2012

Attitudes and Practices of Perioperative Nurses Effecting the Election of Wearing Protection from Occupational Radiation Exposure

Jane Leonard
Gardner-Webb University

Attitudes and Practices of Perioperative Nurses Effecting the Election of Wearing Protection from Occupational Radiation Exposure

by

Jane Leonard

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

Boiling Springs, NC

2012

Submitted by:	Approved by:
_____	_____
Jane Leonard, BSN, RN	Reimund C. Serafica, PhD, RN
_____	_____
Date	Date

Abstract

Health effects from exposure to radiation are unpredictable. On a daily bases, nurses working in the perioperative setting are exposed to medical x-rays (ionizing radiation) and are vulnerable to its carcinogenic effects. Regardless of the potential health consequences, the use of protective equipment remains inconsistent among perioperative nurses. Most research studies regarding nurses' occupational health risks either failed to include or separate radiation exposure from chemicals and blood borne pathogens. The purpose of this study was to examine the relationship between the attitudes and practices of perioperative nurses that influence their decisions to wear or not wear radiation protection equipment during surgical and postsurgical procedures that utilized ionizing radiation. The participants were a convenience sample of 13 perioperative nurses in a rural Western North Carolina hospital. The mean years employed as a nurse was 24 years. The study revealed that there was not a statistically significant relationship between the attitudes and behaviors of perioperative nurses effecting their decision to use or not use protective equipment. However, the research identified lack of time and equipment to be main reasons for non-compliance with utilizing radiation protection equipment. Secondly, of the 13 participants, over half, (53.8%), expressed a desire for more education, indicating a need for additional staff training regarding occupational radiation exposure.

Acknowledgements

I would like to express my appreciation to the faculty of the Masters of Science in Nursing Program at Gardner-Webb University for their infinite patience, guidance, and support. I especially would like to express my gratitude to Dr. Reimund Serafica, my thesis advisor, who always knew when I needed reassurance and to Dr. Rebecca Beck-Little who provided an atmosphere that fostered learning.

To my husband, Terry Leonard, who always believes in me, I dedicate this Master thesis to you. Without your support, endless patience and unconditional love this would never have been possible.

TABLE OF CONTENTS

List of Figures

List of Tables

Chapter I

Introduction

Background

On a daily bases, nurses are confronted with and vulnerable to a variety of hazards in the workplace, including but not limited to blood and blood borne pathogens, musculoskeletal injury, and repeated x-ray exposure. In spite of federal regulations, accrediting agencies and hospital policies regulating and requiring the use of personal protection equipment, illness and injury among health care workers are among the highest of any segment of industry (World Health Organization website, 2010). Of the aforementioned occupational hazards, radiation exposure is increasing and with it augmenting the risk of radiation engendered cancers.

Over the past 25 years, there has been a mutual increase in the quantity of diagnostic x-ray examinations and the introduction of newer, high dose technologies. As a result "the increase in the number of diagnostic exams each year and the higher radiation doses associated with these exams it is estimated that they contribute to nearly fifty percent of our average yearly radiation exposure" (Amis et al., 2007, p. 273). Medical x-rays (ionizing radiation), especially in high doses is recognized as increasing the risk for developing cancer but only recently has been classified as a "carcinogen" by the World Health Organization's International Agency for Research on Cancer, the Agency for Toxic Substances and Disease Registry of the Center for Disease Control and Prevention, and the National Institute of Environmental Health Science (Amis et al., 2007).

Health effects from exposure to ionizing radiation are unpredictable. Effects can occur shortly after exposure, delayed, or a combination. “It is estimated that 4 to 10 percent of cancer diagnosis in the United States, (48,000 annually), are caused by occupational exposure” (Center for Disease Control website, n.d.). Dependent on the cancer, the dormancy period can range from two to five years. The types of effects, latency period, and probability of occurrence can depend on the magnitude of the exposure and whether exposure occurs over a long period (chronic) or during a very short period (acute). Health effects resulting from chronic exposure (continuous or intermittent) to low levels of ionizing radiation are usually delayed effects (Department of Labor, Occupational Safety and Health Administration, 2005).

Nurses compose the largest sector of healthcare workers. According to the 2010 Bureau of Labor Statistics, there are 2.74 million employed nurses in the United States with an expected growth to 3.45 million by 2020. By virtue of the increasing number of nurses in the work force, increasing diagnostic x-rays with higher doses, the opportunity for more nurses to be exposed to ionizing radiation exists. Therefore the assumption can be made that a proportional increase in nurses diagnosed with cancer will also occur. In spite of being a known carcinogen, the use of protective equipment (aprons, thyroid shields, goggles etc.) during surgical and postoperative procedures in which x-rays are used remains erratic among perioperative nurses. Studies have revealed that nurses underrate their risk of developing cancer as a direct result of exposure to occupational radiation. Recognizing a susceptibility to an illness can persuade a behavioral change and implementation of safer work habits. “Self-efficacy is the belief that one has the ability to

change one's behavior; recognition that personal health practices and choices can positively influence health" (McEwen & Wills, 2011, p.292).

