

RURAL NURSE ENVIRONMENTAL HEALTH
EDUCATION PROJECT

by

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ABSTRACT

Rural communities face increased vulnerabilities to various environmental hazards. The National Institute of Medicine and the American Nurses Association have enforced the need for all nurses to increase their competency in addressing environmental hazards in the communities in which they provide care. Rural nurses face the challenging role of expert generalist. Several research studies demonstrate that there is a need to increase nurse's education to better address environmental hazards. The purpose of the Rural Nurse Environmental Health Education (RNEHE) Project was to: (a) investigate nurses' perception of priority environmental health topics within a specific rural community, (b) investigate learning methods that increase the probability of nurse participation in an Environmental Health (EH) learning activity, and (c) provide environmental risk reduction knowledge that is locally relevant. The anticipated outcome of the project was empowered rural nurses prepared to educate and advocate for EH in the communities in which they provide care. The Project utilized a two-phase approach to investigate priority topics and provide education that was specific to a group of nurses in rural central Montana. The Project resulted in a low participation rate despite utilizing preferred learning methods. The graduate nursing student concluded that education about environmental hazards in rural communities would be more successful with direct insider involvement in project planning and provision of education materials.

INTRODUCTION

Rural communities face unique environmental health (EH) challenges (Butterfield & Postma, 2009). Rural nurses play the challenging role of expert generalists (Scharff, 2013). Rural nurses are confronted with the challenge of addressing environmental health risks, treatment, and prevention within the communities in which they work (Butterfield & Postma, 2009). There are increasing demands for healthcare professionals to focus on environmental threats impacting individuals and communities (Hill, Butterfield, & Kuntz, 2010). Providing EH education to rural nurses requires investigation into the unique EH issues impacting individuals within specific communities and awareness of educational methods that are tailored to the unique community where nurses practice (Medves, Edge, Bisonette, & Stansfield, 2015).

Background & Significance

Environmental health has been central to the role of nursing since the work of Florence Nightingale; inclusion of EH concepts has primarily been limited to the practice of occupational and public health nursing (Leffers, McDermott-Levy, Smith, & Sattler, 2014).

Nurses interact with individuals among the community in which they work and reside on a daily basis. The settings of these interactions include: home, work, school, community events, hospitals, and clinics. Throughout nurses' daily

interactions, they are required to deliver and communicate health information related to environmental exposures such as: indoor air pollution, water contamination, mold and pesticides, and adverse health outcomes such as asthma, cancer, and autism (O'Fallon, 2006).

Clear recommendations to re-emphasize EH in the scope of responsibilities and competencies for nursing practice have been made by the Institute of Medicine (IOM), American Nurses Association (ANA), the National Institute of Environmental Health Sciences, and the National Institute of Nursing Research. The IOM competencies focus on four areas: (1) knowledge and concepts; (2) assessment and referral; (3) advocacy, ethics, and risk communication; and (4) legislation and regulation. The competencies establish a baseline of knowledge and awareness in order for nurses to prevent and minimize morbidity associated with exposure to environmental agents (Hill, Butterfield, & Kuntz, 2010b; O'Fallon 2006).

Although there has been clear national consensus regarding the responsibility of nurses to integrate EH into their practice, little evidence exists about the extent to which nurses have incorporated EH into general nursing practice, professional nursing literature, and education (Hill et al., 2010; O'Fallon, 2006). Ellison-Bowers, Otterness, and Pritchard (2011) compared VanDongen's findings from a survey of nurses in Wisconsin in 2002 to a study using VanDongen's survey tool in Idaho in 2011. Ellison-Bowers, Otterness, and Pritchard's (2011) findings confirmed that in the ten years between the two studies, nursing curriculum has neglected to increase its coverage of EH issues. Nurses reported

similar barriers and facilitators, and while they reported stronger beliefs about the importance of EH, they felt less prepared to address EH issues (Elison-Bowers, 2011).

