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The Effect of Education on Healthcare Personnel's Knowledge of Lymphedema Detection and Prevention

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THE EFFECT OF EDUCATION ON HEALTHCARE PERSONNEL'S KNOWLEDGE
OF LYMPHEDEMA DETECTION AND PREVENTION

by

Dolly Wilson

A thesis submitted to the faculty of
Gardner-Webb University School of Nursing
in partial fulfillment of the requirements for the
Degree of Master of Science in Nursing.

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Submitted by:

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Abstract

Secondary lymphedema (SLE) is a serious problem for many of the 2.6 million breast cancer survivors in the United States. It is estimated that 28 – 38% of breast cancer survivors develop lymphedema. The five-year incidence ranges from 43% to 94% (Armer, 2010). The purpose of this study was to evaluate the effectiveness of an education program on healthcare personnel's knowledge of the risk of and preventive measures for upper limb lymphedema in breast cancer patients. A sample of healthcare personnel (N = 32) included both trained healthcare personnel and ancillary staff who are employed in a single oncology center based at two hospitals. Fifteen healthcare personnel who attended an educational program on lymphedema detection and prevention and seventeen healthcare personnel who did not attend were randomly selected to participate in the study. Although there was little variation in the scores between the educated versus the uneducated group, the educated group did better. Among the groups, the highest score was found in the educated group (97%). The group that did not receive the education received a lower score (92%).

Levene's test for equality of variances was found to be violated for the present analysis, $F(1,30) = 2.903, p = .099$. Therefore, in order to test the efficacy of the lymphedema education, an independent samples t-test not assuming equality of variances was conducted and found to be not statistically significant, $t(22.637) = 1.798, p = 0.085$.

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Chapter I Introduction

Lymphedema is regarded as one of the most dreaded complications following breast cancer. Although lymphedema is considered one of the most distressing and debilitating complications after breast cancer treatment, its incidence and symptoms are not well understood. Early detection and intervention hold the greatest promise of reducing and managing this widespread condition in patients who have undergone breast cancer treatment (Gergich et al., 2008). Edema is defined as a palpable swelling produced by expansion of the interstitial fluid volume. Lymphedema, which is due to an abnormality in the lymphatic system is caused by interruption of the axillary lymphatic system by surgery and/or radiation therapy in women with breast cancer, resulting in the development of arm edema (Mohler, 2012). The lymphatic system can be compromised when one or more lymph vessels or nodes (small organ distributed throughout the body that transport and filter or trap foreign particles and waste) are surgically removed or stop working properly due to disease. Breast cancer comprises 10.4% of all cancer incidences among women. Although mortality rates from breast cancer are decreasing (Harris, Campbell, & McNeely, 2004), the morbidity associated with the standard treatment of lymphedema continues to be significant with decreased shoulder mobility and strength, lymphedema, and impaired activities of daily living (Lawrance & Stammers, 2008). Any type of procedure that affects the lymphatic system may put you at risk for lymphedema—a risk that persists for life.

Since there is no cure for lymphedema, precautions and prevention should be emphasized. Informing patients by raising awareness might reduce the incidence of lymphedema. It has been suggested that prevention programs might reduce the incidence

of lymphedema. If lymphedema is left untreated it can become disabling by decreasing mobility and increasing dysfunction.

The key word in lymphedema management is *early*. “Education and early intervention are huge pieces to lymphedema management” (James, 2012) . Obesity, severe fatigue, susceptibility to infection, and heavy trauma to the lymphatic systems (such as multiple surgeries and radiation) can increase risk. Healthcare providers, informed of the importance of aftercare following breast surgery, have the ability to have an impact on reducing the potential physical and psychological complications. Educated healthcare providers can empower and encourage patients to be active participants in their care following breast surgery. They play an important role in educating women about the risks of lymphedema associated with breast cancer as well as identifying patients at increased risk. Early identification and prevention are paramount. Teaching patients about their risk of lymphedema and how to prevent complications, referring to specialists in lymphedema management, reinforcing self-care measures, and offering emotional support to patients who experience lymphedema helps minimize the effect of lymphedema on quality of life (Singer, 2009).

Background

According to Mei R. Fu (2011), the majority of doctors and nurses don't know how to educate patients undergoing breast surgery. Studies document that the majority of patients do not receive basic information about the risk of lymphedema. Healthcare providers need to have specialized training that includes risk-reduction education, the physiology of lymphedema and preventive measures. “Nurses are on the frontline and may hold the key in proactively preventing lymphedema in many patients by educating

them about triggers and symptoms, continual and specific lymphedema assessments during each visit and pursuing research in this area” (McDowell, 2008). Unless a nurse or healthcare provider specializes in oncology nursing, lymphedema may not be an occurrence that they assess and treat frequently. Determination of baseline knowledge of lymphedema is essential before beginning education. Following baseline assessment, education including definition of lymphedema, cause, assessment, treatment, and prevention is necessary (McDowell, 2008).