Research Problem

Differentiating which nurse is at highest risk remains a challenge. Monitoring of radiation exposure can vary between personnel with in a department and between departments within the same institution. Opportunity for exposure can also vary within departments by virtue of the nurses responsibilities. Regardless of the known risks and the accessibility of protective equipment nurses neglect to reduce their exposure to radiation. There is limited data defining the factors that influence the nurses' decision to use or not use protective equipment. This limitation of research inspired this study.

Purpose of the Study

The purpose of this study is to describe the relationship between the attitudes and practices of perioperative nurses that influence their decision to protect themselves or not, from radiation exposure during surgical and post-surgical procedures. This knowledge has the potential to identify those at highest risk to exposure.

Significance to Nursing

Significance of this study is to contribute to the existing knowledge related to nurses and their decision making regarding protecting themselves from radiation exposure. Identification of barriers and facilitators to compliance has the potential to affect the long term health of thousands of practicing nurses. In addition, information concerning the issues influencing their decisions can evolve into improved training, policies and increased compliance.

Research Question

What is the relationship between the attitudes and practices of perioperative nurses that influence their decision to use or not use radiation protective equipment during surgical and post-surgical procedures?

Theoretical Framework

Health Belief Model adapted in 1988 by Rosenstock to include the concept of self-efficacy was chosen for the theoretical framework for this study. The Health Belief Model (HBM) was one of the first models that were taken from behavioral science to predict health behaviors (McEwen & Wills, 2011). Originally developed by social psychologist who wanted to improve the public's use of preventive services, Rosenstock assumed "people fear disease and that health actions were motivated in relation to the degree of the fear and the benefits obtained" (McEwen & Wills, 2011, p.290). Currently the HBM proposes that people will take certain actions to prevent or control illness if they believe they are susceptible to it and if the illness is deemed severe, and that taking action is beneficial, the barriers to action are lessor than the expense of the action. This requires the perioperative nurse to have knowledge of the risk to health from chronic ionizing radiation exposure and the benefits of using protective equipment.

The Health Belief Model (Figure1) is composed of four original concepts (a) perceived susceptibility or a persons' belief surroundings increase their risk of actually acquiring a health problem, (b) perceived severity or a person's perception of the seriousness or consequences of a health threat, (c) perceived benefits or a person's belief related to the effectiveness of preventive actions, and (d) perceived barriers or a person's

belief of obstacles to changing behavior. The last two concepts added are (e) cues to action or the external or internal stimulus that triggers health related behaviors, promoting the desired behavior, and (f) self-efficacy or the person's belief in their ability to positively change their behavior (McEwen & Willis, 2011, p.292).