Rural nursing is unique in its scope and practice. Rural nurses have a greater burden of self-responsibility for continued education and professional development. The challenge of maintaining skills and knowledge to address the vast array of health issues is further complicated by decreased resources and geographical distance for rural nurses (Scharff, 2013).

There is a general assumption that rural areas are pristine, with fresh water and air. Research suggests however, that rural communities have higher cumulative EH risks including: herbicide exposure, well-water contamination from agricultural runoff, and hazards related to older housing (Larsson, Butterfield, Christopher, & Hill, 2006).

Rural dwellers face additional challenges in obtaining EH risk reduction advice. The lack of municipal services leads to families relying on equally uninformed neighbors for advice about septic systems, drinking water, well maintenance, and household hazards. Often, attitudes toward EH issues are strongly influenced by economic factors and a pervasive distrust of government oversight in rural communities. Rural low-income families are often impacted in local economic downturns, involving lack of insurance benefits, un-or underemployment and the necessity of multiple part-time jobs. Rural EH is further affected by lax zoning, lower property values, and less sophisticated local resistance. Rural residents potentially

live adjacent to a variety of point source polluters, including confined animal feeding operations, under regulated small businesses, illicit methamphetamine laboratories, or a combination of these pollution sources (P. Butterfield, Postma, & Team, 2009).

Purpose

The purpose of the Rural Nurse Environmental Health Education (RNEHE) Project is to: (a) investigate nurses' perception of priority EH topics within a specific rural community, (b) investigate learning methods that increase the probability of nurse participation in an EH learning activity, and (c) provide environmental risk reduction knowledge that is locally relevant. The anticipated outcome of the project is empowered rural nurses prepared to educate and advocate for EH in the communities in which they provide care.

Conceptual Framework

The Rural Nursing Theory (RNT) will theoretically guide the RNEHE Project. The RNT is a middle-range theory developed by faculty and graduate students at Montana State University College of Nursing (Lee & McDonagh, 2006; Long & Weinert, 1989). Smith and Liehr (2003) explain that a middle range theory is focused "on a limited dimension of the reality of nursing," and grows at the "intersection of practice and research to provide guidance for everyday practice and scholarly research rooted in the discipline of nursing," (Lee & McDonagh, 2013, p. 16). The RNT addresses how rural dwellers define health and how nurses work and

participate in bringing healthcare to rural communities (Long & Weinert, 1989). The unique rural environment impacts health seeking behaviors, needs, and actions of rural patients, the RNT works to address these unique aspects of rural nursing (Lee & McDonagh, 2013).

Molinari and Guo (2013) suggested that prior to beginning a community intervention, a sound awareness of the community is required. There is need for a deeper understanding of rural perceptions and practices, where RNT is utilized, to understand individuals, the community, the environment, and potential health interventions. An effort should be made to gain trust, key stakeholder buy-in, and a thorough understanding of a rural community (Molinari & Guo, 2013).

Three key theoretical statements updated in 2013 (Lee & McDonagh) guide RNT:

Theoretical Statement #1

Rural residents define health as being able to do what they want to do; it is a way of life and state of mind; there is a goal of maintaining balance in all aspects of their lives....

Older rural residents and those with ties to extractive industries are more likely to define health in a functional manner-to work, to be productive, and to do usual tasks...

Theoretical Statement #2

Rural Residents are self-reliant and make decisions to seek care for illness, sickness or injury depending on their self-assessment

of the severity of their present health condition and of the resources needed and available....

Rural residents with infants and children who experience illness, sickness, or injury will seek care more quickly than for themselves...

Theoretical Statement # 3

Health care providers continue to experience lack of anonymity and role diffusion.

(Lee & McDonagh, 2013, p. 22-23)

The Translational Environmental Research in Rural Areas (TERRA) framework further guides the RNEHE project. The TERRA framework was created to guide nurses addressing EH inequities in rural communities. The TERRA framework concepts clarify environmental health risks experienced by the rural dwellers. The premise that risks exist within physical-spatial, economic-resources, and a cultural-ideological context is central to the TERRA framework. A precautionary risk reduction approach has the greatest potential to protect health in the face of scientific and political uncertainty (Butterfield et al., 2009).