Purpose of the Study

The purpose of this study is to evaluate the effectiveness of an education program on healthcare personnel’s knowledge of the risk of and preventive measures for lymphedema in breast cancer patients. This knowledge has the potential to improve the ability of healthcare personnel to deliver effective patient education, provide quality care and improve health outcomes for those at risk for lymphedema.

Lymphedema is an adverse effect that can be a result of cancer treatment related surgical and radiation procedures that damage or disrupt lymphatic structures. It can occur immediately or many years after treatment. Healthcare personnel play a pivotal role in caring for patients throughout cancer treatment and are sentinels for the early assessment of lymphedema risk, prompt identification of lymphedema symptoms, and implementation of evidence-based, individualized treatment plans in collaboration with lymphedema therapists (Armer, Poage, Poundall, Shellabarger, & Singer, 2008).

Significance

Lymphedema is a common complication following breast cancer surgery and is believed to be largely undiagnosed in clinical practice. It is caused by interruption of the

lymph drainage in the armpit (axilla) that results in discomfort and swelling of the arm. The risk of developing lymphedema depends on the extent of surgery, how many lymph nodes were removed, and whether radiation therapy to the axilla was used. Infection caused by insect bites or even scratches could precipitate this complication. The highest risk for shoulder dysfunction or lymphedema is typically the first four years post surgery. Another, not so common problem is shoulder and/or arm dysfunction (Lawrance & Stammers, 2008).

As reported at American Society of Clinical Oncology's (2009) Breast Cancer Symposium, "More cases of lymphedema are seen between six and nine months after treatment, but even after 60 months we still see new cases, so there are late-occurring cases". Depending on the criteria used to define lymphedema, the five-year incidence ranged from 43% to 94% (Armer, 2010). Awareness and preventive effort are vitally important because once symptoms arise it may be too late for prevention. It is critical that women are educated, aware, and instructed in prevention strategies and precautionary behaviors for avoiding lymphedema. Information about lymphedema should begin when they are making decisions about their breast cancer treatment.

This study makes a significant contribution to nursing knowledge by describing and documenting the effect of an education program on healthcare personnel's knowledge of the risk and prevention of lymphedema for women who have had breast cancer treatment. There is a need to educate providers about the situation of women at risk for lymphedema, the prevention strategies, treatment modalities, and support groups to refer patients appropriately for education and support.

Findings from this study may be used to improve educational programs for

healthcare personnel caring for this patient population. Even though ancillary staff may not give direct care to patients, they are more likely to see patients for visits that do not require the direct care of the nurse.

Research Question

Will healthcare personnel attending an educational program on lymphedema demonstrate higher knowledge of lymphedema detection and prevention than those healthcare personnel not attending an educational program?

Theoretical Framework

Pender's Revised Health Promotion Model (HPM) guided the framework of this study. The HPM was developed as a holistic predictive model of health-promoting behavior for use in clinical practice and research (Peterson & Bredow, 2009). Major concepts of the HPM include individual characteristics and experiences, behavior specific cognitions and affect, and behavioral outcomes.

The HPM identifies ten sub-concepts to the three major concepts (see table 1 below). According to Pender, Individual Characteristics and Experiences include Prior related behaviors and Personal biological, psychological, and sociocultural factors. Behavior-specific Cognitions and Affect includes: Perceived benefits and barriers to action, Perceived Self-efficacy, Activity-related affect, and Interpersonal and Situational influences. Behavioral Outcomes includes: Commitment to a plan of action and Health-promoting behaviors (Peterson & Bredow, 2009).

Table 1*Pender's Health Promotion Model (HPM)*

Individual Characteristics & Experiences:	Behavior-Specific Cognition & Affect:	Behavior Outcomes:
<ul style="list-style-type: none"> • Prior related behaviors • Personal biological, psychological, & sociocultural factors 	<ul style="list-style-type: none"> • Perceived benefits & barriers to action • Perceived self-efficacy • Activity-related affect • Interpersonal & situational influences 	<ul style="list-style-type: none"> • Commitment to a plan of action • Health promoting behaviors

This study's aim, to determine the effect of education on Healthcare Personnel's knowledge of Lymphedema detection and prevention, utilizes three of Pender's sub-concepts: Personal factors; Interpersonal influences, and Health-promoting behaviors. In this study, Pender's sub-concept "Personal factors" will be represented by the participant's demographic information as measured by the Demographic Data Sheet. Pender's sub-concept "Interpersonal influences" will be represented by the Lymphedema Educational Program. Pender's sub-concept "Health-promoting behaviors" will be represented by the participant's knowledge of Lymphedema detection and prevention as represented by the scores on the Lymphedema Knowledge Test.

Lymphedema may have an adverse influence on quality of life but more importantly its relationship with overall survival may extend beyond quality of life to quantity of life, emphasizing the importance of identifying evidence-based prevention and treatment strategies (National Lymphedema Network, 2009).

Healthcare providers should advocate for referral as needed to other specially

trained physiotherapists. Patients with cancer should routinely receive education about their relative risk for developing lymphedema. Providing education “could help prevent and reduce secondary lymphedema in patients after breast cancer surgery involving dissection of axillary lymph nodes, at least for one year after surgery” (Torres, 2010). Patients should also be told about risk reduction guidelines such as those contained in the National Lymphedema Network (2009).

