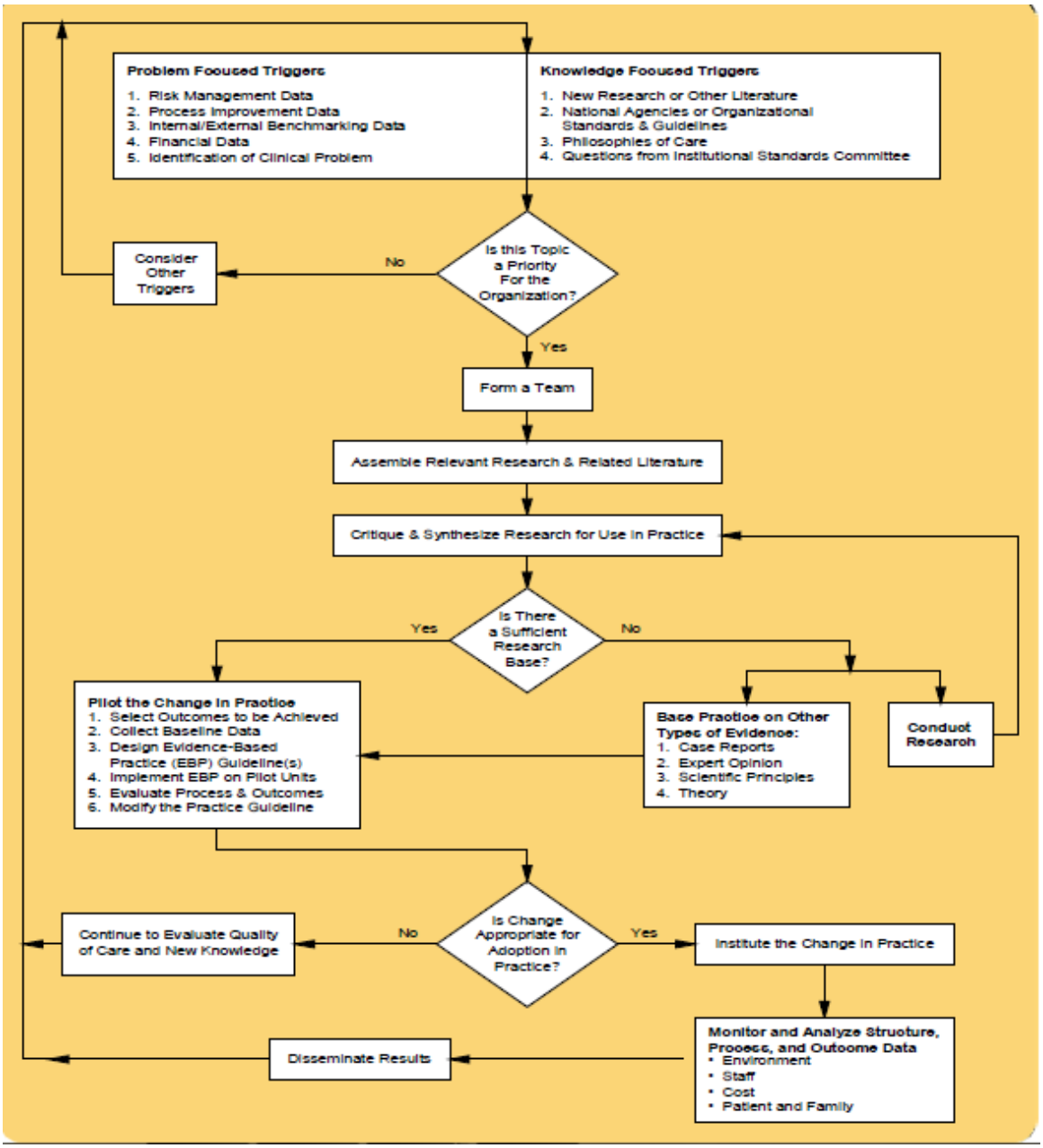

Figure 1. The Iowa Model of Evidence-Based Practice to Promote Quality Care. by Titler et al., 2001. Reprinted with permission from the University of Iowa Hospitals and Clinics and Marita G. Titler, PhD, RN, FAAN. Copyright 1998.

The first step of the Iowa Model was to identify the problem. In this project the problem was a perceived knowledge deficit regarding CIPN and the lack of formal assessment of patients for CIPN. The second step was to determine the priority level of

the problem. This project was considered moderate priority because the risk for not implementing this change was fairly low, yet the desire to provide the best care for patients was high.

Identifying the team was the next step. Team members for this project included one certified nurse practitioner (CNP), two nurse managers, the clinic director, and a South Dakota State University (SDSU) faculty advisor. All team members expressed a desire to implement this project. A PICOT question was formed, a literature review was done, and desired outcomes were identified. The paucity of research did not deter the team. The level of available evidence was relatively low, but the project was still justified, as it was believed that this project was low risk but could offer great benefits to the patients and the Cancer Center.

The next step in the Iowa model was to perform a pretest of nursing knowledge and confidence. Nursing education on CIPN and patient assessment took place and a posttest was performed. Nurses were then considered trained and expected to assess patients for CIPN. The project underwent continuous evaluation with changes as needed. After three months an additional nursing knowledge and confidence posttest was performed, along with project evaluation. At this point it will be determined if formal assessment for CIPN should be developed and implemented. Dissemination of the results will take place for possible CIPN assessment organization wide and possibly in other cancer centers.

Adult Learning Theory

This innovation project proposed to educate nurses about CIPN so proper identification of CIPN can take place for patients receiving neurotoxic chemotherapy. The Adult Learning Theory was used to guide this project. Adult learning, or andragogy, was studied by Malcolm Knowles who believed there are five underlying assumptions: adult learners are independent and self-directed, life experiences influence learning, social roles and learning are related, adult learners are interested in applicable and problem-focused learning, and adults have internal motivations for learning (Merriam, 2002). Additionally, Knowles developed four principles of andragogy (Figure 2). These include the need to be involved in the education process, incorporation of the learner's previous experiences, relevance and impact on the learner, and problem-centered education.

To be in alignment with these assumptions and principles, the educational session was offered at two different times and simple options were given to the learners for independence in style of learning- handouts and writing tools, visual PowerPoints, and discussions. This will help to foster respect, support, and autonomy in learning (Merriam, 2002). Open communication and dialogue with the nurses was used to promote approval. The nurses' previous knowledge was gathered through a pre-test and was used to form the educational session to build on. Evaluations were done in the form of a posttest, which nurses were able to review. For the nurses to relate the importance of the education, background information and impact on patients was given to the nurses. The hope was that if nurses could see the impact this education and identification of CIPN could make on patients, they would more likely to adapt to the change. Also, the

immediate application of knowledge through CIPN assessments should help in the adaptation to change.

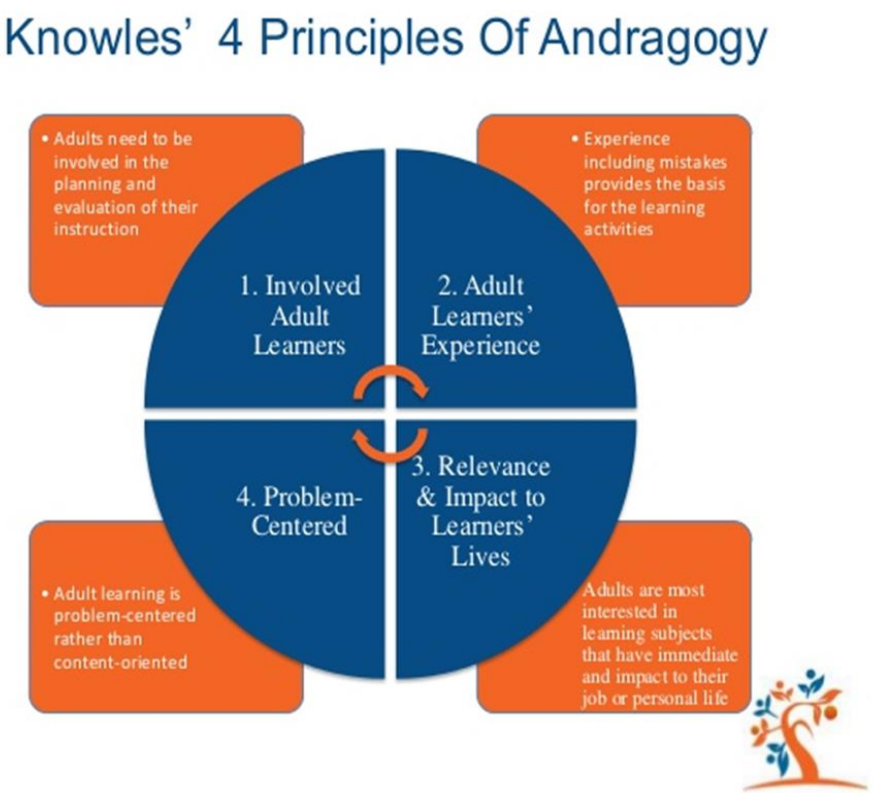

Figure 2. Malcolm Knowles Adult Learning Theory. Reprinted from "The Adult Learning Theory- Andaragogy- of Malcolm Knowles" by C. Pappas, 2013, from http://elearningindustry.com/the-adult-learning-theory-andragogy-of-malcolm-knowles. Reprinted with permission.