Seven Key Concepts of the TERRA Framework

- 1) **Macrodeterminants** of EH, are multifaceted and include *physical-spatial*, *economic-resources*, and *cultural-ideologic* elements.
- 2) **Environmental** health inequities, refer to the differential distribution of resources available to reduce exposure to environmental risks.

- 3) **Environmental health risks**, refer to the potential for exposure to biologic, chemical, physical, and social agents with deleterious health consequences.
- 4) **Environmental health mental models**, refer to beliefs about risks. People decide to act (or not) on the basis of a social-cognitive construction of a risk; this “mental model” may or may not reflect current scientific views about EH.
- 5) **Environmental Risk Reduction (ERR)** interventions, are delivered by health providers, can either directly mitigate EH risks or indirectly alter the mental models pathway, such that citizens act to change their risk.
- 6) **Proximal outcomes**, such as knowledge, risk interpretation, and/or self-efficacy, are the tools that families need to have both the information and confidence to act. These outcomes may or may not result in a change in risk reduction behavior.
- 7) **Distal outcomes**, refer to families ERR actions, reductions in exposure, and decreases in disease incidence, severity, or both (Butterfield, Postma & Team, 2009, pp. 110 & 111).

Assumptions

Two assumptions underlie the RNEHE project. First, it is assumed that surveying rural nurses about priority EH issues impacting their patients will result in an accurate depiction of local threats to EH. Second, gaining an understanding of rural nurses’ preferences in learning methods and barriers to learning will enable

the graduate student to create an EH education opportunity that will increase to likelihood of rural nurses participation.

Definitions

1. *Rural*. Rural was defined as a community with a population of 10,000 or less and 15 or more miles from a community with a population of 50,000 or greater (USDA, 2013).
2. *Environmental Health*. Environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviors. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments (World Health Organization, 2015).
3. *Nurses*. Nurses are defined as licensed registered nurses and licensed practical nurses responsible for the nursing care of patients at Teton Medical Center in Choteau, Montana.

REVIEW OF LITERATURE

This chapter contains a summary of literature regarding the importance of EH, the profession of nursing and preparedness to address environmental health, the impact of nurse environmental health education on individuals and communities, barriers and nurses' preferences in engaging in EH education, and unique aspects of rural nurse education. The following search terms were used in PubMed®, CINAHL® and Google Scholar®: environmental health AND nurs*, rural AND nurs* AND education, limited by sources published in 2005 and later, with exception of seminal work. The review of literature concluded with a vast amount of literature supporting increased EH focus among nurses and student nurses, but little research exists investigating the actual education of rural nurses.

The Relationship of the Environment and Human Health

All humans consist of a similar structure with distinctive anatomical parts that have discrete morphologies and functions. Ideally, the human body systems work in harmony to maintain a state of homeostasis. The disruption of homeostasis occurs when there is loss of the body's structural integrity and function initiated by internal factors or by physiological response to hazardous earth materials in the environment. Most earth materials, solids, liquids, and gases, are essential for the body or are benign. A few earth materials can become harmful in elevated amounts, where they enter the body and disturb the normal functions of the organs. There are three usual routes of exposure to environmental hazards: respiration, ingestion, and

dermal (Skinner et al., 2007).

The World Health Organization (2006) defines EH as “all the physical, chemical, and biological factors external to a person, and all the related behaviors,”(Pruss-Ustun & Corvalan, 2006, p. 22). Environmental health is specified as the prevention of disease, injury, and disability related to the interactions between humans and their environment (HealthyPeople, 2016).

The Healthy People 2020 Environmental Health Objectives focus on 6 themes, each of which highlights an element of environmental health: outdoor air quality, surface and ground water quality, toxic substances and hazardous wastes, homes and communities, infrastructure and surveillance, and global environmental health. Emerging issues in EH include: climate change, disaster preparedness, and nanotechnology. The health effects of toxic substances and hazardous wastes are not yet fully understood. Research to better understand the health impacts of toxic substances and hazardous wastes is ongoing. (HealthyPeople, 2016) Infrastructure and surveillance, by state and local health departments is required to ensure prevention of exposure to environmental hazards (HealthyPeople.gov, 2016; Pruss-Ustun & Corvalan, 2006).