INDIVIDUAL PERCEPTIONS	MODIFYING FACTORS	LIKELIHOOD OF ACTION

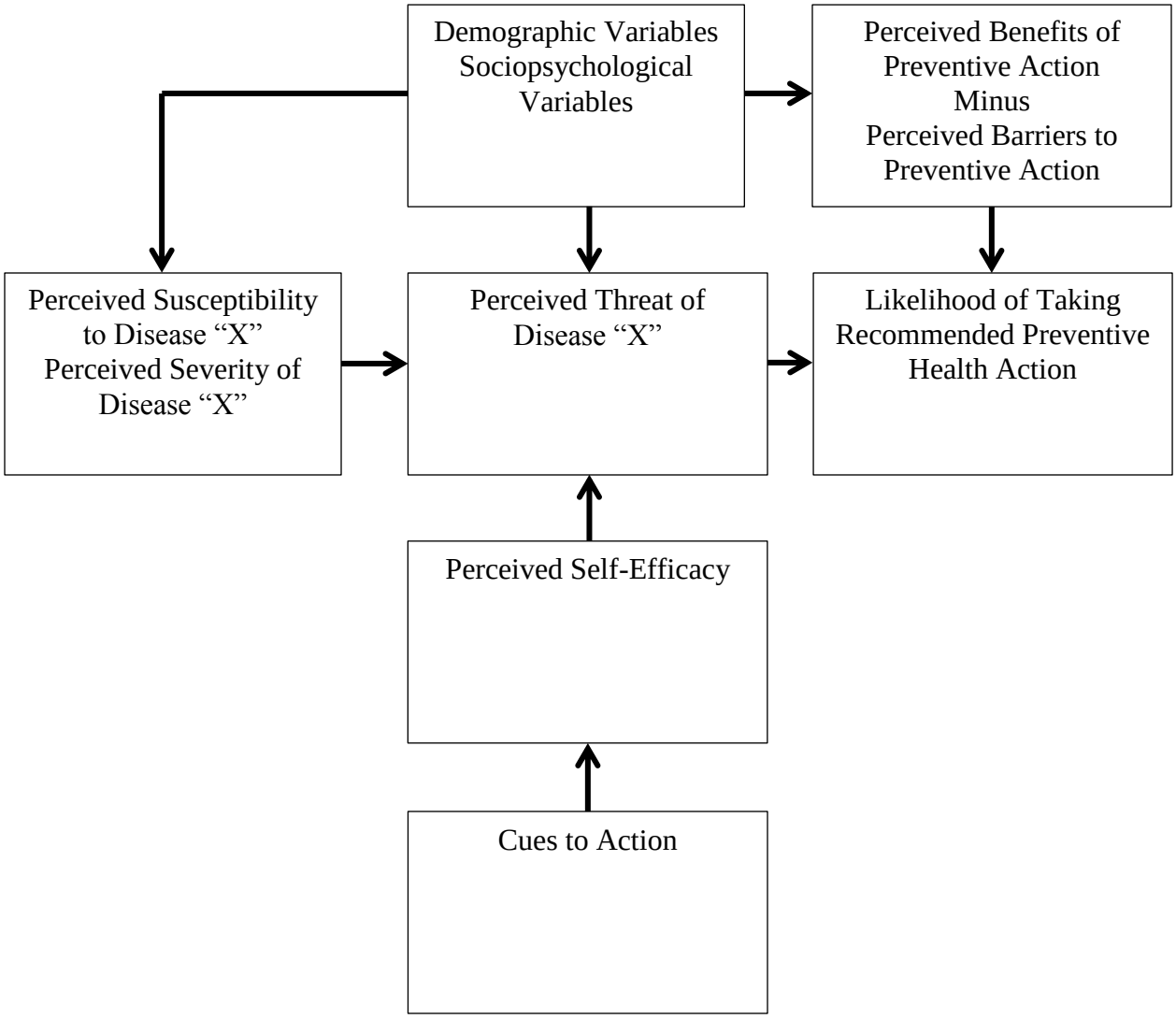

Figure 1. Health Belief Model
(modified to include all concepts)

Chapter II

Literature Review

A narrow review of research was conducted in the following databases: Cumulative Index for Nursing and Allied Health Literature (CINAHL), Google Scholar, and Elsevier with the following key words: ionizing radiation, cancer, nurses, occupational exposure and standard precautions.

Nurses are exposed to a variety of hazards in the course of the work day. Exposure to ionizing radiation (medical x-rays) has not historically been associated with nursing but dependent on the work environment, staff attitudes, and their behaviors posed a significant risk to health. Literature review identified the risks of ionizing radiation exposure, the cancers associated with exposure, and reasons why nurses remain non-compliant with known standard precautions.

Research that identifies nurses' occupational health risk for work place hazards traditionally does not separate radiation exposure from chemicals and those risks associated with blood borne pathogens. On a daily basis nurses are absorbing radiation that is being used diagnostically on their patients. Little is known as to the extent of health problems nurses may experience as a result of chronic radiation exposure.

An online survey conducted the Environmental Working Group (EWG) and Health Care Without Harm, in association with the American Nurses Association identified workplace exposures and disease conditions. It was reported that "nurses who reported high exposure to radiation during pregnancy had a 36 percent higher cancer incidence among their children than those exposed less often or not at all" (Nurses'

Health and Workplace Exposures to Hazardous Substances, 2007, para. 8). Currently there is no government restriction on the allowable dose of radiation for pregnant nurses. Among the 264 nurses in the study routinely exposed to radiation, they experienced a 16% higher rate of cancer compared to those nurses with minimal to no exposure. Skin cancer was the predominant cancer reported at a rate of 63%, followed by thyroid, breast, and cardiovascular (Nurses' Health and Workplace Exposures to Hazardous Substances, 2007). This was not a controlled study as it was available to any nurse who was willing to participate. Absolute conclusions cannot be derived from the data. The study did however indicate that nurses are being exposed to workplace hazards, experiencing consequential health effects, and brings into light the need for additional research.

According to the Bureau of Labor and Statistics (2010) over 5.5 million healthcare workers are employed in settings where there are potential exposures to hazardous material. Of these, over 2 million are nurses (Polovich & Gieseker, 2011, para. 1). A particular selection of these hazards are known or suspected to be human carcinogens, including ionizing radiation. Despite this fact, few studies examining the cancer rate or mortality among nurses considered occupational exposure to radiation (Teschke et al., 2008).

A cohort study of 58,125 registered nurses in British Columbia Canada, examined their cancer risk with regards to three employment exposures: antineoplastic drugs, anesthetic gases, and ionizing radiation. Data collected related to ionizing radiation exposure was focused to determine a relationship between exposures, the nurses work environment, length of employment and the accuracy of exposure monitoring. This data

was in turn compared to the monitoring data reported to the National Dose Registry of Health Canada (Teschke et al., 2008, p.208). In comparison to other healthcare workers associated with ionizing radiation, the "role" of the nurse places them at a higher risk to unprotected radiation exposure. When nurses are preoccupied with patient care during procedures requiring diagnostic x-ray, they opt not to take the time to protect themselves. Also, this study identified that monitoring methods between hospitals and practice settings varied over time. "There was an inverse relationship between the number of nurses monitored each year and the annual mean radiation dose equivalent. This finding highlights the significance of considering the proportion of nurses monitored in interpreting ionizing radiation exposures" (Teschke et al., 2008, p.81). Data collection methods used were interviews of nursing staff and a national dose data bank, both of which were identified to be unreliable. However, this study did provide the foundation for understanding gaps in exposure assessment and the need for further research in this area.