Change Theory

In 1962, Everett Rogers published his first book on the change theory, Diffusion of Innovation. Since then, the theory has been used around the world with numerous disciplines and countless innovative projects. From the time new research is unveiled or a new process is developed, it can take years to spread the information for the benefit of

others (Rogers, 1995). One reason the theory is widely known is because it aims to improve the time it takes to disperse the knowledge of an innovative change.

Diffusion is the process of communicating new ideas to others in a group in order to make mutual decision (Rogers, 1995). This change theory is applicable because the aim of this project was designed to deliver knowledge about CIPN and the need for identification of patients in order to improve care for patients. CIPN education and assessment for nurses is a new idea in the Cancer Center given there is a perceived knowledge deficit and lack of formal assessment.

Roger's (1995) four components were used in this project: innovation, communication, time, and social system. Nurses in the Cancer Center were educated on CIPN and assessments which was anticipated to improve the knowledge of nurses. Knowledge was retested after three months to test for retention, knowledge gaps, and confidence. This project is expected to contribute to the innovation-decision making for future formal implementation of assessment of patients for CIPN.

The rate of adoption by the nurses is an important factor for the long term success of CIPN assessments. It was anticipated that the innovators would be influential team members. A desire to provide better care to patients and continuing education contact hours were expected to influence the nurses in the early adopters and early majority categories. The late majority and laggards (Rogers, 1995) may have needed more time to accept the knowledge and see the need to identify patients with CIPN. The majority of the nurses who adopted the change helped encourage the late majority and laggards and continue the process of educating these nurses.

Chapter III: Project Design and Methodology

Introduction

EBP is the incorporation of best available research, practitioner experiences, and patient needs into high quality and cost-conscious care (Burns & Grove, 2005). EBP is essential for improving healthcare and patient outcomes. This EBP change was intended to increase the knowledge and confidence of nurses in their care of patients with, or at risk for, CIPN. It has the potential to improve the care and outcomes of patients who receive known neurotoxic chemotherapy agents.

Population

The population studied was a convenience sample of nurses employed in an outpatient Cancer Center in a large Midwest city. The Cancer Center contains a clinic where provider office visits are conducted and an infusion center where treatments are given. At the time of the project initiation there were 10 nurses that primarily worked in chemotherapy infusions, and 10 nurses that worked primarily in the providers' offices. Several of these nurses have cross training to both areas. There are also four CNPs employed by the Cancer Center that care for patients in the clinic, infusion center, and hospital. All nurses had some college level education, between two to six years of college. Approximately half of the nurses were oncology certified and chemotherapy/biotherapy certified. Years of nursing experience ranged from 0-20 years. Most of the nurses worked full time. The majority of the nurses were Caucasian.

According to the 2010 census, the state in which the Cancer Center is located is 84.7% Caucasian (United States Census Bureau, 2014). Additional races served include

African American, American Indian, Hispanic, and Asian. The percentage of persons 25 years or older who are a high school graduate or higher is 90.1%, while those with a bachelor's degree or higher is 26%.

Setting

The setting for this project was the Cancer Center- an adult outpatient medical oncology center and infusion center in a large Midwest city which serves a large geographic region, including urban, rural, and frontier population. Demographics of patients at this clinic were primarily Caucasian, middle class, and 18 years old and older. The center included six oncologists, four CNPs, four pharmacists, and multiple other support staff. Services offered within the Cancer Center included doctors' offices, cancer treatment administration, pharmacy, lab, palliative care, psychiatry, and research studies. This project was well suited for this Cancer Center because no standard existed in this clinic for CIPN assessments, and providers expressed a desire to implement a formal assessment process.

Design

This practice innovation project was a quasi-experimental one-group pretest multiple posttest design. Questionnaires with multiple choice questions were used to gather the pre and posttest data (Appendix D). The pre and posttests were identical. Advantages of the one group pretest multiple posttest design included identification of baseline knowledge, as well as comparison of pre and post-education knowledge (Burns & Grove, 2005). The simple structure and simple analysis of data was also an advantage to this design. Disadvantages include maturation from pretest to posttest not attributable

to the education, no comparison group or independent variable, and the lack of generalizability (Burns & Grove, 2005).

Participant Recruitment

Participants were recruited from nurses and CNPs who worked at the oncology center. Approximately two weeks before the education, the project leader emailed all nurses with an overview of the project, including timeline, objectives, and contact information. One week prior to the education, fliers were hung in the break room and an email was sent to all nurses from a Cancer Center manager which included the date, times, objectives of the education, and contact hour information. Two sessions were offered, one at 7:30 am and one at 4:30 pm, to optimize nurses' ability to attend. These scheduled times were the standard format for nursing education in the Cancer Center. Participation in the project was not be mandatory, but was be highly encouraged. One contact hour was given to nurses who attend the educational session. A Cancer Center manager completed the application process for the contact hours and approval was received.

Development of Education

Education content was compiled from available literature and clinical expertise. No standardized education content or format for nurses on CIPN existed at the time of this project. Content for education included pathophysiology, significance, associated factors, prevention, management, methods for assessment, and patient education. Additional emphasis was given during the education based on the pretest results to ensure deficient areas were well discussed. Education on performing CIPN patient assessment

was also done through discussion and hands on demonstrations. The CIPN patient assessment consisted of already existing resources, based on clinic preference, and ease of assessment for the nurses. Education format was based on the common format of education for the clinic. Handouts were given to the nurses containing step by step information on the CIPN patient assessment process. The four principles of the Adult Learning Theory (Merriam, 2002) helped guide the education format development by involving the nurses in the education process, incorporating nurses' baseline knowledge and experience of CIPN, identifying why this education is relevant, and identifying CIPN as a problem while working towards improving patient care.

Intervention

The intervention was an educational session for nurses on CIPN and CIPN identification. Nursing knowledge and confidence was tested. A pretest was administered to nurses to determine baseline knowledge of CIPN and their confidence in performing a patient assessment for CIPN. Gaps in knowledge that were identified from the pretest were incorporated into and emphasized in a one hour educational session on CIPN. Nurses were also taught how to identify patients with CIPN through PowerPoint discussion and hands on learning. The education was in the form of a PowerPoint presentation, discussion, and demonstration. Following the education, nurses were again tested on their knowledge and confidence to compare from baseline before the education. An additional posttest was administered three months after the initial education. This posttest served as a measure of knowledge retention and change in confidence.

Instruments

Demographic information was obtained at the time of the pretest (Appendix E). No standardized tests for nursing knowledge on CIPN existed at the time. The pretest and posttest were identical and were developed from available literature and clinical expertise (Appendix D). Nurses' confidence in identifying CIPN was also measured in the pretest and posttests. CIPN signs and symptoms, common patient reports, common causes, and treatments were included in the tests, which supports the content validity of the tests because of the broad range of knowledge tested on CIPN. Face validity was tested with four inpatient oncology nurses not directly involved with this project, and their conclusion was that the pre and posttests were at least adequate for measuring nursing knowledge and confidence. Reliability was established through review of the pretest and posttest by a provider highly knowledgeable in CIPN. It was not feasible to fully test validity and reliability prior to the start of this project due to time constraints and resources available.

At the time of the project, the Cancer Center was not interested in implementing additional screening instruments in full. The Cancer Center implemented the Distress Thermometer (Appendix A) in March of 2014, and it was felt that the available functional assessments were too lengthy and contained duplicate questions. The institution agreed to pull the neurotoxicity questions from the FACT/GOG-Ntx (Appendix F) and add these with the Distress Thermometer, which are both self-administered screenings. The Cancer Center believed combining the Distress Thermometer with neuropathy specific questions from the FACT/GOG-Ntx (Appendix

F), a thorough pain assessment, and simple function and sensory testing was adequate and appropriate based on the evidence reviewed.

Following review of available literature and published guidelines, a simple five component assessment was compiled. The five components included patient self-report, quality of life screening, sensory testing, functional testing, and a clinical grading system. The Distress Thermometer and the FACT/GOG-Ntx was to be given to all cancer patients at registration to fill out independently. Nurses were to record the self-administered screening results in the electronic medical record (EMR). Pain assessments will continue to be recorded as before, with additional emphasis on neuropathic pain. Sensory testing was to be done with two point discrimination using a paperclip. Functional testing was to be done by asking each patient to pick up a small paperclip from a flat surface. This information was to be recorded in the EMR in a progress note for the visit which was to be used to communicate to the provider. With the information gathered, the hope was that the providers who saw the patient could easily assign a clinical grade, specifically the NCI-CTCAE, to each patient. The assessment process was modified throughout the project to better accommodate the nurses and providers, and to better assess the patients. Modifications are discussed in chapter four.

Education for nurses was the essential first step to CIPN assessments so the nurses better understood CIPN, the importance of identification, and how to administer an assessment. Nurse education was step one in the process of improving care for patients with CIPN. This project positions the Cancer Center for further research and EBP in patient assessments for CIPN conducted by nurses.

Protection of Human Subjects

Approval from the SDSU Human Subjects Committee was obtained (Appendix G), as well as the Institutional Review Board of the organization where the project took place (Appendix H). Written approval from the Cancer Center director and the Chief Nurse Executive was obtained prior to initiation of this project. Consent of the participating nurses was implied by their voluntary participation. Results from nursing demographics and testing were kept secure at all times. This project was considered low risk with potential important benefits for nurses and patients. No patient data was obtained or analyzed for this project.