Poor air quality is linked to premature death, cancer, respiratory infections, and long-term damage to respiratory and cardiovascular systems (Pruss-Ustun & Corvalan, 2006). Approximately 127 million people lived in U.S. counties that exceeded national air quality standards in 2008 (HealthyPeople, 2016).

Contamination of surface and ground water by infectious agents or chemicals is commonly associated with diarrheal diseases, trachoma, schistosomiasis, ascariasis, trichuriasis, and hookworm disease. Water quality is a priority in global environmental health. Many diseases can be reduced by improving water quality and sanitation and increasing access to adequate water and sanitation facilities around the world (Pruss-Ustun & Corvalan, 2006).

Environmental health risks associated with homes and communities are related to indoor air pollution, inadequate heating and sanitation, structural problems, electrical and fire hazards, and lead based paint hazards (HealthyPeople, 2016). Diseases commonly associated with indoor air pollution are chronic obstructive pulmonary disease (COPD), lower respiratory infections, and lung cancer. Lead exposure is associated with mental retardation and cardiovascular disease (Pruss-Ustun & Corvalan, 2006).

Infrastructure and surveillance, by state and local health departments is required to ensure prevention of exposure to environmental hazards (HealthyPeople, 2016; Pruss-Ustun & Corvalan, 2006).

Poor environmental quality has its greatest impact on already vulnerable populations. Addressing the unique societal and environmental factors that increase the likelihood of exposure and disease is required when working to address environmental health of individuals and communities (HealthyPeople, 2016). Rural areas are uniquely vulnerable to environmental hazards, as these large open areas have been considered a place for production-based economy's unwanted items to be

dumped. Contamination created by nuclear waste, mining and smelting is often not discovered until years later, often leaving rural dwellers dependent on federal resources for cleanup and remediation. Rural dwellers often live near agricultural and industrial facilities, unaware of risks that may accompany these facilities. Further rural communities are often underrepresented in EH research (Hill & Butterfield, 2013).

Families and communities look to nurses for guidance on health risks. Rural nurses have a unique opportunity to intervene where environmental hazards and exposures exist (Hill & Butterfield, 2013) as they are seen as “insiders” and familiar to rural persons (Lee & McDonagh, 2013). Increasing the understanding of disease causing environmental exposures is essential for reducing healthcare costs, human mortality, and morbidity (Skinner et al., 2007).

The Profession of Nursing and Preparedness to Address EH

Nurses are increasingly confronted with EH concerns and questions (Elison-Bowers, 2011). The nurse plays a key role in educating the public about EH issues (Elison-Bowers, 2011). Rural nurses need to have an understanding of the community in which they practice, in order to successfully impact the health of the rural people (Findholt, 2013).

Research demonstrates that nurses continue to report inadequate EH knowledge and feel unprepared to address EH issues within the community where they work (Elison-Bowers, 2011; Van Dongen, 2002). Van Dongen (2002) surveyed

registered nurses in Wisconsin asking them about their perceived relationship between EH and nursing practice, and perceived self-competency in addressing EH issues in nursing practice. It was found that registered nurses believe that the environment and health are related, but feel poorly prepared to address environmental health in practice (Van Dongen, 2002). Elison-Bowers (2011) used Van Dongen's survey tool to query registered nurses in Idaho. Nurses were again asked how prepared and competent they feel to address EH issues in their practice. Few nurses felt adequately prepared, meaning RNs were uncertain as to whether they were prepared to address issues of EH on an individual and community level (Elison-Bowers, 2011).

There are also continued misperceptions of EH risks among nursing students, where there continues to be a gap between what is recommended for environmental health education and what level of accurate awareness and competency actually exists (Pascale Jonckheer & Christophe De Brouwer, 2009; P. Jonckheer & C. De Brouwer, 2009; Polivka & Wills, 2014).