Standard precautions for healthcare workers in order to reduce the risk of transmission of blood borne and other pathogens was first proposed by the United States Center for Disease Control and Prevention (CDC) in 1996 (Luo, He, Zhou, & Luo, 2010, para 1). Standard precautions require the use of personal protection equipment in order to protect both patient and healthcare worker from a real or potential hazardous exposure. There is significant research that proves the need and benefits of standard precautions. However, noncompliance among nurses still exists. A study conducted in China that includes a total of 1500 randomly selected nurses concluded that compliance with

standard precautions was low. Factors cited as influencing compliance were a knowledge deficit regarding standard precautions, lack of training, unavailability of equipment, lack of belief in acquiring a pathogen, and self-efficacy (Luo et al., 2010). "Self-efficacy is a general confidence the individual has in dealing with changeable environments and new experiences" (Luo et al., 2010, p.1109). This research identified a significant relationship between self-efficacy and compliance with using personal protective equipment.

Self-Efficacy

A number of studies on the implementation of health practices have measured self-efficacy to assess its potential influence in instigating behavior change. In an early study, Beck and Lund (1981) exposed dental patients to an influential message intended to alter their beliefs about periodontal disease. Perceived self-efficacy surfaced as the best predictor of the intent to floss (r=0.69) and of the actual behavior, frequency of flossing (r=0.44). Seydel, Taal, and Wiegman (1990) reported that outcome expectancies as well as perceived self-efficacy are good predictors of intention to engage in behaviors to detect breast cancer. In general, researchers have established that self-efficacy beliefs and behavior changes and outcomes are highly correlated and that self-efficacy is an excellent predictor of behavior. Graham and Weiner (1996) concluded self-efficacy has proven to be a more consistent predictor of behavioral outcomes than any other motivational paradigms (Pajares, 2003-2009).

There remain gaps in literature on the long term effects to nurses' health from chronic, repeated exposure to ionizing radiation and the attitudes and behaviors that influence decision making to use or not use personal protection equipment. More

research is needed to determine personal and environmental factors that nurses perceive to be barriers and facilitators to compliance.

Chapter III

Methodology

Design, Setting, and Sample

In order to examine the factors that influence attitudes and practices of perioperative nurses decisions to protect themselves from occupational ionizing radiation exposure, this study was guided by a descriptive correlational design. In a descriptive correlational design "the focus is on relationships among the study variables without interventions from the researcher" (Burns & Grove, 2009, p.246). This study was non-experimental and did not require the principle investigator to influence the variables, therefore supporting the appropriateness of a descriptive correlational design (Burns & Grove, 2009).

A convenience sampling method was utilized in selecting participants for the study. A convenience sample involves "using the most conveniently available people… who are in the right place at the right time" (Polit & Beck, 2010, p.309). The study included perioperative nurses in a rural Western North Carolina hospital. Criteria for inclusion in the study required the participants be registered nurses actively working in the operating room, post anesthesia care unit, outpatient surgery department or a combination of environments. Thirteen nurses volunteered to participate in the study and completed the study questionnaires.

Instruments

The instruments used to collect data include a self-reported questionnaire prepared by the principle investigator that consisted of two parts: participants'

demographics and participants' compliance with radiation protection equipment and a 10 item General Self-Efficacy Scale (GSES) utilizing a 4-point Likert scale (Schwarzer & Jerusalem, 1995). Data collected from the demographic questionnaire included age, level of education, job title, department worked, estimated exposure to occupational radiation and diagnosis of cancer. Data collected from the compliance portion of the questionnaire utilized a 5-point Likert scale with the direction such that a lower number is associated with higher incidence of the behavior and included self-reported usage of monitoring and protection equipment (x-ray badge, lead apron, thyroid shield, and eye protection). The survey also collected data to identified objective factors that contributed to noncompliance and if more education on occupational exposure to radiation was desired. The General Self-Efficacy Scale (GSES) is a 4-point Likert scale with the direction such that a higher number is associated with higher incidence of the behavior. The GSES assesses the optimistic self-beliefs to cope with a variety of situations and is designed specifically to determine the belief that one's actions are responsible for positive behavioral outcomes. Descriptive statistics implementing Statistical Package for the Social Sciences Version 19 (SPSS 19) was conducted using the data obtained from the questionnaires.

Ethical Considerations

Permission to complete this study was obtained from the Institutional Review Board (IRB) of Gardner-Webb University. Permission to distribute questionnaires to staff was obtained from the facility's Chief Executive Officer. Participants who agreed to participate in the study received a cover letter assuring anonymity and voluntary

participation (Appendix A), and a copy of the Demographic and compliance questionnaire (Appendix B) and the Self-Efficacy Scale Tool (Appendix C). Completion and return of the questionnaires to the principle investigator served as implied consent.