Healthcare professionals need continuing education about definition, assessment, intervention, and prevention of lymphedema (Armer, Radina, Porock, & Culbertson, 2003). With this accomplished, patients will benefit with patient education and high quality care.

Chapter II Literature Review

Lymphedema is regarded as one of the most dreaded complications following breast cancer. The following chapter reports the state of the literature regarding Lymphedema. The studies were located in CINAHL, PUBMED and MEDLINE using the key terms: 1) axillary lymph node dissection--surgery to check for cancer in lymph nodes in the armpit, 2) lymph node--round mass of lymph fluid and white blood cells that filter bacteria and waste from the body, 3) lymphedema--condition in which excess fluid, called lymph, collects in tissues and causes swelling, 4) sentinel lymph node biopsy--surgery to check for cancer in the first lymph nodes in the armpit where cancer is like to travel, 5) cellulitis--infection and swelling that causes skin to be warm, red and tender; may also produce fever, chills, swollen lymph nodes or blisters (Living Beyond Breast Cancer, 2010).

Documentation of the problem of lymphedema is readily found in cancer survivorship topics. However, reports in medical literature vary widely on estimates of lymphedema incidence (Oncology Nurses Society, 2009). Challenges to assessing incidence and prevalence stem from difficulty in attaining accurate measurement, diagnosis, duration of follow-up and limitation to a particular hospital or clinic. Current criteria for staging and grading of lymphedema vary in the literature. Quantification of lymphedema is problematic for two reasons. A standard criterion for diagnosing lymphedema does not exist and limb measurement methods may vary so a “gold standard” for objective measurement does not exist (Armer, 2005; Torres, 2010). Data regarding the incidence and prevalence of lymphedema occurring patients are sparse and inconclusive (Oncology Nurses Society, 2009). Studies do not provide consistent,

clear definitions of lymphedema. Lymphedema can occur not only during cancer treatments but also for several years afterward (Armer, 2010).

Torres (2010) conducted a study to determine the effectiveness of education on early physiotherapy in reducing the risk of lymphedema. This was a quantitative, randomized, single blinded, clinical trial of 120 women who had breast surgery with axillary dissection between May 2005 and June 2007. In addition to education, a physiotherapist treated the early physiotherapy group and also an educational strategy was provided. The control group received the education strategy only. The incidence of clinically significant secondary lymphedema (>2cm increase in arm circumference measured at two adjacent points compared with the non-affected arm) was evaluated. One hundred sixteen (116) women completed the one-year follow-up. Eighteen women (16%) developed secondary lymphedema (16%): 14 women in the control group 14 (25%) and four (7%) women in the intervention group. The difference between the groups was statistically significant ($p=0.01$). A survival analysis showed a significant difference, with secondary lymphedema being diagnosed four times earlier in the control group than in the intervention group. Early physiotherapy could be an effective intervention in the prevention of lymphedema. Weaknesses of this study included the limited duration of follow-up and the setting being one hospital. Also, the ambiguous definition of lymphedema may have resulted in significant measurement errors. It was clear that outcomes of the study might be used for calculations in a larger effect study.

In one study assessing incidence of lymphedema following the surgical procedure of Axillary Lymph Node Dissection (ALND) 73% of women reported restricted shoulder mobility, tightness, edema, pain, and numbness of the arm, and

limitations in daily life (Beurskens, Van Uden, Strobbe, Oostendorp, & Wobbes, 2007). Physiotherapy has been clinically observed to improve treatment of these patients. The goal of Lawrance and Stammer's (2008) study was to demonstrate that physiotherapy has been clinically observed to improve quality of life for patients following breast cancer. Presently, there is no standard referral for physiotherapy unless there is edema or restricted shoulder function. The researchers utilized a computer-generated random list to ensure accuracy of outcomes. Assessments were made at baseline and after three and six months. The treatment group received standardized physiotherapy treatment of advice and exercises for the arm and shoulder for three months. The control group received a leaflet containing advice and exercises. The outcome variable of pain in the shoulder/arm was measured by a Visual Analogue Scale and digital inclinometer that was a measure of shoulder mobility. The study was conducted over a two-year period from 2003 to 2005. Patient characteristics of intervention group and control group indicated no significant differences in groups prior to the intervention. Findings indicated physiotherapy, beginning two weeks after surgery, improved shoulder function (Lawrance & Stammers, 2008).