Project Analysis

Different measures were used to analyze the data collected. Questions one through five were Likert scale format. T-tests were used to test the mean scores and determine if there is a significant difference between the pretest and posttests with statistical significance set at 0.05 (Burns & Grove, 2005). One-way ANOVA was used to test the difference between the means of the pretest and posttests (Burns & Grove, 2005). Questions six through 23 were knowledge questions; the averages of the scores correct pre and posttest were recorded and analyzed. Descriptive statistics were used to analyze demographic data. Demographic information on the participating nurses was gathered, including the following information: age, gender, ethnicity, education, employment status, primary work area, years of nursing experience, years of oncology experience, oncology certification, chemotherapy and biotherapy certification, and previous formal training on CIPN.

Environmental and Organizational Context

Nurses are expected to be able to assess and identify adverse symptoms from cancer and chemotherapy. Education is offered on a regular basis in the Cancer Center for nurses on types of cancer, medications, and symptom management. Prior to this project education had never been offered specifically on CIPN, which made this project novel and significant for this clinic.

Assessment tools available for nurses in the Cancer Center that may be applicable to CIPN include a pain assessment flow sheet, the NCCN Distress Thermometer, and a nurse-driven triage protocol on neuropathy. These assessment tools do not allow for thorough assessment of CIPN. Additionally, no education or formal implementation of the nurse-driven triage protocol has been conducted since development. The areas missing from the assessment tools prior to this project were function, motor, and sensory assessment. To properly assess for CIPN, a better focused assessment incorporating available tools, missing assessment areas, and compilation of information in one place in the EMR should be developed, educated on, and implemented. This project paves the way for a future CIPN screening protocol.

This project was also important to the Cancer Center because there was no current standardized education for patients regarding CIPN. Patients are given informational handouts developed by the National Institute of Health entitled *Managing Chemotherapy Side Effects: Nerve Changes*, and *Managing Chemotherapy Side Effects: Pain* on their first day of chemotherapy if they receive a neurotoxic chemotherapy. Given the perceived

nurses' knowledge deficit and lack of standardized patient education, this project will help nurses be prepared to educate patients.

The Cancer Center is dedicated to exceptional care, research, and advancing the care of cancer patients. This project aligns with these values because it has the potential to improve the care through education of nurses and research based interventions. The clinic administration was supportive of this project as they seek to increase education of nurses and to improve the care of patients. Patients also desire improved symptom management and care. Healthcare is competitive and patients will seek out the best care available.

Stakeholders and Facilitators

Key stakeholders of this project within the healthcare system included physicians, CNPs, nurses, and management from the Cancer Center. Patients and families were also stakeholders as they serve to benefit from the education and process change within the clinic related to improved identification of CIPN. This should translate into improved care and outcomes for patients.

One CNP was identified as the primary facilitator who helped form the committee, advocate for the project, and develop the nursing education and testing. She had a strong interest and extensive education in symptom management. All of the providers at the Cancer Center expressed an interest and support of the project. Management and nurses also expressed their desire to support and assist in this project.

Anticipated Barriers

Anticipated barriers included resistance from nurses who may not perceive value in the education and assessment of CIPN due to the time involved. While research indicates that nurses desire to EBP changes and improved care for patients, lack of time is frequently cited as a barrier to EBP change (Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012). Sustainability of the assessments following the education was also a perceived barrier, primarily related to nurses' resistance. Lack of support from leadership may also be a barrier to EBP implementation (Melnyk et al., 2012), which could directly affect nursing time and sustainability. If the Cancer Center leadership is not supportive and does not allow nurses to take the time to become more educated or to assess patients, this project will not be sustainable.

With an already small sample size, nurses who chose not to participate in the project were a perceived barrier to interpretation of the results. Attempts to overcome these barriers were made through nurse input, contact hours credit for the education, and positive reinforcement from the project leader and stakeholder. The education, itself, was a means to break the barriers as it intended to educate nurses on the prevalence of CIPN and the quality of life concerns for patients.

With the lack of concrete recommendations from guidelines, choosing an assessment method was a barrier. It was important for the nurses and providers to come to a consensus on what assessment components to use and how to communicate the results to the providers. Additionally, having the screening tool in the EMR would have been ideal for ease of data input, comparing from assessment to assessment, and

interpretation by the providers. This was not realistic or feasible prior to the project implementation. Historically, it can be difficult and time consuming to have changes made to the EMR charting formats. Although this wasn't necessarily a barrier to the implementation of education, it did prevent ideal compilation of assessment results. EMR documentation will be an area to focus on in the sustainability process. For the purpose of this project, a "dot phrase" template was created for data input into the chart and entered into a progress note in the patient encounter.

Organizational Impact

This project has the potential of positively financially impacting the organization. Nurses who are better educated can provide better care. Patients whose symptoms are well managed may have lower healthcare costs. Patient satisfaction scores may also be impacted if patients feel they are receiving better care. Patient satisfaction is increasingly being measured and reported publicly, and may impact reimbursement.

Policy implementation based on research and EBP is vital to healthcare. Through the literature identified in this project and the results of the nurse education, a novel CIPN assessment strategy process could be developed. These patient assessments may positively impact patients through early identification of CIPN so proper management can take place. This project may open the door to further policy implementation of CIPN screening, which can be modified with future literature recommendations.

Rural and underserved patients are treated on a daily basis in this Cancer Center. The region the Cancer Center serves is primarily rural. Geriatric patients were one underserved population that was impacted by CIPN assessment and identification.

Approximately 46% of cancer survivors are older than 70 years of age (American Cancer Society, 2014). Cancer survivors are living longer and the elderly population is growing. With cancer patients living longer, and the need to care for a larger elderly population, it is important to provide the best possible, evidence-based, care to these patients to prevent years of unnecessary suffering.

Chapter IV: Results and Analysis

Introduction

The population studied was a convenience sample of nurses employed by the Cancer Center who voluntarily participated in education on CIPN and were asked to complete a pretest and two posttests. The pretest was distributed to all nurses in the Cancer Center one week prior to the education session. Nurses were allowed to turn in the pretests up until the time of the education. The posttest was distributed at the completion of the education program, handed out with the contact hours. The second posttest was distributed three months after the education session to all nurses who attended the education session. Pretests returned with demographics totaled 20, with 16 first posttests, and 12 second posttests returned.

Demographics

Of the 20 demographic surveys that were returned, 11 worked primarily in the clinic and nine worked primarily in the infusion center. The mean age surveyed was 32.2. Ninety percent surveyed were female and all identified as Caucasian. All nurses have some college level education: two certificates, eight associates, six bachelors, four masters or higher (Figure 3). Seventeen nurses surveyed were full-time employees and three were part-time. The majority of the nurses had between three and 11 years of nursing experience and less than six years of oncology experience (Figure 4). Nineteen nurses were chemotherapy/biotherapy certified and 10 were Oncology Certified Nurses.

All nurses surveyed marked that they had never had previous formal training on CIPN.

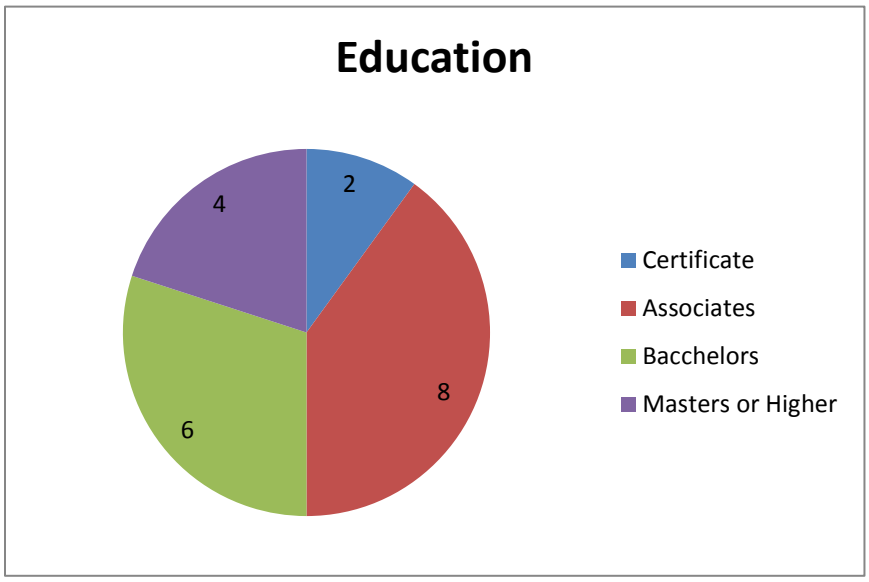

Figure 3. Education level of nurse participants.

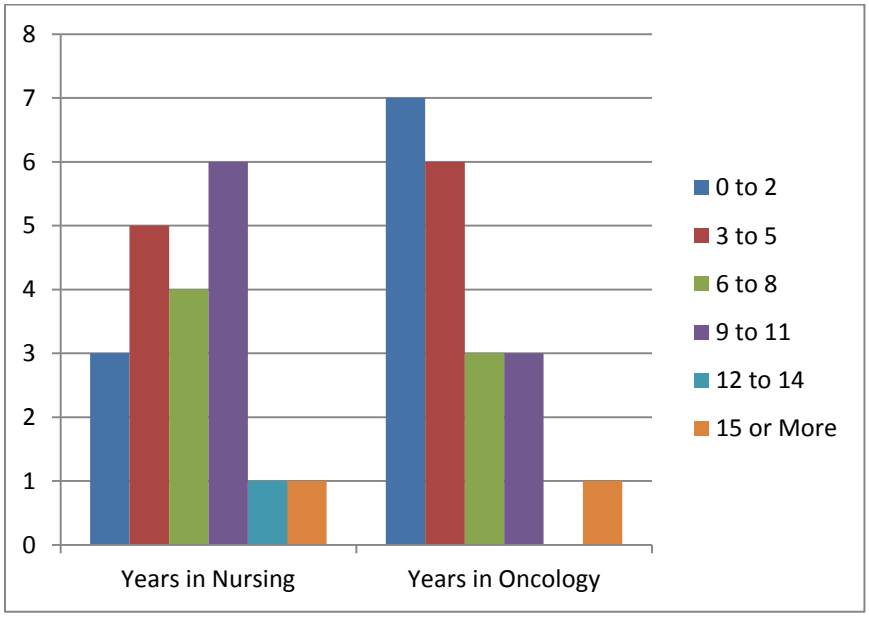

Figure 4. Years of experience of nurse participants.