Procedure

After receiving permission for the study from the university IRB, the survey questionnaires with the cover sheet, serving as informed consent, were distributed to the participants. The principle investigator was not present during the completion of the surveys. Completion of the questionnaires occurred at home or in the work environment and returned to the principle investigator in sealed self-addressed stamped envelopes provided by the principle investigator with in the specified time frame. All information will remain confidential and data was coded in order to protect the privacy and identity of the participants. Descriptive statistics implementing SPSS19 was used to analyze the data obtained from the questionnaires.

Chapter IV

Results

Sample Demographics

The participants in this study consisted of perioperative nurses at a rural Western North Carolina hospital. The study participants were nurses actively working in the operating room, post anesthesia care unit, outpatient surgery department, or a combination of environments. Thirteen nurses participated in the study to determine if there is relationship between their attitudes and practices and compliance using radiation protection equipment. Of the 13 participants participating in the study, the mean age was 47.23 years (SD=12.30) with participants ranging in age from 27 to 66 years. The majority held either an Associate Degree (38.5%) or a Master of Science Degree (38.5%). Only one participant held a diploma in nursing and two (15.4%) held a Bachelor in Science Degree. Six (46.2%) were staff nurses, five (38.5%) were Certified Registered Nurse Anesthetists; there was one Student Registered Nurse Anesthetist and one Nurse Navigator. The study participants had been employed as nurses between four and forty five years (M=24.30, SD=12.80). Six (46.2%) worked in the operating room, two (15.4%) worked in the post-anesthesia care unit, two (15.4%) worked in the operating room and post anesthesia care unit, two (15.4%) worked in all three environments, operating room, post anesthesia care unit and outpatient surgery department. Only one participant worked in the post anesthesia care unit and outpatient surgery. The mean yearly exposure to occupational radiation was 803.30. The mean occupational radiation exposure without protection equipment was 201.70. Fifteen percent reported occupational

exposure to ionizing radiation (medical x-rays) within the last year. Of those that reported occupational exposure to ionizing radiation (15.4%) of the total sample (N=13), 23.1 percent had had a diagnosis of at least one cancer. Table 1 and 2 gives the demographic data for the study sample (n=13).

Table 1

Measures of Central Tendencies for Demographic data for Sample (n=13)

Variable	Mean	Std. Deviation	Range
Age	47.23	12.30	27-66
Years of Nursing Experience	24.30	12.80	4-45
Number of Yearly Occupational Radiation Exposures	803.30	2363.94	5-7530
Number of Yearly Occupational Radiation Exposures Without Protective Equipment	201.70	631.86	0-2000

Table 2

Percent Distributions for Demographic data for Sample (n=13)

Variable		
Highest Level of Nursing Education	Diploma	7.7% (1)
	Associate Degree	38.5% (5)
	Bachelor of Science Degree	15.4% (2)
	Master of Science Degree	38.5% (5)
Job Title	Student Registered Nurse Anesthetist	7.7% (1)
	Staff Nurse	46.2% (6)
	Nurse Navigator	7.7% (1)
	Certified Registered Nurse Anesthetist	38.5% (5)
Area(s) of Employment	Operating Room	46.2% (6)
	Post Anesthesia Care Unit	15.4% (2)
	Operating Room/Post Anesthesia Care Unit	15.4% (2)
	Operating Room/Post Anesthesia Care Unit/ Out Patient Surgery	15.4% (2)
	Post Anesthesia Care Unit/ Out Patient Surgery	7.7% (1)
Occupational Exposure to Ionizing Radiation Within the Last Year		15.4% (2)
No Occupational Exposure to Ionizing Radiation Within the Last Year		84.6% (11)
Number of Cancer Diagnosis		23.1% (3)

Questions 1-5 of Part Two of the questionnaire collected data regarding participant's compliance with using radiation protective equipment. This data was analyzed using descriptive statistics, central tendencies, and correlations. Questions 6 and 7 addressed objective reasons for noncompliance and whether or not there was a need for

further staff education. This data was also analyzed using frequency for central tendency. The mean and standard deviations were used to identify the presence of compliance with using radiation protection equipment. The analysis revealed that on average the participants always wore lead aprons during procedures that require ionizing radiation and felt that protection equipment was usually available. Table 3 illustrates the compliance data for the study sample (n=13). Table 4 identifies reasons for noncompliance and Table 5 identifies educational need.