Beurskens et al. (2007) investigated the efficacy of physiotherapy treatment of shoulder function, pain and quality of life in patients who have undergone breast cancer surgery. Thirty patients were included in a randomized quantitative control study. The treatment group received standardized physiotherapy treatment of advice and exercises; the control group received a leaflet containing advice and exercises. Primary outcome variables were amount of pain in the shoulder/arm recorded on the Visual Analogue Scale, and shoulder mobility measured on a digital inclinometer under standardized

conditions. The researcher was blinded to treatment allocation. All thirty patients completed the trial. After three and six months the treatment group showed significant improvement in shoulder mobility and had significantly less pain than in the control group. Results of the study indicate that quality of life improved significantly, however, handgrip and strength and arm volume (edema) did not alter significantly. Beurskens et al. (2007) study demonstrated that physiotherapy, which began two weeks after surgery, improved shoulder function and quality of life. Limitations of the study included the small sample size and short follow-up time of six months. The researchers recommended a long-term follow up to provide further information about the lasting improvement and occurrence of lymphedema following ALND. The study recommended that larger studies with at least a one-year follow-up with relevant outcome measures are needed (Beurskens et al., 2007).

Shoulder morbidity resulting from surgery and effects from radiotherapy (RT) results in limited shoulder range of motion (ROM). Axillary dissection can contribute to limited shoulder ROM called “axillary web syndrome” (AWS). This may be referred to as “cording” Visible and palpable cords may develop within the first six to eight weeks after surgery and begin in the axilla and into the forearm. The risk of developing lymphedema due to subcutaneous fibrosis and changes in vessel and lymphatic capillary walls (thereby affecting circulation) may be three and a half times higher in cases of axillary and supraclavicular RT (Harris et al., 2004). The objective of a quantitative study by Nesvold, Dahl, Lokkevik, Mengshoel, and Fossa (2008) was to compare the prevalence of late effects in the arm and shoulder in patients with breast cancer stage II who had radical modified mastectomy (RM) or breast-conserving therapy (BCT)

followed by radiotherapy (RT). Women consecutively treated for stage II breast cancer between 1998-2002 at the Norwegian Radium Hospital (NRH) were invited to take part in a follow-up study in 2005. The survey consisted of mailed questionnaires in an outpatient clinical examination. All patients delivered written informed consent before inclusion. Shoulder range of motion ROM was evaluated by goniometry. The women were asked to perform active motion to reach the greatest range possible, and the angles were recorded in degrees. Findings indicated no significant differences between the groups concerning demographic, treatment and medical characteristics. Statistically significant difference in ROM between the groups studied was observed. Lymphedema was observed in 43 patients (20%) belonging to the RM group compared to 6 (8%) in the BCT group. There was no statistically significant difference ($p=0.43$) in functional capacity between the groups. Nine patients had severe lymphedema, all of them belonging to the RM group. Six patients in the BCT group had lymphedema in the affected breast. Among those with arm lymphedema, 80% reported that the edema had developed during the first year after surgery and 17% during the second year. Nesvold et al., (2008) reported that compared to the RM group, significantly fewer patients treated with BCT suffered from arm/shoulder problems including lymphedema. The results from this study support the proposal to provide physical therapy during RT, consisting of shoulder exercises. Physical therapy favors the maintenance of shoulder ROM in relating to flexion and abduction and minimizes the occurrence of scar tissue formation in women with breast cancer, during the first six months of follow-up. Limitations of the study included the interval for follow up may have been too short to detect the late effects of radiation, such as lymphedema and subcutaneous fibrosis and the physical therapists were

not blinded which could result in bias. The researchers recommended longer follow-up period to assess whether the promising results from physical therapy (Nesvold et al., 2008).

Meta-analysis

Bicego et al. (2006) addressed that many women experience secondary complications of breast cancer not only from the disease and its treatments but also decreased quality of life (QOL), weight gain, sleep disturbances, poor body image, fatigue, increased risk for osteoporosis, cardiovascular disease, premature menopause, and lymphedema. The purpose of this qualitative study was to review and critique recent studies investigating the effects of aerobic exercise and upper extremity resistance training for women with or at risk for lymphedema. The questions addressed are: (1) does aerobic or resistance exercise lead to lymphedema in women who are at risk for the condition? And (2) does aerobic or resistance exercise reduce or exacerbate pre-existing lymphedema. The article reviews the prevalence, etiology, pathology, and diagnosis of exercise from leading oncology experts. The researchers categorized the level of each research study from level II to V, according to Sackett levels. Of the eight studies reviewed, the researchers found five were level V, the least rigorous type of experimental design. Three studies were categorized as level II, which were small, randomized controlled trials, one of which explored lymphedema as an adverse effect rather than an outcome. Prior to this study, the idea that aerobic exercise and upper extremity exercise should be contraindicated was widely accepted. The studies revealed that exercise neither initiated nor exacerbated lymphedema, although more cases of new lymphedema were reported in one study (Bicego et al., 2006). Lymphedema related questions such as this

require the evaluation of a physical therapist and healthcare personnel are important entities in making recommendation for referral.

A systematic review by Harris, Campbell, and McNeely (2004) of late morbidity after treatment of breast cancer (one year or more after surgery) was done. The review included six articles that were methodologically rigorous enough to satisfy rigorous inclusion criteria. The review assessed studies evaluating muscle and grip strength. One prospective study reported a prevalence of limited range of motion in 20% in patients who had sentinel node biopsy and 72% in patients who had axillary dissection. Physical activity levels were evaluated in approximately 3,000 women in the Nurses' Health Study who had been diagnosed with stage 1, 2, or 3 breast cancer between 1984 and 1998 and were followed until death or June 2002. The primary measured outcome was breast cancer mortality risk according to the level of physical activity.