Project Outcomes

Nursing knowledge. The range of correct answers on the pretest was 10 to 17 out of 18 questions with a mean score of 13.7 (SD 2.05). The range of correct answers on the

first posttest was 13 to 18 with a mean score of 16 (SD 1.55). The range of correct answers on the second posttest was 10 to 17 with a mean score of 15.33 (SD 1.78) (Table 1). The improvement in scores was statistically significant from the pretest to the first posttest (p<0.01), and from the pretest to the second posttest (p= 0.025) (Table 2). There was a statistically significant difference between the groups as determined by one-way ANOVA (F(2,45)=7.515, p<0.01) (Table 3).

Table 1

Knowledge Mean and Standard Deviation

	Range	Mean	Standard Deviation
Pretest	10-17	13.7	2.05
1st Posttest	13-18	16	1.55
2nd Posttest	10-17	15.3	1.78

Table 2

Knowledge Statistical Significance

	T value	*p value*
Pretest and 1st Posttest	-3.82774	*0.000529*
Pretest and 2nd Posttest	-2.37319	*0.025312*
1st Posttest and 2nd Posttest	1.03784	0.310618

Table 3

ANOVA

	SS	Df	MS	F	P
Between	50.027	2	7.467	7.467	0.002
Within	150.737	45	3.350		
Total	200.764	47			

Confidence. Confidence in nurses' knowledge and ability was assessed on a Likert scale with five being very confident, three was somewhat confident, and one was

not confident at all. The range of confidence on the pretest was 1.5 to 4. The range of confidence on the first posttest was 1 to 5 and 3 to 5 on the second posttest. The mean confidence level on the pretest was 2.94, first posttest was 4.00, and second posttest was 4.13. Individual confidence increased with each test except for one nurse who initially marked 1-2 on the pretest for confidence in ability to perform CIPN assessment and marked 1 on the first posttest. No second posttest was received for this nurse. This was the only nurse that marked 1 for confidence. Statistical significance was reached in the increase in overall confidence from the pretest to the second posttest (p= 0.0457) (Table 4 and Table 5).

Table 4

Confidence Range and Mean

	Range	Mean	Standard Deviation
Pretest	1.5-4	2.94	0.80
1st Posttest	1-5	4	0.80
2nd Posttest	3-5	4.13	0.54

Table 5

Confidence Statistical Significance

	T value	*p value*
Pretest and 1st Posttest	-6.17382	0.102228
Pretest and 2nd Posttest	-4.51567	*0.045705*
1st Posttest and 2nd Posttest	-0.57324	0.668633

Application of knowledge. Additional questions were included in the test in Likert scale format from one to five in regards to how important the nurses felt CIPN assessments were, how often assessments were being done, and the likelihood of performing CIPN assessments. The means for importance were 4.65 pretest, 4.27 first

posttest, and 4.58 second posttest. The means for frequency of assessments for the pretest, first posttest, and second posttest were 3.74, 4, and 3.67 respectively. The means for likelihood of assessing patients were 4 pretest, 4.56 first posttest, and 4.25 second posttest (Table 6). One nurse had marked on the pretest that CIPN assessments were done on every patient and subsequently marked on the first posttest "I don't know how to assess CIPN." A second posttest was not completed by this nurse.

Table 6

Application Mean

	Importance	Frequency	Likelihood
Pretest	4.65	4.27	4.58
1st Posttest	3.74	4	3.67
2nd Posttest	4	4.56	4.25

Anecdotal information. Nurses were queried with both posttests if they felt their knowledge had increased since the time of the education and all answered either somewhat or definitely. Nurse managers and providers approached the project leader with information that they had noticed an increase in identification of CIPN by nurses. The nurses also had positive feedback to the managers about the knowledge they gained with comments such as "I'm glad I know the chemotherapy medications better now," and "I had no idea that certain disease put a person at higher risk for neuropathy." During discussions about continuation or modification of CIPN assessments by nurses one nurse stated "Even if we can identify one person with neuropathy we've made a difference. There is value in assessing all chemotherapy patients for CIPN."

Chapter V: Discussion of Outcomes

Discussion

The purpose of this project was to evaluate effect of an educational program on the knowledge of oncology nurses regarding CIPN and their confidence level with assessing CIPN before and after an educational session. The PICOT question and the clinical questions were answered with this project. The effect of education and hands on demonstration was that there was an increase in knowledge and confidence. Following the education session nurses expressed an increase in knowledge about CIPN and confidence in assessing patients for CIPN. The three month timeframe from the education to the second posttest was attributable to very little loss in knowledge and marginal increase in confidence. The overall increase in knowledge and confidence indicates nurses' ability to provide better care and identify CIPN earlier. Interpretation of results from pretest to the second posttest was made difficult by a 40% decrease in response rate.

There was a positive effect on nursing knowledge of CIPN from baseline to the three month posttest. There was an increase in knowledge from baseline to the first posttest and baseline to the second posttest. There was statistical significance in the increase in knowledge for both pretest to first posttest and pretest to second posttest. The content and presentation of the education on CIPN was in a format that was easy to understand and gain knowledge from. The format of the education eased access and encouraged attendance. The contact hours were a positive incentive for education attendance. There was a slight loss in knowledge from the first posttest to the second posttest with mean scores decreasing from 16 to 15.33 respectively. Loss of knowledge

could be attributed to regression and the time from education to the second posttest. Distribution of notes with key education points or distribution of the PowerPoint itself may have provided access for a knowledge refresher as nurses felt the need. This could be considered as an option for future education.

There was a positive effect on nursing confidence in assessing patients for CIPN from baseline to the three month posttest. While not statistically significant, the mean score for overall confidence from pretest to first posttest did increase. It's possible that nurses needed more hands on experience with assessments prior to feeling confident. This is evident in the statistically significant increase in confidence from pretest to the second posttest. An increase in awareness of the need for assessment may also be attributed to the increase in confidence.

The results of this project support the available literature in finding that nurses do not receive adequate training on CIPN. Despite the fact that all but one nurse had chemotherapy-biotherapy training, and half were Oncology Certified Nurses, none had received formal training on CIPN. This project also supports the literature in recognizing that CIPN is important and that nurses can be taught how to perform assessments. While not formally evaluated, nurses did express to the project leader agreement with literature that for sustainability any assessment of CIPN by nurses has to be fairly simple and quick to perform.

The results are also in alignment with previous literature in that prior to CIPN specific education, nurses are not overly confident in their knowledge or ability to assess patients for CIPN. Nurses do not get adequate training for specialty assessments during

nursing school. On the job education and training for medical specialties is needed to supplement the nursing school general education. To become confident in specialty assessments, nurses need to perform multiple assessments over a period of time. This project was important to educate nurses about CIPN and instruct them on how to identify those at risk for and those who currently have CIPN. Routine education on CIPN should take place in the Cancer Center, as well as other oncology areas, so that nurses are more knowledgeable and confident in their assessments of patients.

Reflections

Evidence-based care is a constantly evolving process. There was an increase in nursing knowledge and confidence, and there were beneficial modifications to the patient assessment process; however, further education and process refinement needs to be done. According to the Iowa Model, this project is not ready for adoption. Further evaluation of the quality of care given and new research as it becomes available should be incorporated into another pilot project on nursing knowledge, confidence in assessments, and patient assessments of CIPN.

The Adult Learning Theory was, indeed, helpful in this project (Merriam, 2002). The nurse learners were actively involved in their own education and they were given a choice to be involved. Some lead nurses were increasingly involved in modification and sustainment of the patient assessment portion, thus providing autonomy and ownership in the process. The education was developed based on what the nurses already knew and was expanded beyond the baseline while incorporating old and new skills. Nurses agreed

that assessing CIPN was important, which therefore, endorsed the relevance and impact on the learner, and problem-centered education.

The Diffusion of Innovation theory (Rogers, 1995) has helped and will continue to help the progress of this project. By continuing to communicate ways to improve nursing education and patient assessments, this small scale project can be perfected in a shorter time in order to be applicable on a larger scale. This supportive social system within the Cancer Center is conducive to innovative decision making.

The significance of the problem was addressed by increasing the knowledge of nurses so they are better prepared to identify and care for patients with CIPN. One area of knowledge that was improved upon was autonomic nervous system dysfunction symptoms, such as hypotension, shortness of breath, impotence, and constipation. Not only did knowledge increase from pretest to posttest in these areas, nurses expressed to the project leader that they are more aware of symptoms of CIPN and are better able to identify patients who may have CIPN. It is reasonable to presume that the increase in nurses' knowledge may improve care provided to vulnerable cancer patients.

This project adds to the under-addressed, under-researched issue of CIPN by identifying a means to improve awareness and care for patients. With proper specialized education, oncology nurses can gain an increase in knowledge on CIPN and an increase in confidence to assess and identify patients at risk for, and with CIPN. Because of this project, there was an increase in knowledge and confidence about CIPN in nurses in the Cancer Center.