Table 3

Measures of Central Tendency for Compliance Data for Sample (n=13)

Variable	Mean	Std. Deviation	Range
Wear X-ray Badge	3.76	1.23	2-5
Wear Lead	4.53	0.51	4-5
Wear Thyroid Shield	2.07	0.95	1-4
Wear Eye Protection	2.53	1.12	2-5
Available Equipment	4.46	0.66	3-5

Table 4

Percent Distribution for Compliance Issues

Reason For Not Wearing Protective Equipment Variable	
Equipment Cumbersome	0% (0)
Lac of Time to Put On	30% (3)
Inconvenient	10% (1)
Uncomfortable	10% (1)
Patient Demands	10% (1)
Al of the Above	10% (1)
Limited Availability/No Equipment Available	20% (1)
Unclear When Equipment is Needed	10% (1)

Table 5

Percent Distribution for Educational Need

Variable	
Receive Training in Radiation Exposure	69.2% (9)
Have Not Received Training in Radiation Exposure	30.8% (4)
Desire Additional Training	53.8% (7)

Data obtained from the General Self-Efficacy Scale survey tool was analyzed using frequency for central tendencies. The mean and standard deviations were used to identify participant's perceived self-efficacy. Perceived self-efficacy has been proven to be an indicator of health behavior based on personal belief that one's actions are responsible for positive behavioral outcomes. Mean self-efficacy and mean compliance were compared to identify a correlation between the participants attitudes and behaviors and wearing of protection equipment. In order to compare the two Likert Scales, the compliance data was

inversed so the direction such that a higher number was associated with higher incidence of the behavior.

Analysis revealed a mean self-efficacy of 3.33. The participants scored the highest in the areas of being able to stick to their goals, confidence in dealing with unexpected events, and in the belief they can solve most problems if they invest effort. They scored the lowest in areas of solving difficult problems, getting what they want if opposed by someone, and in the ability to handle unforeseen situations. The mean and standard deviation self-efficacy individual question scores are illustrated in Table 6. Table 7 illustrates the correlation between mean self-efficacy and mean compliance. Statistical analysis utilizing Pearson's correlation revealed a non-significant positive correlation between participants perceived self-efficacy and compliance with using protective equipment ($r=.256$, $p>.05$).

Table 6

Mean Self-Efficacy Scores

Variable	Mean	Std. Deviation	Range
Manage to solve difficult problems	3.15	0.376	3-4
Ability to find the means and ways to get what is wanted.	2.69	0.480	2-3
Ability to stick to aims/ accomplish goals.	3.54	0.519	3-4
Confidence	3.54	0.519	3-4
Resourcefulness	3.23	0.439	3-4
Invest effort to solve problems.	3.62	0.506	3-4
Coping abilities	3.38	0.506	3-4
Ability to find several solutions to problems.	3.46	0.519	3-4
Find solutions to problems	3.31	0.480	3-4
Ability to handle whatever	3.38	0.506	3-4
Self-efficacy	3.33	0.278	

Table 7

Correlations

		Mean Self-Efficacy	Mean Compliance
Mean self-efficacy	Pearson Correlation	1	0.256
	Sig. (2-tailed)		0.399
	N	13	13
Mean compliance	Pearson Correlation	0.256	1
	Sig. (2-tailed)	0.399	
	N	13	13

Chapter V

Discussion

The purpose of this study was to explore the relationship between the attitudes and behaviors of perioperative nurses that affect the use of radiation protection equipment. Results of the study confirmed there was a slight connection between self-efficacy and compliance with the use of protection equipment within the sample population however, Pearson's' correlation revealed this to be statistically non-significant. Inadvertently, the research identified limited time to put protection equipment on, and limited availability/lack of equipment contributed to 50% of participants' non-compliance. Also, in spite of prior education on radiation exposure (69.2%), over half of the participants (53.8%) expressed a need for more staff training.

Lack of availability has been cited in this study as a reason for not wearing personal x-ray protection equipment, and in multiple research studies as a reason for nurses' noncompliance with standard precautions. The storage of equipment away from the place of nursing care provided makes their use in certain situations impossible (Efstathiou, Papastavrou, Raftopoulos, & Merkouris, 2011). In general, the majority of the participants wore lead aprons and their radiation monitoring badges. Adoption of compliance behaviors may have been affected by a variety of positive influencing factors. The majority of procedures that require the use of x-ray are performed in a specific operating room. Radiation aprons are stored in this room along with the participant's radiation badges being immediately available prior to entry. The readily available

equipment, along with being placed in a location where it is most likely to be used, may have positively influenced participants increased compliance with use.

The circulating nurse in the operating room is the primary care provider, who is charged with the responsibility of implementing and monitoring institutional policy and procedures. This includes ensuring the safety of patients and staff. A majority of the participants in this study participated in the circulating nurse role. A relationship between the circulators personal belief in the benefits of protecting themselves, and a conviction that it is in everyone's best interest to do so, may have led to increased enforcement and in turn contributed to the compliance of staff wearing lead aprons and radiation monitoring badges.

Although it is a known fact and generally accepted belief that personal radiation protective equipment is one of the best methods of protection against the negative health effects from occupational radiation exposure nurses continue not to wear it. Ward's (2006) audit analyzing infection control practice in primary care identified two predominant factors that had an adverse effect on personal protective equipment (PPE) use: time constraints and workload stress. (Hinkin, Gammon, & Cutter, 2008). The participants in this study identified lack of time to do equipment as the primary reason for non-compliance. Operating rooms are time sensitive, stressful environments. The requirement to maintain the operating schedule and demands from surgeons to quickly turn over cases may have contributed to feelings that there wasn't enough time to do protective equipment, sequentially influencing the participants to omit the prevention methods in place to protect themselves.