The Impact of Nurse EH Education on Individuals and Communities

In a randomized control trial done by Butterfield, Hill, Postma, P.W. Butterfield, & Odon-Manyon (2011) public health nurses were provided with EH education regarding specific home health risks, which in turn enabled them to provide tailored information and guidance to parents during home health visits. Two hundred thirty five families were studied and demonstrated that

environmental health education, provided by registered nurses, yields significant improvements in environmental health self-efficacy and stage of EH precautionary adoption among families (Postma, Butterfield, Odom-Maryon, Hill, & Butterfield, 2011).

Barriers and Facilitators to Nurse EH Education

Registered nurses have repeatedly reported that cost, inadequate time while at work and away from work are the greatest barriers to increasing EH continued professional education (Elison-Bowers, 2011; Hill et al., 2010; Van Dongen, 2002).

Van Dongen's (2002) study found three additional dominant barriers to EH knowledge among nurses including: "Personal lack of knowledge about how the environment can affect human health and what to do about it," and "Lack of recognition by health professional regarding how the environment can affect human health," (Elison-Bowers, 2011, p. 232).

Research findings underscore the importance of EH education for student nurses and practicing nurses. Studies also suggest that continued professional education, with EH content, will be most successful when it is a collaborative with academic partners and public health professionals, low-cost, internet based, accessible from work or home with flexible learning options (Elison-Bowers, 2011; Hill et al., 2010; McCurdy, Roberts, Rogers, & Love, 2004; Van Dongen, 2002).

Fitzpatrick-Lewis, Yost, Cliliska, and Krishnaratne (2010) performed a systemic review looking to identify the effectiveness of communication strategies

and factors that impact communication uptake related to EH risks. A total of twenty-four articles were selected for analysis. Results of the analysis demonstrate that EH risk communication strategies are most affective when the target audience's needs are incorporated with multi-faceted delivery methods (Fitzgerald & Townsend, 2012).

Rural Nurse Education

Acquiring current evidence to guide nursing practice is a unique challenge among rural nurses. Education methods are distinctive among rural practicing nurses and vary by their diverse locations, experience level, level of education, and positions of authority. On average, rural nurses are more likely to obtain new information from nursing and non-nursing colleagues, newsletters, and in-services, considered central sources of information. Rural nurses are less likely to obtain new information from the internet, library, journal subscriptions and continuing education, considered peripheral sources of information. Rural nurses who sought peripheral knowledge sources (information not provided by institution in which they work) typically had access to current information, had an opportunity to share their knowledge with others, had higher education levels, were in positions of authority or worked with healthcare students (Kosteniuk, D'Arcy, Stewart, & Smith, 2006).

Medves, Edge, Bisonette and Stansfield (2015) further confirmed the need to recognize the unique practice of rural nurses and the increased need for rural

specific education through an ethnographic approach interviewing rural nurses. The rural nurse ethnography concluded that ultimately, it is the unique qualities of a community that require attention when promoting engagement and retention of rural nurses (Medves et al., 2015)

Fitzgerald and Townsend (2012) created a questionnaire addressing previous continued education activities as well as needs and preferences for ongoing professional development related to the rural nursing role. The rural nurses questioned by Fitzgerald and Townsend (2012) reported that continued education of rural nurses would be most successful when done as a collaboration with universities and rural hospitals (Fitzgerald & Townsend, 2012).

This review of literature led to the ideas and methodology on the RNEHE project. In summary, it is clear that there are links between the environment and human health. Rural nurses have a unique, key role in EH assessment, education, and advocacy, as rural dwellers face unique vulnerabilities to environmental hazards. There is a clear link between EH and rural nursing, but there is a need to increase nurses' EH education and assess for empowerment to utilize this EH education within a rural nurses' daily practice.

METHODS

The RNEHE project received IRB exemption approval in February of 2016. The RNEHE project utilized a two-phase approach. The methods utilized recognized that rural nursing is a unique type of nursing, where the individualized aspects of the community in which they provide care should be considered when providing educational interventions.