Limitations

Possibly the greatest limitation to interpretation of the results was attrition. There was a 20% response reduction from pretest to the first posttest and a 40% response reduction from the pretest to the second posttest. The reason for this was multifactorial. Around the time of the initiation of this project there were significant staffing changes in the clinic and infusion center. The clinic had been short staffed which may have increased nurse resistance to buy in to a project that did take time and effort. Shortly after project initiation the clinic had an influx of very novice nurses just out of nursing school. This may have made sustainability of patient assessments difficult because of the lack of knowledge. These new nurses were just honing basic nursing skills and may not have been ready to learn new, potentially more advanced skills. Perhaps specialty orientation should occur three to six months after employment.

Attrition is a risk in any post-survey. Methods used to prevent a high attrition rate included distribution of contact information for the project leader with an open invitation to contact with questions at any time, regular face to face contact with managers and nursing staff, and email reminders to fill out and return the posttests. Additional methods to prevent attrition that could have been considered would include an incentive to turn in posttests and additional contact information gathered at the time of the initial test. Furthermore, offering an online testing option may have been more convenient and appealing to nurses and could be used in the future. Nursing resistance was not evident in the initial pretest and education; however, it likely contributed to attrition of posttests and sustainability of the patient assessment.

Discussions between the clinic and infusion center on where and when the assessment should take place occurred, as each area thought it would be best done in the other area. A clearer protocol enforced by nursing management with defined reassessment of the protocol, perhaps a month after initiation, may have improved acceptance and sustainability.

Time could have been a factor in completing the posttests. While the tests were short, it still was an added task in what nurses perceived as an already busy day. Staffing issues contributed to the lack of nursing downtime. Assessment of the patient was felt to be time consuming, particularly by the clinic nurses. It would be expected to have slower assessment times and frustrations at initiation of a new process. Positive reinforcement was given; however, more time may still have been needed to allow for adjustment to the process. While initially perceived as beneficial to initiate patient assessments by nurses immediately following the education, perhaps the resistance to the process change caused resistance to the education posttests. Separating CIPN education and patient assessments with a period of time, perhaps one to two months, may also improve resistance. Additionally, a project dedicated to the evaluation of CIPN assessments would be warranted allowing a project leader more involvement and focus on this process alone.

Lack of concrete recommendations on nursing education, nursing knowledge assessment, and patient assessment posed a barrier. While there was an increase in knowledge, as evidenced by statistically significant increase in correct answers from pretest to posttests, the validity of the test is unknown. Face validity was performed; however, further evaluation should be done to show if the questions are adequate to test nursing knowledge. Lack of concrete recommendations on how patients should be

assessed continues to be a barrier because the clinic would like to improve patient assessments but were somewhat unsuccessful immediately following this project.

Recommendations for Practice

Based on the increased knowledge level and confidence in assessment, it would be recommended to implement education on CIPN for all nursing staff. One recommendation extrapolated from this project would be to have education at regular intervals. While the Cancer Center does have educational sessions once or twice a month, which are an hour long and often very in depth topics, it was discussed that perhaps smaller topics could be educated on in a shorter format, perhaps a PowerPoint presentation emailed to all the nurses to be read at their convenience with an independent posttest for knowledge evaluation. CIPN, for example, could be discussed once or twice a year as a refresher. Staffing changes can also be addressed with this format. Just in the time of this project's implementation, there were multiple new nurses who started in the Cancer Center. Continual rotation of important topics, such as CIPN, throughout the year may improve knowledge deficits and improve care for patients in this specialty population. This continual rotation of education can address research and EBP changes as well.

Prior to project initiation, providers expressed a desire to better assess patients for CIPN. Little feedback was given on what exactly was desired content for the assessments. There was a perceived lack of provider acknowledgement of the information obtained by the nurses, which caused frustration on behalf of the nurses. For future modifications of the CIPN patient assessments, more information could be gathered from

the providers on what worked, what didn't work, and recommendations for nursing practice change.

Recommendations for Future Projects

Recommendations for future projects include means of improving cancer patients' symptoms and QoL, specifically in regards to CIPN. While research has made great gains in addressing common symptoms from cancer and chemotherapy such as nausea and neutropenia, more research needs to be done in the area of CIPN. More research needs to be done to determine the best format and content for nursing education on CIPN. More research is also needed to determine the most usable, efficient method for nurses to assess for CIPN in an outpatient clinic.

Future research should be aimed at validating the best format and content for nursing education on CIPN. Further inquiry is also suggested with a larger sample size of nurses and a confidence and knowledge test that has been tested for validity. More research is also needed to determine the most usable, efficient method for nurses to assess for CIPN in an outpatient clinic. Additional EBP projects on CIPN are needed to improve the care and outcomes of cancer patients.

Conclusion

CIPN can be debilitating, decrease QoL, and possibly even decrease the life of cancer patients who have received neurotoxic chemotherapy (Stubblefield et al., 2009). Nurses are well suited to make a positive impact on the way we care for patients with or at risk for CIPN. Despite the fact that there is no gold standard for CIPN nursing education and patient assessments, and much more research needs to be done on this

topic, this EBP project successfully educated nurses and increased their confidence in CIPN. Further inquiry is suggested with a larger sample size and a confidence and knowledge test that has been tested for validity.

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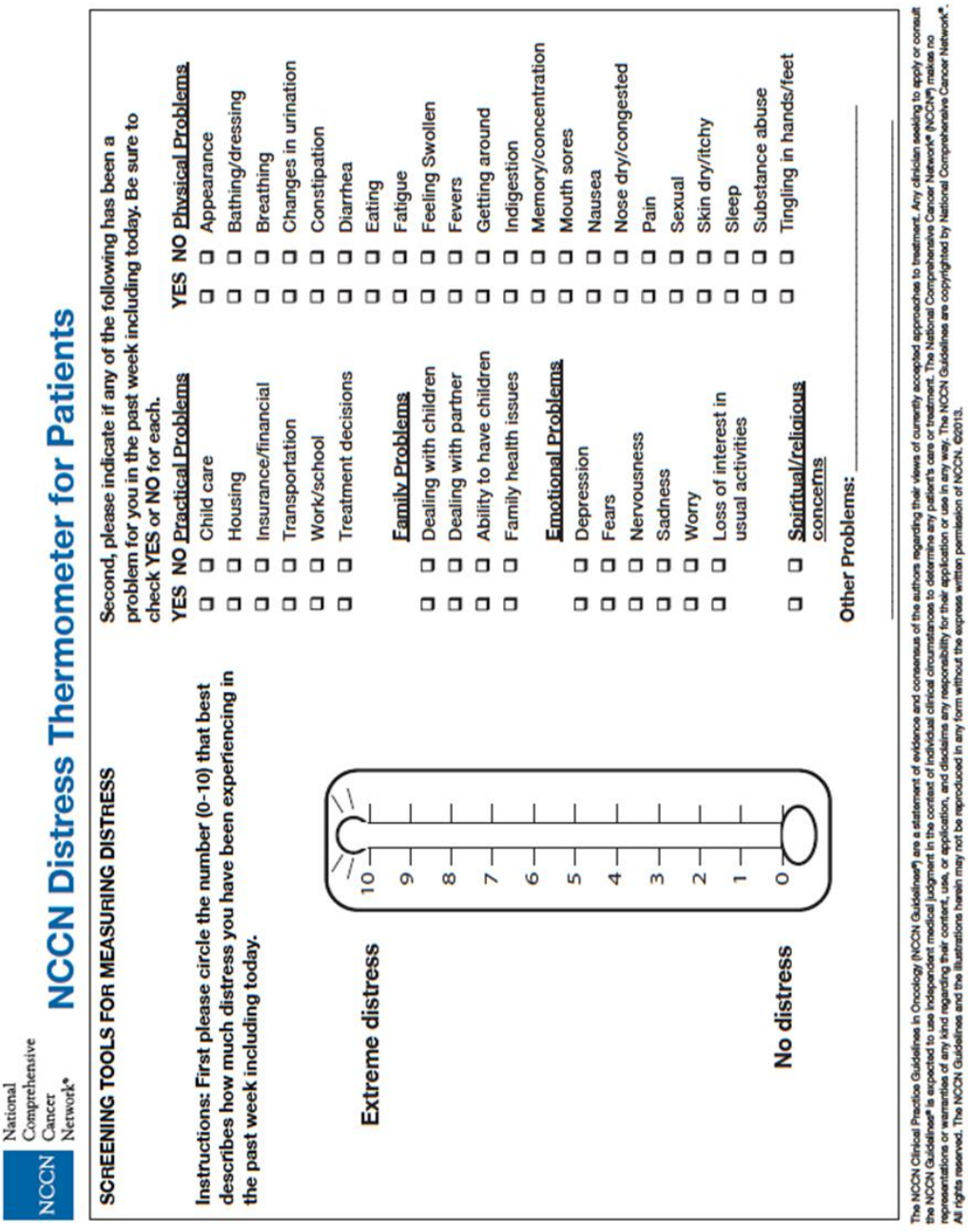
Appendix A

NCCN Distress Thermometer for Patients



National Comprehensive Cancer Network®

NCCN

NCCN Distress Thermometer for Patients

SCREENING TOOLS FOR MEASURING DISTRESS

Instructions: First please circle the number (0-10) that best describes how much distress you have been experiencing in the past week including today.