Although the majority of the participants admitted that they had received training in radiation exposure, they also acknowledged their desire to earn additional training. This may be due in part to this research awakening an awareness of their individual health risks from radiation exposure, and coincides with the concepts of The Health Belief Model that guided this research.

"Research shows that people with high self-efficacy perceive troubles as challenges, are highly committed to the activities the carry out and invest more time and effort in their daily activities" (Salanova, Lorente, Chambel, & Martinez, 2011, p. 2257). The participants in this study on average scored high on the self-efficacy scale. Nurses with high self-efficacy may seek the challenges of the perioperative environment resulting in the increased concentration of nurses with high self-efficacy beliefs. The participants in this study scored the lowest on the self-efficacy scale in one area; the ability to find the means and ways to get what they wanted. Contributing to this belief may be the absence of a department manager, thus leaving the department and staff in a state of uncertainty. Other contributing factors may also include time constraints, external pressure from the institution to reduce healthcare cost, and the lack of teamwork among staff.

Limitations

There were two primary limitations to this study. The first limitation of this study was the number of perioperative nurses who responded to the questionnaires. Of the 25 distributed questionnaires only 13 were returned. The lack of statistical significance between self-efficacy and compliance is apt to be a result of a rather small total sample

size of 13 participants and may not be truly representative of a larger sample within the same population.

Secondly, participants were obtained from a convenience sample. Only nurses actively working in the perioperative environment were included into the study. This limits generalization of these results to participants in the study. The inclusion of other healthcare personnel that are exposed to occupational radiation exposure within the same environments may have resulted in an improved representation of the connection between self-efficacy and compliance. Also, as most of the participants are known to the principle investigator, bias cannot be excluded from contributing to the research findings.

Implications for Nursing

Identification of barriers and facilitators to compliance with safety equipment has the potential to affect the long term health of thousands of practicing nurses. Nurse educators and staff development teams can use the findings of this study to design and implement directed education, policy development, and training that will result in increased compliance and proper use of radiation protection equipment.

Further research is needed in order to investigate the influence of perceived health benefits and known consequences to health that influence nurses and all healthcare professional exposed to occupational radiation exposure that contribute to compliance with personal protective equipment use.

A larger sample of nurses in the perioperative setting is needed to increase the generalizability of the research findings. Randomized sampling is recommended to not only increase the generalizability of the study but would reduce bias in the sample.

It is essential that perioperative nurses maintain a balance between their instinctive need to care for patients along with their need to protect themselves from potential exposure to occupational radiation. It is the principle investigators' hope that the results of this study illuminate the necessity of this balance.

References

Amis, E. S., Butler, P. F., Applegate, K. E., Birnbaum, S. B., Brateman, L. F., Hevezi, J. M., ... Zeman, R. K. (2007). *American College of Radiology white paper on radiation dose in medicine* (White Paper). Retrieved from American College of Radiology website: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/white_paper_dose.aspx

Bureau of Labor and Statistics website. (2010). Retrieved from United States Department of Labor website: http//www.bls.gov/

Burns, N., & Grove, S. K. (2009). *The practice of nursing research Appraisal, synthesis and generation of evidence* (6th ed.). St. Louis, Mo: Sauders Elsevier.

Center for Disease Control website. (n.d.). http://www.cdc.gov/niosh/topics/healthcare/

Department of Labor, Occupational Safety and Health Administration. (2005, May 3). *Occupational exposure to ionizing radiation* (Proposed Rules 70: 22828-22835). Retrieved from Department of Labor Occupational Safety and Health Administration website: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=FEDERAL_REGISTER&p_id=18341

Efstathiou, G., Papastavrou, E., Raftopoulos, V., & Merkouris, A. (2011). *Factors influencing nurses' compliance with Standard Precautions in order to avoid occupational exposure to microorganisms: a focus group study*. Retrieved from http://www.biomedcentral.com/1472-6955/10/1

Hinkin, J., Gammon, J., & Cutter, J. (2008, January). Review of personal protection equipment used in practice. *British Journal of Community Nursing, 13*(1), 14-19. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18399366

Luo, Y., He, G., Zhou, J., & Luo, Y. (2010, December). Factors impacting compliance with standard precautions in nursing, China. *International Journal of Infectious Diseases, 14*(12), e1106-e1114. Retrieved from http://www.biomedsearch.com/nih/Factors-impacting-compliance-with-standard/21071254.html

McEwen, M., & Wills, E. M. (2011). *Theoretical basis for nursing* (3rd ed.). Philadelphia, PA: Wolters Kluwer Health | Lippincott Williams Wilkins.

Nurses' Health and Workplace Exposures to Hazardous Substances. (2007). Retrieved from http://www.ewg.org/reports/nursesurvey

Pajares, F. (2003-2009). *Self-efficacy theory*. Retrieved from http://www.education.com/reference/article/self-efficacy-theory/

Polit, D. F., & Beck, C. T. (2010). *Essentials of nursing research appraising evidence for nursing practice* (7th ed.). Philadelphia, PA: Wolters Kluwer/Lippincott Williams & Wilkins.