The graduate nursing student used phase one to gain knowledge of EH concerns that are specific to a rural community in central Montana, where a critical access hospital is located. Phase one of the RNEHE project aimed to understand methods that would be most successful in educating the nurses at the hospital and what barriers existed to providing EH education to the staff nurses at the hospital.

Phase two of the RNEHE project involved using data collected from phase one to create custom continued education opportunity for the nurses of the hospital. The goal of phase two of the RNEHE project was to create an EH educational intervention that was specific to a community of rural nurses that they were most likely to participate in and would be utilized in daily practice.

Population

The population selected for the RNEHE project was nurses providing care at a rural hospital in central Montana. Nurses employed at this rural hospital work in varied settings, including an outpatient clinic, emergency room, hospital, and nursing home. This particular population was selected due to its rural nature,

adequate sample size, and lack of the graduate nursing student's insider bias (Becker, Isreal, Gustat, Reyes & Allen, 2013). The graduate nursing student worked to gain and maintain trust within this population of nurses using methods suggested by Becker, Isreal, Gustat, Reyes & Allen (2013) including: showing respect, adequate follow through, respect of confidentiality, attending to group's interests and needs and engaging in an ongoing relationship. The graduate nursing student initially worked to establish group trust by performing clinical studies within the hospital in Fall of 2015, prior to starting the RNEHE Project.

Setting

The hospital of focus is a small, critical access hospital (CAH) in rural Central Montana. The hospital provides essential medical care services to people living along the Northern Rocky Mountain Front.

Nurses at the hospital participated in phase one of the project during break time in designated staff break areas. The initial questionnaires were designed to be self-administered and efficient, to be completed over a minimum break time of fifteen minutes. The setting of the second phase of the RNEHE project was determined by phase one findings.

Tools

The phase one questionnaire aimed at identifying three potential educational determinants: 1) identifying priority EH issues experienced by patients treated at

the hospital, 2) barriers to gaining knowledge about priority EH issues, and 3) what type of educational format would most effectively facilitate participation by staff nurses in education surrounding perceived priority EH issues. The phase one questionnaire consisted of three multiple-choice questions with an option to hand-write in “other” answers.

The graduate nursing student, considering the most common environmental concerns in literature, developed question one. Question one asked: “What environmental health hazards most significantly impact the health of patients you care for?” The participants were asked to circle the top two priority environmental health concerns including: lead, tobacco smoke/e-cigarettes, metals (other than lead), water pollution, climate change, allergens, air pollution, pesticides and/or hazardous waste. The participants were also given the option to circle “other” and hand-write environmental health concerns not listed.

Question two asked: “What educational factors would increase the likelihood of you taking part in an environmental health education offering?” Question two was developed from a professional continuing educational survey tool and permission was given to use the content of the question (Spackman, Freedman, Gabaldon, Baldwin & Powell, 2005). Potential answers for question two consisted of several continued education methods and factors including: class-room setting, video/DVD, self-learning, availability by email, online-based learning, audio/teleconference, obtaining continued education credits and/or low-cost/free offerings. Participants

were asked to circle all that apply, with the option to circle “other” and hand-write an answer.

The third question and answers were influenced by VanDongen’s study done in 2002, and permission was given by the study’s author to use the question and responses in the RNEHE project questionnaire. Question three asked: “What are barriers to educating your patients about environmental health hazards?” Potential answers to question three included: little or no time to consider environmental health concerns in my clinical practice, few or no resource people with expertise related to environmental health, addressing environmental health concerns is not seen as a part of my nursing role, personal lack of knowledge about how the environment can affect human health and what to do about it, and/or clients/families have little interest in understanding how the environment can affect their health. Participants were asked to circle all that apply and were given the option to circle “other” and hand-write an answer. The phase one questionnaires were analyzed using descriptive statistics.