Extreme distress — 10 9 8 7 6 5 4 3 2 1 0 — No distress

Second, please indicate if any of the following has been a problem for you in the past week including today. Be sure to check YES or NO for each.

YES	NO	Practical Problems	YES	NO	Physical Problems
☐	☐	Child care	☐	☐	Appearance
☐	☐	Housing	☐	☐	Bathing/dressing
☐	☐	Insurance/financial	☐	☐	Breathing
☐	☐	Transportation	☐	☐	Changes in urination
☐	☐	Work/school	☐	☐	Constipation
☐	☐	Treatment decisions	☐	☐	Diarrhea
			☐	☐	Eating
		Family Problems	☐	☐	Fatigue
☐	☐	Dealing with children	☐	☐	Feeling Swollen
☐	☐	Dealing with partner	☐	☐	Fevers
☐	☐	Ability to have children	☐	☐	Getting around
☐	☐	Family health issues	☐	☐	Indigestion
			☐	☐	Memory/concentration
		Emotional Problems	☐	☐	Mouth sores
☐	☐	Depression	☐	☐	Nausea
☐	☐	Fears	☐	☐	Nose dry/congested
☐	☐	Nervousness	☐	☐	Pain
☐	☐	Sadness	☐	☐	Sexual
☐	☐	Worry	☐	☐	Skin dry/itchy
☐	☐	Loss of interest in usual activities	☐	☐	Sleep
			☐	☐	Substance abuse
☐	☐	**Spiritual/religious concerns**	☐	☐	Tingling in hands/feet

Other Problems: _____

Retrieved from

http://www.nccn.org/patients/resources/life_with_cancer/pdf/nccn_distress_thermometer.pdf

Appendix B

Nursing Education PowerPoint

Chemotherapy-Induced Peripheral Neuropathy

Kim Schmidt, RN, DNP student

What is CIPN?

- Damage to axons, myelin sheaths, or cell bodies
- Adverse Effect of Neurotoxic Chemotherapy
- Peripheral Nervous System is more sensitive to neurotoxic chemotherapy
- Usually starts distally- toes, fingertips
- Stocking-glove distribution
- Axons may repair when chemotherapy stopped

Significance of CIPN

- Prevalence is unknown
- May Cause Dose Reduction or Discontinuation of Therapy
- May lead to
  - Inability to fully perform ADLs
  - Decrease physical abilities
  - Decreased quality of life
  - Possibly decrease life expectancy

Associated Cancer Types

- Breast
- Colorectal
- Pancreatic
- Lung
- Endometrial
- Ovarian
- Head and neck
- Prostate
- Multiple myeloma
- Lymphoma
- Leukemia

Associated Agents

- Vinca Alkaloids
  - Vincristine*
  - Vinblastine
  - Vinorelbine
- Taxanes
  - Paclitaxel*
  - Docetaxel
- Platinums
  - Cisplatin*
  - Carboplatin
  - Oxaliplatin
- Thalidomide
- Bortezomib
- Procarbazine
- Arsenic Trioxide
- Methotrexate
- Ifosfamide
- Ara-C
- Etoposide

Onset of CIPN

- Rapid
- Progressive
- Coasting
  - Symptoms progress after cessation of treatment
- Acute-Transient
  - Cold induced
- Dose Dependent
- Duration
- Schedule
- Concurrent Administration

Patient History

- Surgery
- Tumor Pathology
- Diabetes
- Hypothyroidism
- Alcoholism
- Vitamin Deficiencies
- Crohn's Disease
- Rheumatoid Arthritis
- Lupus
- Sjogrens
- AIDs
- Charcot-Marie-Tooth Syndrome
- Metal Toxicity
- Medications
  - Lithium
  - Amitriptyline
  - Dilantin
  - Amiodarone
  - Interferon
- Vasculitis
- Ischemic Lesions

Peripheral Nervous System

- Sensory
- Motor
- Autonomic

Sensory Symptoms

- Paresthesia
- Hyperesthesia
- Dysesthesia
- Nerve Pain
- Allodynia
- Numbness and Tingling
- Hyporeflexia or Areflexia
- Diminished or Absent Proprioception
- Diminished or Absent Vibratory Sensation
- Diminished or Absent Cutaneous Sensation
- Diminshed or Absent Discrimination of Sharp and Dull

Motor Symptoms

- Weakness
- Gait Disturbance
- Balance Disturbance
- Difficulty with Fine Motor Skills

Autonomic Symptoms

- Constipation
- Urinary Retention
- Sexual Dysfunction
- Blood Pressure Alterations
- Irregular heart rhythm
- Shortness of breath

Prevention

There are NO recommended treatments for the prevention of CIPN.

- NCCN
- ASCO
- ONS

Prevention

- Amifostine
- Vitamin E
- Calcium and Magnesium Infusion
- Tricyclic Antidepressants
- Anticonvulsants
- Acetyl-L Carnitine
- Glutamine
- Glutathione
- Nimodipine
- Alpha Lipoic Acid
- Human Leukemia Factor
- Diethyldthio-Carbamate

Pharmacologic Management

- Duloxetine*
- Venlafaxine**

- Opiods- Morphine, Oxycodone
- Gabapentin
- Nortriptyline
- Amitriptyline
- Pregabalin
- Tramadol
- Lidocaine patches
- Compounded Gel- Baclofen, Amitriptyline, Ketamine

Non-Pharmacologic Management

- Acupuncture
- Assistive Devices
- Physical Activity
- TENS
- Massage
- Meditation

Nursing Role

- Baseline Assessment
  - Risk Factors
  - Medications
  - Current Symptoms
- Ongoing Assessment
  - Onset of Symptoms
  - Resolution of Symptoms
  - Progression of Symptoms
- Patient Education
- Advocate

Available Screening Tools

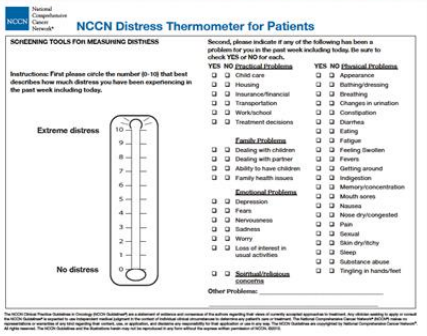
- NCI-CTCAE*
- WHO
- ECOG
- Ajani
- TNSc
- PNQ
- CIPNAT
- FACT-GOG NTx*
- EORTC-QLQ

Important Components of CIPN Screening

- Patient Report of Symptoms
- Quality of Life Screening
- Sensory Testing
- Functional Testing
- Clinical Grading System

Sanford Cancer Center Screening

- Patient Report of Symptoms
  - NCCN Distress Thermometer for Patients
  - Pain
- Quality of Life Screening
  - FACT-GOG NTx Questions
- Sensory Testing
  - Point Discrimination
- Functional Testing
  - Picking Up Paperclip
- Clinical Grading System
  - NCI-CTCAE



NCCN Distress Thermometer for Patients

SCREENING TOOLS FOR MEASURING DISTRESS

Instructions: First please circle the number (0-10) that best describes how much distress you have been experiencing in the past week including today.

Extreme distress

No distress

Second, please indicate if any of the following has been a problem for you in the past week including today. Be sure to check YES or NO for each.

YES NO Practical Problems
- Child care
- Housing
- Insurance/financial
- Transportation
- Work/school
- Treatment decisions

Family Problems
- Dealing with children
- Dealing with partner
- Ability to have children
- Family health issues

Emotional Problems
- Depression
- Fears
- Nervousness
- Sadness
- Worry
- Loss of interest in usual activities

Spiritual/religious concerns

YES NO Physical Problems
- Appearance
- Bathing/dressing
- Breathing
- Changes in urination
- Constipation
- Diarrhea
- Eating
- Fatigue
- Feeling Swollen
- Fevers
- Getting around
- Indigestion
- Memory/concentration
- Mouth sores
- Nausea
- Nose dry/congested
- Pain
- Sexual
- Skin dry/itchy
- Sleep
- Substance abuse
- Tingling in hands/feet

Other Problems: _____

Assessing Nerve Pain

- May be reported as
  - sharp
  - dull
  - Burning
  - Shooting
  - Electric shock-like
- Often reported as "hard to describe"
- Need more detailed assessment

FACT-GOG-NTx Questions

- I feel discomfort in my hands
- I feel discomfort in my feet
- I have joint pain or muscle cramps
- I feel weak all over
- I have trouble hearing
- I have ringing or buzzing in my ears
- I have trouble buttoning buttons
- I have trouble feeling the shapes of small objects when they are in my hand
- I have trouble walking

The Paperclip Tests

NCI-CTCAE Grading Scale

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Sensory	Asymptomatic-loss of deep tendon reflex or parasthesias but not interfering with function	Sensory alteration or paresthesia interfering with function but not with ADLs	Sensory alteration or paresthesia interfering with ADLs	Disabling	Death
Motor	Asymtomatic-weakness by exam, testing only	Symptomatic weakness interfering with function but not interfering with ADLs	Weakness interfering with ADLs-bracing or assistance walking indicated	Life-threatening, disabling, paralysis	Death

If patients are screened positive:

- Are symptoms due to neuropathy?
- Is the neuropathy a result of cancer treatment, cancer pathology, or other causes unrelated to cancer?
- What is the treatment goal?
- Are the symptoms severe enough to require intervention?
- What are the options for symptom management?
- Is modification or discontinuation of chemotherapy necessary?