Polovich, M., & Gieseker, K. (2011, March-April). Occupational hazardous drug exposure among non-onocology nurses. *MedSurg Nursing*, 20(2), 79-97. Retrieved from http://www.highbeam.com/doc/1G1-254012705.html

Salanova, M., Lorente, L., Chambel, M. J., & Martinez, I. M. (2011, February). Linking transformational leadership to nurses' extra-role performance: the mediating role

of self-efficacy and work engagement. *Journal of Advanced Nursing, 67*(10), 2256-2266. doi: 10.1111/j1365-2648.2011.05652.x/abstract

Schwarzer, R., & Jerusalem, M. (1995, 1995). Generalized Self-Efficacy Scale. . Retrieved from http://userpage.fu-berlin.de/~health/engscal.htm

Teschke, K., Chow, Y., Chung, J., Ratner, P., Spinelli, J., Le, N., & Ward, H. (2008, February). Estimating nurses' exposures to ionizing radiation: the elusive gold standard. *Journal of Occupational and Environmental Hygiene, 5*, 75-84. doi: 10.1080/15459620701793050

Ward, D. (2006, December). Compliance with infection control precautions in primary care. *Primary Health Care*, 16(10), 35-39

World Health Organization, 2010 website. (2010). http://www.who.int/whosis/whostat/2010/en/index.html

Appendix A

Participants Cover Letter

Participants Cover Letter

I am a graduate student in the Master of Science in Nursing Program at Gardner-Webb University, Boiling Springs, North Carolina. I am conducting a study on the attitudes and practices of perioperative nurses affecting the election of wearing of protection from exposure to ionizing radiation. You are being asked to participate in this study. This study will yield information regarding the practice of wearing protective equipment in the nursing population and provide new implications for nursing practice.

You are invited to complete an anonymous questionnaire and a demographic datasheet. Your participation in this study will take approximately twenty minutes. Your participation in this study is voluntary and your responses are anonymous. Please do not include your name or any markings on the questionnaires. Your decision regarding participation in this study will be completely voluntary. There is no anticipation of any risk to you because of your participation in this study.

Results of the study will be shared with all participants and nursing faculty. Data obtained through the study may be used in nursing publications and presentations. If this study is published or used in presentations, individual data and the site of collection will not be identified. Your return of the questionnaire signifies your permission and enrollment in the study and serves as informed consent given. You are free to ask questions about the study or your participation in the study. Direct any questions to: Jane Leonard at 864-431-0844 or Jleonard@gardner-webb.edu (and/or) Dr. Rei Serafica at rserafica@gardner-webb.edu

Appendix B

Demographic and Compliance Questionnaire

Demographic and Compliance Questionnaire

Instructions: Fill in demographics

1. Age_____
2. Highest level of nursing education_____
3. Job title_____
4. Years working as a nurse_____
5. Department(s) work:_____
6. Occupational exposure to ionizing radiation (medical x-rays) within the last year

   yes no
7. If yes estimate the number of occupational exposures _____
8. If yes estimate the number of occupational exposures not wearing protection_____
9. Have you ever had a diagnosis of cancer? If yes what kind(s)_____

Compliance: Instructions: Circle

Do you:

1. Wear your x-ray badge during procedures requiring x-rays.

    a) always

    b) usually

    c) sometimes

    d) never

    e) seldom

2. Wear lead apron during procedures that require the use of ionizing radiation

    a) always

    b) usually

    c) sometimes

    d) never

    e) seldom

3. Wear a thyroid shield during procedures that require the use of ionizing radiation

    a) always

    b) usually

    c) sometimes

    d) never

    e) seldom

4. Wear eye protection during procedures that require the use of ionizing radiation.

a) always

b) usually

c) sometimes

d) never

e) seldom

5. Is protection equipment available?

a) always

b) usually

c) sometimes

d) never

e) seldom

6. If you chose not to wear the necessary protection the main reason is

a). equipment cumbersome

b) no time to put on

c) inconvenient

d) uncomfortable

e) patient demands

f) other please specify_____

7. Have you received any training in radiation exposure?

Yes

No

8. Do you want more training on radiation exposure? If yes, what kind?

Yes

No

Appendix C

Self-efficacy Scale

Self-efficacy scale

Instructions: Circle

1. I can always manage to solve difficult problems if I try hard enough.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

2. If someone opposes me, I can find the means and ways to get what I want.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

3. It is easy for me to stick to my aims and accomplish my goals.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

4. I am confident that I could deal efficiently with unexpected events.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

5. Thanks to my resourcefulness, I know how to handle unforeseen situations.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

6. I can solve most problems if I invest the necessary effort.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

7. I can remain calm when facing difficulties because I can rely on my coping abilities.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

8. When I am confronted with a problem, I can usually find several solutions.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

9. If I am in trouble, I can usually think of a solution.

   1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true

10. I can usually handle whatever comes my way.

    1 = Not at all true 2 = Hardly true 3 = Moderately true 4 = Exactly true