The researchers found that studies are currently underway to compare different types of exercise following breast cancer treatment. California researchers are studying whether weight-bearing resistance exercise can reduce bone loss in women undergoing chemotherapy for invasive breast cancer. Other studies are continuing to examine the effects of exercise on immune response in breast cancer survivors. Lower incidences of lymphedema were found in women who exercised regularly, received lymphedema education before treatment, and performed preventive self-care activities. Physical therapy guidelines for management of women with breast cancer surgery are minimal (Harris, Campbell, & McNeely, 2004).

All breast cancer patients, with suspected lymph node invasion, need axillary node dissection. A study by Devoogdt et al. (2009) investigated the short-and long-term

effects of treatment for breast cancer and axillary node dissection on shoulder mobility, development of lymphedema, pain and activities of daily living (ADL). Patients who had a modified radical mastectomy (33%) or a breast-conserving procedure (67%) were included in the study. Shoulder mobility, lymphedema, pain and ADL were evaluated at three months and three years after surgery. At long term, 31% of the patients experienced impaired shoulder mobility, 18% developed lymphedema, 79% had pain and 51% mentioned impaired daily activities. Between three months and three years after surgery, impaired shoulder mobility decreased from 57% to 31%. Lymphedema increased from 4% to 18%. Patients experienced an equal amount of pain but fewer problems with ADL. At three years, no significant differences between mastectomy and breast-conserving procedure were found. The researchers reported limitations of the study including the high rate of patients lost in follow-up and the application of 'normative values' to interpret shoulder mobility and to compare the involved arm with the uninvolved arm to define lymphedema. The researcher recommended further research that included measurement of the patients' arms prior to surgery. The study found at long term, a significant number of breast cancer survivors who still had shoulder mobility, developed lymphedema, had pain and experienced difficulties during daily activities. Shoulder mobility, pain and daily activities had positive improvements but the incidence of lymphedema increased.

Park, Lee, and Chung (2008) researched women (n=450) with breast cancer who had mastectomies. Participants were recruited from outpatient breast cancer clinics in two university hospitals in Seoul, Korea from 2004 to 2005 for this quantitative study. Lymphedema was defined by circumferential measurement. Risk factors associated with

lymphedema were examined. A descriptive design was used and data was collected using a questionnaire.

The study reported that of the 450 cases of breast cancer, 24.9% had developed lymphedema. The higher the staging, the greater extent of breast surgery, including axillary lymph node dissection and also body mass increased the risk of lymphedema. Women, who exercised regularly, received pretreatment education and performed preventive self-care activities had a decreased risk of lymphedema. Since a retrospective study was conducted, the results do not include assessment of trends. Park et al. (2008) stated other factors that might contribute to lymphedema must be considered. The researchers recommend that patients be educated in the symptoms and risk of lymphedema. Nurses should inform patients with breast cancer about their risk for lymphedema, provide guidelines, and emphasize self-care activities to reduce the risk for lymphedema.

Chapter III Methodology

The purpose of this study is was to determine the effect of an educational program on healthcare personnel's knowledge of lymphedema detection and prevention.

Lymphedema is regarded as one of the most dreaded complications following breast cancer. Its relationship to overall survival may extend beyond quality of life to quantity of life. Early detection and intervention hold the greatest promise of reducing and successfully managing this widespread, chronic condition. Nursing practice guidelines for lymphedema education, assessment, monitoring and management are lacking. Providing education on lymphedema "could help prevent and reduce secondary lymphedema in patients after breast cancer surgery involving dissection of axillary lymph nodes, at least for one year after surgery" (Torres, 2010). Early detection and intervention hold the greatest promise of reducing and managing this widespread condition in patients who have undergone breast cancer treatment (Gergich et al., 2008).

Lymphedema can occur not only during cancer treatment but also for several years afterward (Armer, Radina, Porock, & Culbertson, 2003). Survivorship is one of the areas Oncology Nurses Society (ONS) began to focus on in 2009. Data regarding the incidence and prevalence of lymphedema occurring in patients are sparse and inconclusive (Oncology Nurses Society, 2009).

Sample Population

Participation was based on a convenience sample and included both trained healthcare personnel and ancillary staff who are employed in a single oncology center based at two hospitals. Fifteen healthcare personnel who attended an educational program on lymphedema detection and prevention and seventeen healthcare personnel

who did not attend the program participated in the study.

Setting

The setting for the study to determine the effect of an educational program on healthcare personnel's knowledge of lymphedema detection and prevention includes one large healthcare organization in Western North Carolina. The healthcare organization includes two acute care hospitals with patient populations consisting of women undergoing breast surgery. The average daily census for both of the healthcare facilities is 100. Hospital A employs approximately 1,000 healthcare personnel and Hospital B employs approximately 400 healthcare personnel. Patients are seen at both hospitals, this study was conducted with staff from both hospitals.