Patient Education

- Signs and Symptoms need to be reported
- Most CIPN will improve within weeks to months of cessation of chemotherapy
- CIPN may not occur until after cessation of treatment
- Safety- lighting, shoes, no rugs
- Risk for Ischemia and Thermal Injury
- Foot Care
- Autonomic Dysfunction
  - Postural Hypotension
  - Constipation
  - Urinary Retention

Appendix C

Evidence Table

Article #	**First Author, Date, & Title**	**Evidence type**	**Sample, Sample Size & Setting**	**Study findings that help answer the EBP question**	**Limitations**	**Evidence level & Quality**
1	Binner, Ross, & Browndер, 2011 Chemotherapy-Induced Peripheral Neuropathy: Assessment of Oncology Nurses' Knowledge and Practice	Cross-sectional exploratory	39 oncology nurses from 2 hospital-based outpatient chemo clinics; convenience sample	Nurses believe CIPN assessment is important and is a problem; Nurses are not confident in their CIPN assessment skills; Knowledge deficits exist for non-pharm management strategies, autonomic neuropathy as a form of PN (hypotension), med term for CIPN sensations; 15% of nurses received previous instruction on how to perform assessment for CIPN; barriers include limited proficiency, time, cumbersome documentation; 33% screen for baseline PN; practice integration is lacking	Self-selected sample; survey structure may have led to prompts-not necessarily completely accurate; applicability to other practices	Level IIIA-B
2	Tofthagen, Visovsky, & Hopgood (2013)	Literature review, EBP Algorithm recommendati	NA	An algorithm developed to be used by nurses in multiple care settings; researched and clinical expertise developed;	Not research backed-validated	Level VA

	Chemotherapy-Induced Peripheral Neuropathy: An Algorithm to Guide Nursing Management	on		list of nursing interventions; describes how to perform assessments		
3	Mann, 2008 Neuropathic pain: could nurses become more involved?	Literature review/editorial	NA	Nurse assessment and management of neuropathic pain is a viable option in this under-addressed medical concern; personal contact time is essential in identifying symptoms early which in turn potentially initiates and effectively manages treatment; nurses have this time and ability; nurses can help with non-pharm interventions	Some literature support- significant amount of opinion	Level VB
4	Mols, et al., 2013 Chemotherapy-Induced Neuropathy and Its Association With Quality of Life	Descriptive comparative and prevalence	1643 patients diagnosed with colorectal cancer identified through a cancer registry; convenience sample	Patients with multiple neuropathy symptoms report lower QOL; CRC patients continue to report neuropathy symptoms	Limited data on previous use of the EORTC QLQ-CIPN20; comorbidities were difficult to account for; no baseline assessment prior to treatment; self-report of PN- no clinical	Level III B

	Among 2- to 11-Year Colorectal Cancer Survivors: Results From the Population-Based PROFILES Registry				assessment; chemo dosage not known; causal association between CIPN and HRQOL not determined; not randomized study	
5	Tofthagen, 2010 Patient Perceptions Associated With Chemotherapy-Induced Peripheral Neuropathy	Qualitative; purposive convenience sample	14 cancer patients who have received certain chemos in an outpatient clinic setting	Discusses importance of patient-reported symptoms; importance of subjective and objective measures; CIPN negatively affects QOL; proper management of CIPN is important for patient safety-falls; thorough and frequent exams by nurses can improve patient QOL	Small sample size; demographics not necessarily generalizable; bias r/t researcher = provider; lapse of time from tx completion to study; no objective or systematic assessment	Level IIIB
6	Lavoie Smith, 2103 Current Methods for the Assessment and	Literature review	NA	Oncology nurses are aware PN is an issue, but not sure what to do about it; TNS and FACT/GOG-Ntx; good table of measurement tools; "validated assessment tools should be administered … prior to each taxane		Level VA-B

	Management of Taxane-Related Neuropathy			treatment"; "provides practical suggestions for how nurses can take the lead in improving TIPN measurement practices"; good discussion on what to look for/how to evaluate, good use of case examples		
7	R. Wickham 2007 Chemotherapy-Induced Peripheral Neuropathy: A Review and Implications for Oncology Nursing Practice	Literature review	NA	Good article for review of CIPN including pathophysiology; Good description of peripheral nerve pathophys and why they are sensitive to certain chemotherapies; PN are more sensitive than central nerves; need better patient education; incidence of CIPN is unknown, more common w/ vincristine, taxanes, and platinums; CIPN likely to increase r/t longer life expectancy and more neurotoxic agents; good tables with neurotoxic chemos and grading scales, and nursing care; online resources; objective finding of screening must include functional impairment; CIPN may be bothersome but tolerable if cure is intent, whereas palliative chemo may have		Level VA-B

				lower threshold; comprehensive assessment impractical for nurses, can identify patients at risk and perform brief assessments		
8	Paice, 2009 Clinical challenges: Chemotherapy-induced peripheral neuropathy	Literature review	NA	Managing CIPN is challenging; will become more common with more chemotherapy agents and longer survival; prevalence is unknown because it is not well studied; no standardized assessment or staging system; self-report the most common method of evaluation, not systematic; table of validated tools;		Level VB
9	Postma & Heimans, 2000 Grading of chemotherapy-induced peripheral neuropathy	Literature review	NA	Not an overly helpful article; lists some grading scales; recommends standardized grading scale plus QOL; limited indications for EP studies; assess during and after chemo administration	Age- 2000	Level IVB-C

10	Visovsky, Collins, Abbott, Aschenbrenner, & Hart, 2007 Putting evidence into practice: Evidence-based interventions for chemotherapy-induced peripheral neuropathy	Evidence-based review	NA	Incidence unknown r/t no standardized measurement; concerning issue because of need for dose reductions, treatment delays, or termination of treatment; no meta-analyses found for prevention or treatment; no recommended/research supported nursing interventions for prevention or treatment; no pharmacologic or non-pharmacologic interventions were rigorously supported; need studies with more rigor, standardization and adequate sample size; only recommendations that can be made are for education and support		Level IV A
11	Kiser, Greer, Wilmoth, Dmochowski, & Naumann, 2010 Peripheral Neuropathy in Patients With Gynecologic Cancer	Observational descriptive with retrospective review	171gynecologic oncology patients who received chemotherapy, convenience sample	No standardized grading of PN or self-reporting of PN exists; EP scores have little value as they do not correlate with patient subjective symptoms; having received neurotoxic chemo previously seems to decrease reporting of neuropathy in subsequent treatments; gaps in provider charting and grading;	Retrospective analysis, convenience sample, low completion rate, gaps in data, no labeling on data as to order of treatment	Level IIIB

	Receiving Chemotherapy: Patient Reports and Provider Assessments			impossible to determine true prevalence of CIPN because of data gaps; Nurses should be leaders in identifying CIPN and its effects on QOL; oncology nurses must be knowledgeable about CIPN and educate patients; nurses play a crucial role in ensuring patients have good QOL and appropriate treatment		
12	Maxwell, 2013 Quality-of-Life Considerations With Taxane-Based Therapy in Metastatic Breast Cancer: A Case Vignette	Case vignette	NA	Infusion nurses are first line defense as they administer chemo; nurses don't have the time to do proper CIPN assessments; initial and continued nursing assessments and education are important; teach patients to report symptoms; nurses are "frontline managers of supportive care"		Level V B
13	Lavoie Smith, Beck & Cohen, 2008 The Total Neuropathy	Systematic review	NA	Nerve conduction studies are considered gold standard, yet they are expensive, time consuming, and do not correlate well with subjective reports; 3 challenges- nerve		Level IV B

	Score: A Tool for Measuring Chemotherapy-Induced Peripheral Neuropathy			pain is not always reported with routine pain assessments; CIPN is difficult to describe; oncologists don't see CIPN as being a big concern; appropriate tool has not been developed yet; TNS is most comprehensive; should be considered for use by oncology nurses; assessments should include patient distress r/t CIPN; no literature to support screening by nurses, but TNS could easily be taught to nurses to use; need more research regarding nurses ability to accurately assess		
14	Stubblefield et al., 2009 NCCN Task Force Report: management of neuropathy in Cancer	Task force report/guideline	NA	Ideal resource for definitions and signs and symptoms; list of cancer related causes of PN; CIPN is the most widely reported PN in cancer patients; diagnostic features unique to CIPN; CIPN is recognized as an adverse event but not the focus of studies as response or survival is; multi-agent therapies make studying difficult; pre-existing conditions as a study limitation; evaluation based on		Level IVA

				self-report rather than active probing; need better teaching on pain terms and associated conditions; "quality assessment and reporting leading to accurate diagnosis is a crucial step that must precede clinical decisions regarding treatment"; no gold standard for evaluation of CIPN; current assessments include clinical evaluation (grading systems), objective testing, and questionnaires; CIPN is subjective which makes evaluation more complex; poor correlation between subjective and objective data; patient tolerance and patient preference influence interventions; the task force strongly encourages active assessment at baseline and intermittently during therapy; recommends use of a neuropathic pain specific scale; education is necessary in interim while more studies are done on treatment		
15	Hershman et al., 2014	Practice Guideline	NA	Overall, well written guideline; it is limited in that there is		Agree II score of 7