Research design

A quasi-experimental design utilizing a convenience sample was used for this study to determine the effect of an educational program on healthcare personnel's knowledge of lymphedema detection and prevention.

Protection of Human Subjects

Approval of the University Institutional Review Board (IRB) was obtained prior to data collection. Approval of the Healthcare organization was obtained from Director of Specialty Services and the Director of Human Resources. Verbal and written explanation of the study purpose was given to the participants prior to data collection. Written informed consent, ensuring the subject's right to confidentiality and anonymity, the right to ask questions of the investigator, and the right to withdraw from the study was given to each participant. Return of the completed surveys indicated the participant's consent to participate. No identification was indicated on the surveys (see appendix C).

Data Collection

Healthcare personnel working with patients at risk for lymphedema (n =15) whom had previously attended an education presentation on lymphedema prevention and detection completed the demographic form and the Lymphedema Knowledge test. Healthcare personnel (n =17) who did not attend the education presentation completed the demographic form and the Lymphedema Knowledge test.

Data Analysis

Data was stored and analyzed on the principal investigator's personal computer with access to the research files will be password protected. Aggregate data was analyzed using the Statistical Package for the Social Sciences, version 19. Statistical analysis included descriptive statistics of frequency and measures of central tendencies. The effect of the educational program was determined using an independent samples *t* test.

Educational Program

An educational program on Lymphedema detection and prevention was developed by the researcher (see Table 2 below). The Lymphedema educational program is outlined in Appendix A and was based on the following facts:

- Lymphedema is a condition in which excessive fluid and protein accumulate in the extravascular and interstitial space (Rockson, 2001). This accumulation of fluid and protein occurs when the lymphatic system either cannot accept or transport lymph (the colorless fluid that bathes the cells of the body, carrying away by-products of metabolism and helping to fight infection) into the circulatory system (Browse, Burnand, & Mortimer, 2003).
- Any patient who has treatment for breast cancer, including prophylactic

mastectomy (lumpectomy, modified radical mastectomy in combination with lymph node removal and/or radiation to the underarm area, breast or chest wall). Seven percent of patients with sentinel node biopsy developed significant clinical lymphedema in one study. For axillary node dissection the incidence was 49% after a 20-year follow-up (McLaughlin, 2008).

- ALL breast cancer patients, immediately after undergoing surgery that includes axillary lymph node dissection and/or radiation, are at risk, for the rest of their lives, of developing lymphedema (National Lymphedema Network, 2011).
- Lymphedema can occur immediately postoperatively, during radiation, within a few months, a few years or even decades or more after cancer treatment (McLaughlin, 2008).

Table 2

*Prevention Interventions and Precautions**

Prevention Interventions	Strategies and Precautions
Avoidance of trauma and injury to the arm	Use of protective gloves for household work and gardening; avoid venipuncture, blood pressure measurement, and injections in the affected arm; and do not get bitten by an insect or scratched by an animal
Prevention of infection	Preventing infection with timely first aid; immediately identifying and treating any signs of infection; avoiding heat and sun exposure; practice meticulous skin and nail care; avoid paper cuts
Avoidance of Arm Constriction	Avoiding constrictive clothing and jewelry on the affected extremity; wear a padded bra strap to avoid pressure; do not carry a shoulder bag
Use and Exercise of the Limb	Use the affected limb in moderation; not carrying heavy objects; avoiding repetitive motion

*National Lymphedema Network (2009). *Lymphedema Risk Reduction Practices*.

Chapter IV Results

Demographic Description of Sample

Thirty-two healthcare personnel participated in the study to determine the effect of an educational program on healthcare personnel's knowledge of lymphedema detection and prevention. Of the sample, 29 (91%) were female, and three (9%) were males. Ten (31%) of the healthcare personnel participating in the study were employed in Radiation Oncology. The remainder was employed in Medical Oncology, or as ancillary staff. Nine (28%) of the respondents were Registered Nurses. Sixty-two percent had at least one degree in the whole sample ($N=32$), and seven (22%) held Bachelors Degrees. Only one healthcare provider held a doctorate degree and four (13%) reported holding "Other, or No Degree". The ages of the participants were between 23 and 70 years ($M = 46.9$, $SD = 11.68$). The study participants had been employed as healthcare providers between one and thirty-six years ($M = 14.33$ $SD = 10.95$). The number of certificates held ranged from 0 to 3 ($M = 0.87$, $SD = .88$). There were five Registered Nurses (RNs) in each group. The RNs that received the lymphedema education did slightly better than the RNs that received no education (100% vs. 96%, respectively). See Table 3 and 4 for the Demographic data for the entire sample ($n = 32$).