	ASCO Prevention and management of chemotherapy induced peripheral neuropathy in survivors of adult cancers: American society of clinical oncology practice guideline			limited reliable data; bottom line is there needs to be more high quality research done; no consistent or conclusive evidence that prevention or treatment strategies work; communication between provider and patient are important for identification and management; need discussion along with numeric scale		
16	Griffith et al., 2014 Evaluation of chemotherapy -induced peripheral neuropathy using current perception threshold and clinical	Prospective observational pilot study	29 chemo-naïve cancer patients who will receive taxane or platinum chemo in an outpatient cancer center; convenience sample	Patients were studied prior to chemo and with each cycle; used NCI-CTCAE v3.0; measured CPT, QST, and mechanical sensation of right great toe; measured grip strength of dominant hand and DTR of rightankle; subjective questionnaires- neuropathic pain scale, FACT/GOG-ntx; increased CPT readings may predict impending reduction in	Relatively small sample size, subject heterogeneity, multiple examiners- different interpretations, need more robust measure of CIPN	Level IIIA-B

	evaluations			QOL; NCI-CTCAE score is associated with CPT 2000-impairment and hypoesthesias occur together; CPT 2000 is a feasible tool to use for screening CIPN patients		
17	Lavoie Smith, Cohen, Pett, & Beck 2011 The Validity of Neuropathy and Neuropathic Pain Measures in Patients With Cancer Receiving Taxanes and Platinums	Cross-sectional	117 cancer patients in 2 outpatient cancer centers; convenience sample	TNSr-SF and NPS-CIN took 5 mins to complete; TNSr-SF was simpler to use than TNSr; reflexes should be measured but don't need to be included in the TNS; the TNSr-SF used in combination with the NPS-CIN is preferred over the NCI-CTC; nurses should find the TNSr-SF and NPS-CIN the easiest of all measures to use within busy clinical settings; nurse-physician collaboration will lead to better patient care and patient outcomes, detect subtle changes, more timely care	Relatively small sample size; limited available research	Level IIIB
18	Griffith, Merkies, Hill, & Cornblath, 2010 Measures of chemotherapy -induced	Systematic review	NA	Systematic review of validity, reliability, and responsiveness of CIPN measures; best tool must have subjective and objective measures; must be easy to use and minimal cost; FACT/GOG-Tnx and TNS clinical version are most		Level IV A-B

	peripheral neuropathy: a systematic review of psychometric properties			promising		
19	Cavaletti et al., 2010 Chemotherapy-Induced Peripheral Neurotoxicity assessment: A critical revision of the currently available tools	Non-systematic review	NA	Reviews several CIPN evaluation tools; existing scales are not satisfactory (rationale delineated with each scale review); providers underestimate and underreport CIPN severity; TNSc and a reliable QOL questionnaire (EORTC QLQ-CIPN20) and pain assessment are most effective until better screening is developed	Non-systematic	Level VB

Appendix D

Pretest and Posttests

1. How confident are you in your knowledge about chemotherapy-induced peripheral neuropathy (CIPN)? (Please circle a *number*)

   Very confident Somewhat confident Not confident at all

   5 4 3 2 1

2. How confident are you in your ability to perform an assessment for CIPN?

   Very confident Somewhat confident Not confident at all

   5 4 3 2 1

3. How important do you believe it is to assess for CIPN?

   Very important Somewhat important Not important at all

   5 4 3 2 1

4. How often are you assessing for CIPN?

   Every patient Just patients at risk I don't know how to assess CIPN

   5 4 3 2 1

5. What is the likelihood of performing a CIPN assessment on patients if implemented in the clinic?

   Very likely Somewhat likely Not likely at all

   5 4 3 2 1

6. CIPN can cause persistent pain.
   a. True
   b. False
7. CIPN can decrease patient's ability to perform ADLs.
   a. True
   b. False
8. Which of the following are signs or symptoms of CIPN? (may choose multiple)
   a. Numbness or tingling
   b. Pain
   c. Constipation
   d. Temperature intolerance

9. Which of the following are signs or symptoms of CIPN? (may choose multiple)
    a. Hypotension
    b. Gait disturbance
    c. Shortness of breath
    d. Impotence
10. Patients often use this/these terms to describe CIPN. (may choose multiple)
    a. I feel like I'm always wearing gloves
    b. I can't feel the heel of my foot
    c. I can't pick up my pills from the counter
    d. The pain is hard to describe
11. When assessing for pain, which of the following descriptions may indicate CIPN?
    a. Sharp
    b. Dull
    c. Burning
    d. All of the above
12. It is important to assess for proprioception. Why?
    a. This will indicate if a patient is safe to drink water
    b. Patients with good proprioception should have their blood pressure monitored closely
    c. Patients with poor proprioception may need to walk with a cane and remove throw rugs from the house
    d. Patients with proprioception have frequent diarrhea

13. Which medication is NOT known for causing neuropathy?
    a. Rituxan
    b. Taxol
    c. Carboplatin
    d. Thalidomide
14. Which of these assessment findings may indicate CIPN?
    a. Patient walks straight down the hallway without assistance
    b. Decreased reflexes
    c. Heart rate of 90, regular rhythm
    d. A negative Romberg test
15. Which information is NOT important at baseline to determine CIPN risk?
    a. Alcohol use
    b. Charcot-Marie-Tooth disease
    c. Diabetes
    d. Acetaminophen use
16. Which term is NOT associated with CIPN side effects?
    a. Allodynia
    b. Dysesthesia
    c. Hyperreflexia
    d. Paresthesia

17. Which vinca alkaloid is MOST likely to cause CIPN?
    a. Vinblastine
    b. Vincristine
    c. Vindestine
    d. Vinorelbine
18. CIPN always improves after cessation of chemotherapy.
    a. True
    b. False
19. If a patient has not experienced CIPN before the last dose of cisplatin, they will not experience CIPN.
    a. True
    b. False
20. Which medication is most known to cause acute-transient CIPN?
    a. Cisplatin
    b. Thalidomide
    c. Oxaliplatin
    d. Docetaxel
21. Which of the following treatments do NCCN and ASCO support for use in preventing CIPN?
    a. Vitamin E
    b. Calcium and magnesium infusion
    c. Alpha lipoic acid
    d. None of the above
22. According to ASCO, which medication is most research supported for the treatment of CIPN?
    a. Nortriptyline
    b. Venlafaxine
    c. Gabapentin
    d. Topical baclofen
23. Which non-medication treatment may have benefit for patients with CIPN?
    a. Physical therapy
    b. Acupuncture
    c. TENS therapy
    d. All of the above

Appendix E

Demographics Form

1. What is your age?_____
2. What is your gender?
    a. Female
    b. Male
3. What is your ethnicity
    a. White
    b. Hispanic or Latino
    c. Black or African American
    d. Native American or American Indian
    e. Asian or Pacific Islander
    f. Other
4. What is your highest nursing education level?
    a. Certificate
    b. Associates
    c. Bachelors
    d. Masters or higher
5. What is your FTE status?
    a. Full time
    b. Part time
6. Which area do you primarily work in?
    a. Clinic
    b. Infusion
7. How many years have you been a nurse?
    a. 0-2
    b. 3-5
    c. 6-8
    d. 9-11
    e. 12-14
    f. 15 or more
8. How many years have you been an oncology nurse?
    a. 0-2
    b. 3-5
    c. 6-8
    d. 9-11
    e. 12-14
    f. 15 or more
9. Which of the following certifications do you have? (May choose both)
    a. OCN
    b. Chemotherapy & biotherapy
10. Have you ever had formal training on Chemotherapy induced peripheral neuropathy?
    a. Yes
    b. No

Appendix F

FACT/GOG-Ntx

	Not at all	A little bit	Some -what	Quite a bit	Very muc
I have numbness or tingling in my hands	0	1	2	3	4
I have numbness or tingling in my feet	0	1	2	3	4
I feel discomfort in my hands	0	1	2	3	4
I feel discomfort in my feet	0	1	2	3	4
I have joint pain or muscle cramps	0	1	2	3	4
I feel weak all over	0	1	2	3	4
I have trouble hearing	0	1	2	3	4
I get a ringing or buzzing in my ears	0	1	2	3	4
I have trouble buttoning buttons	0	1	2	3	4
I have trouble feeling the shape of small objects when they are in my hand	0	1	2	3	4
I have trouble walking	0	1	2	3	4

Retrieved from www.facit.org/literatureretrieve.aspx?ID=42405

Appendix G

South Dakota State University Institutional Review Board Approval

SDSU IRB

Dec 29, 2014

Kim,

Thanks for the update. I believe that they would likely rule this activity as "not human subjects research," possibly exempt human subjects research.

I am going to rule the activity to be "not human subjects research." With this determination, no other involvement of the SDSU IRB is required on your part. Please let me know the determination Sanford makes, to complete our records.

Thanks!

Norm

Norman O. Braaten, PhD, CPIA

Research Compliance Coordinator

South Dakota State University

Appendix H

Sanford Institutional Review Board Approval

SANFORD HEALTH

January 13, 2015

PI: Kim Schmidt
Project: 03-14-143 Chemotherapy-induced Peripheral Neuropathy Education and Assessment

The study submission for the proposal referenced above has been reviewed via the procedures the Sanford Health Institutional Review Board

The activities described in your application are intended to contribute to quality improvement / assessment. Based on these findings, the project proposal does not meet the definition or regulatory requirements for human subject research. If in the future, you decide to collect information with the intent to develop or contribute to generalizable knowledge, you will be required to submit an application to the IRB for prospective review.

Please maintain a copy of this letter in your study file for documentation that your study does not meet the regulatory requirements for human subject's research.

Sincerely,

Deb Langstraat, CIP
Director-Sanford IRB

Sanford Health Human Research Protection Program, Route #5033 • 1305 W. 18th Street • Sioux Falls SD 57117-5039 • P 605-312-6430