Table 3*Percent Distributions for Demographic data for Sample (n=32)*

	Lymphedema Education(n=15)	No Lymphedema Education (n=17)
Gender		
Male	7% (1)	12% (2)
Female	93% (14)	88% (15)
Healthcare Area of Employment		
Registered Nurse	33% (5)	24% (4)
Registration	33% (5)	0
Registration Oncology Staff	7% (1)	53% (9)
Certified Medical Assistant	13% (2)	12% (2)
Other	13% (2)	12% (2)
Highest Degree Held		
Associate	53% (8)	71% (12)
Bachelors	27% (4)	7% (3)
Masters	0	0
Doctorate	0	6% (1)
No degree	20% (3)	6% (1)

Table 4*Measures of Central Tendencies for Demographic Data for Sample (n=31*)*

Variable	Mean	SD Deviation	Range
Age	46.97	11.68	23-70
Years of Experience	14.35	10.95	1-38
Number of Certifications	0.87	0.88	0-3

* Demographic data was missing for one participant.

Demographic Description of Groups

Of the 32 study participants who completed a lymphedema quiz, 15 (47%) attended a lymphedema educational seminar before taking the quiz, and 17 (53%) did not. Of the 15 who completed the seminar, 14 (93%) were female; of the 17 who did not complete the seminar, 15 (88%) were female. Of the 15 who attended the seminar, five (33%) were registered nurses; and of those who did not attend the seminar four (24%)

were registered nurses. Ten healthcare personnel from the radiation oncology department participated in the study, but only one attended the educational seminar. There was an equal number of certified medical assistants and staff who self-identified as ‘other’ in each of the two sample groups. The average age for both groups was similar $M = 46.86$ years for those who received education, and $M = 47.06$ years for those who did not. The groups were also similar for years of experience and number of certifications. Years of experience were also very similar, $M = 13.73$ for the group receiving education, and $M = 14.94$ for the group that did not receive education. The number of certifications was also very similar, $M = 0.86$ for the group receiving the education, compared to $M = 0.88$ for the group that did not (see Tables 4 and 5).

Table 5

Measures of Central Tendencies for Groups

Variable	Education (n=15)			No Education (n=17)		
	M	SD	Range	M	SD	Range
Age	46.86	12.14	23-61	47.06	11.68	28-70
Years of Experience	13.73	11.55	2-36	14.94	10.7	1-38
Number Certifications	0.86	0.77	0-2	0.88	0.99	0-3

Regardless of participation in the lymphedema prevention and detection program, all participants of both groups identified the correct answer for questions one, and five through eight. In question 2, participants were asked to identify the best way to reduce and manage lymphedema. All of the 15 participants who attended the education seminar selected the correct response, however, one of the participants who did not attend the seminar answered incorrectly. One of the main objectives of this education seminar was to teach health care providers how to prevent lymphedema through early detection. The

education regarding the actual management of lymphedema was not covered in detail, as a physiotherapist does the management. Question 3 had a total of twelve incorrect answers counting both groups. This could be due to the inclusion in the educational seminar PowerPoint that “any patient who has treatment for breast cancer” is at risk for lymphedema. For Question 4 there was one incorrect response given by someone who did not attend the educational seminar. It is a common misconception that edema only occurs immediately after treatment. Lymphedema can occur months to years after treatment for breast cancer. As noted previously, both groups answered questions 5 through 8 correctly. Question 9 asks about when a patient is at risk for lymphedema; the educated group answered all questions correctly but two people in the group that received no lymphedema education answered incorrectly. One of the most important facts concerning lymphedema is Question 10. There were six incorrect responses to number 10 in the group that received no lymphedema education. It is a common misconception that lymphedema can be cured. Lymphedema can certainly be treated and over time, lymphedema can often improve– but that once the lymphatics are interrupted the most important thing is aggressive support and awareness of how to manage the problem as best one can along with some physical therapy techniques that might improve the alternate drainage patterns in some lymphedema situations and may improve the regeneration of lymphatics in some situations, particularly over time. Interruption of the lymphatic vessels is a physical problem and lymphedema is a sign – as opposed to the symptom – of the lymphatic interruption. Of course, others may consider "cure" to mean simply improving or relieving symptoms. One would not really cure the physical manifestations of an underlying structural or anatomical disruption or abnormalities.

Table 6*Percentages of Correct Responses for Lymphedema Questions for Groups*

Question	Lymphedema Education (n=15)	No Lymphedema Education (n=17)
1 - What is lymphedema?	100% (15)	100% (17)
2 - Best way to reduce and manage lymphedema?	100% (15)	94% (16)
3 - Who is at risk for lymphedema?	57% (8)	71% (12)
4 - When will lymphedema most likely occur?	100% (15)	94% (16)
5 - What are symptoms of lymphedema?	100% (15)	100% (17)
6 - What are lymphedema preventive measures?	100% (15)	100% (17)
7 - When should healthcare provider be notified?	100% (15)	100% (17)
8 - What can we do prevent lymphedema?	100% (15)	100% (17)
9 - When is the patient no longer at risk for lymphedema?	100% (15)	88% (15)
10 - Lymphedema can be cured.	100% (15)	65% (6)

All of the nurses that attended the educational program scored 100%. The nurses that did not attend the educational program scored an average of 96%. There wasn't a very significant difference between the groups for most of the questions. Question

number ten, “Lymphedema can be cured”, is an important concept that was answered correctly by all those who participated in the education. This indicates that the educational seminar was successful. Levene’s test for equality of variances was found to be violated for the present analysis $F(1,30) = 2.903, p = .099$. Therefore, in order to test the efficacy of the lymphedema education, an independent samples t-test not assuming equality of variances was conducted and found to be not statistically significant $t(22.637) = 1.798, p = 0.085$.

Chapter V Discussion

Overall, there was not a significant difference in the scores between the group that received the lymphedema education and the group that did not. The objective was to provide an educational program that would be understandable to participants with a wide range of education from ancillary staff to registered nurses. Accordingly, a goal was to make the test easy enough for all levels of education so that the outcome of participation was positive.

Limitations of the Study

The small sample size was a major limitation of the study to evaluate the effectiveness of an education program on healthcare personnel's knowledge of the risk of and preventive measures for lymphedema in breast cancer patients. The absence of statistical significance between the two groups is likely a result of the relatively small total sample size of only 32 persons and may very well not be consistent with the results that would be expected with a larger sample size in the same general population. Additionally, most, if not all of the test questions were constructed in such a way as to lead to the right answer.

The study setting was limited to one healthcare facility which limits generalizability to other healthcare settings. The inclusion of a variety of healthcare personnel in the sample increases the generalizability to all healthcare personnel working with patients at risk for lymphedema. The convenience sample may have resulted in a sample of healthcare personnel who feel intrinsically rewarded by learning and improving their healthcare practices.

Implications for Nursing

Further research should be conducted to investigate the perceived value of education of healthcare personnel. As noted, the group (1) that received the pretest education did demonstrate a generally higher gross score on the test than the group that did not receive the education. Between the two groups, the highest score was found in the educated group (97%). The group that did not receive the education received a lower score (92%).

Further research with a larger sample of healthcare personnel in a variety of healthcare settings is recommended to increase generalizability of the research findings. A randomized sample would not only increase generalizability but eliminate the self-selection of individuals who are intrinsically motivated to learn and improve their expertise in provision of healthcare.

Patients with cancer should routinely receive education about their relative risk for developing lymphedema. Providing education “could help prevent and reduce secondary lymphedema in patients after breast cancer surgery involving dissection of axillary lymph nodes, at least for one year after surgery” (Torres, 2010). Patients should also be told about risk reduction guidelines such as those contained in the National Lymphedema Network (2009).

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Appendix A**Demographic Information****Lymphedema Education Program**

- I. Age _____
- II. Sex
- ____ Male
- ____ Female
- III. Healthcare Area of Employment
- ____ Registered Nurse
- ____ Registration
- ____ Radiation Oncology Staff
- ____ Certified Medical Assistant
- IV. Years of Experience _____
- V. Highest Degree Held
- ____ Associate
- ____ Bachelors
- ____ Masters
- ____ Doctorate
- VI. List any Certifications

Appendix B

Lymphedema Quiz*

1. What is lymphedema?
 - a. Cancer treatment
 - b. Impaired flow of the lymphatic system
 - c. A type of surgery
 - d. A rash

2. What is the best way to reduce and manage lymphedema?
 - a. Early detection and intervention
 - b. Bathing
 - c. Never use the arm
 - d. Lift weights

3. Who is at risk for lymphedema?
 - a. Everyone
 - b. Oncology patients
 - c. Marathon runners
 - d. Patients undergoing breast cancer treatments such as surgery, radiation, anyone with a family history of lymphedema

4. When will lymphedema most likely occur?
 - a. During adolescence
 - b. Before breast cancer treatment
 - c. After eating a large meal
 - d. Immediately postoperative, during radiation, in a few months, years or decades after cancer treatment

5. What are symptoms of lymphedema?
 - a. Shrunken extremities
 - b. Nausea
 - c. Heavy sensation in the limb, decreased flexibility or mobility in arm, numbness
 - d. Coughing

6. What are lymphedema preventive measures?
 - a. Surgery
 - b. Keep arms in dependent position
 - c. Never wear gloves
 - d. Exercise, use sunscreen, and do not use arm for blood pressure, intravenous or lab sticks, gloves, antibiotic ointment for scratches, insect bites. Do not carry heavy objects

7. When should a patient notify a healthcare provider?
 - a. Insomnia
 - b. For swelling, redness, pain, infection, fever or difficulty moving arm
 - c. Not until drainage is noted
 - d. After swelling continues for two months

8. What can we do to prevent lymphedema?
 - a. Do not wear protective clothing
 - b. Nothing it is expected
 - c. Tell patients not to move their arm after surgery
 - d. Assess, educate, provide written materials, refer to physician if needed

9. When is the patient no longer at risk for lymphedema?
 - a. After surgery
 - b. 20 years after axillary node dissection
 - c. 5 years after treatment completed
 - d. The patient is at risk immediately after surgery, radiation, even decades after cancer treatment

10. Lymphedema can be cured.
 - a. True
 - b. False

*Lymphedema Quiz Answers

1.b, 2.a, 3.d, 4.d, 5.c, 6.d, 7.b, 8.d, 9.d, 10. b.