Phase two of the RNEHE project was a continuing education intervention created specifically for the staff nurses at the hospital, but could be utilized by other nurses interested in gaining EH knowledge. The goal of the phase two educational offering was to provide knowledge that could be used in daily practice, providing direction in patient assessment, education, and advocacy. Phase two of the RNEHE project consisted of an educational intervention. The content and format of the educational intervention was based on phase one findings. The pre-

test and post-test were designed to be administered immediately before and after the educational intervention. The pre-test and post-test were evaluated using descriptive statistics assessing for increased EH knowledge to educate patients about top priority environmental health risks, exposure prevention strategies, and decreased barriers to obtaining additional EH knowledge.

Timeline and Procedure

The phase one questionnaire was administered in-person by the graduate nursing student over a one-week period of time in February 2016. The graduate nursing student remained outside the break room and was available for questions during the administration of the surveys allowing privacy to complete the anonymous questionnaire. A cover letter was attached to each questionnaire, describing the purpose of the survey. No personal information was collected that would identify individual staff nurses who participated in the questionnaire. Each staff nurse placed the completed questionnaires in a collection envelope in the staff break room. The staff nurses were provided with a \$15.00 Amazon gift card upon completion of the phase one questionnaire. Completion of the questionnaire and receipt of the gift card demonstrated consent to participate.

Phase two consisted of 3 modules including “Rural Allergens”, “Rural Tobacco Use, E-Cigarettes and Cessation Counseling” and “Rural Environmental Health Concerns.” The Modules were approved for 3.3 continued education credits through the Montana Nurses Association (MNA). The graduate nursing student

followed requirements for MNA certification; continued education credit was determined by three nurse- volunteers who trialed the pre-test, read the modules, trialed the post-test and reported times requirements. The nurse-volunteers were not included in the results of the project and were not part of the hospital. All content of phase two was submitted to the MNA for approval; approved content included MNA continuing education certificate, the three modules, advertisement poster posted in the hospital staff break rooms, descriptive and reminder emails sent to the hospital staff nurses, and the associated descriptive letter and envelopes provided to all the hospital nursing staff.

The descriptive email and reminder emails were sent to the nurse manager, who agreed to forward the emails to all nursing staff. The descriptive email was used to inform the staff nurses of the upcoming project purpose and dates it would be available. Two reminder emails were sent out at the one-month interval and the one-week remaining interval. The descriptive letter and associated envelope were provided along with the USB drive. The descriptive letter described in detail how to access the modules, the pre-test and post- test. The descriptive letter and USB drives were placed in individual envelopes and placed in a well-marked file folder labeled: "Rural Nurse Environmental Health Education Project" located in the nurse break rooms. There were eighteen envelopes total, enough for the seventeen staff nurses at the facility. The USB drive included the three modules, and clickable links to pre-test and post-test, which could be accessed and completed at anytime between May

1 and June 30, 2016. The final question on the post-test was the participant's email, where the continuing education certificate could be emailed.

RESULTS

Phase One Results

Phase one of the RNEHE Project was completed by thirteen ($n= 13$) out of seventeen staff nurses at the hospital. Question one asked to identify priority environmental health issues experienced by the patients treated at the hospital (table 1). The participants were asked to circle the top two responses. The staff nurses identified: tobacco /e-cigarettes (11), allergens (10), pesticides (4), climate change (1) and one written response of “animals.” Question two asked what type of educational format would most effectively facilitate participation in EH education surrounding perceived priority EH issues, where all that applied could be circled (table 2). The participants identified: low cost/free (11), continuing education credits (9), online- based learning (8), availability by email (7), self-learning (5), video / DVD (3), classroom setting (3), and hand written hands-on (2). Question three asked to identify barriers to gaining knowledge about priority EH issues, where all that apply were circled (table 3). The staff nurses identified: Few or no resource people with expertise related to environmental health (9), personal lack of knowledge about how the environment can affect human health and what to do about it (6), clients/families have little interest in understanding how the environment can affect their health (5), little or no time to consider environmental health concerns in my clinical setting (3), and one hand written response: “they are interested at the time then go back to their ‘normal’ lifestyle (smoking).”

Figure 1. Phase one: question one results. What environmental health hazards most significantly impact the health of patients you care for?

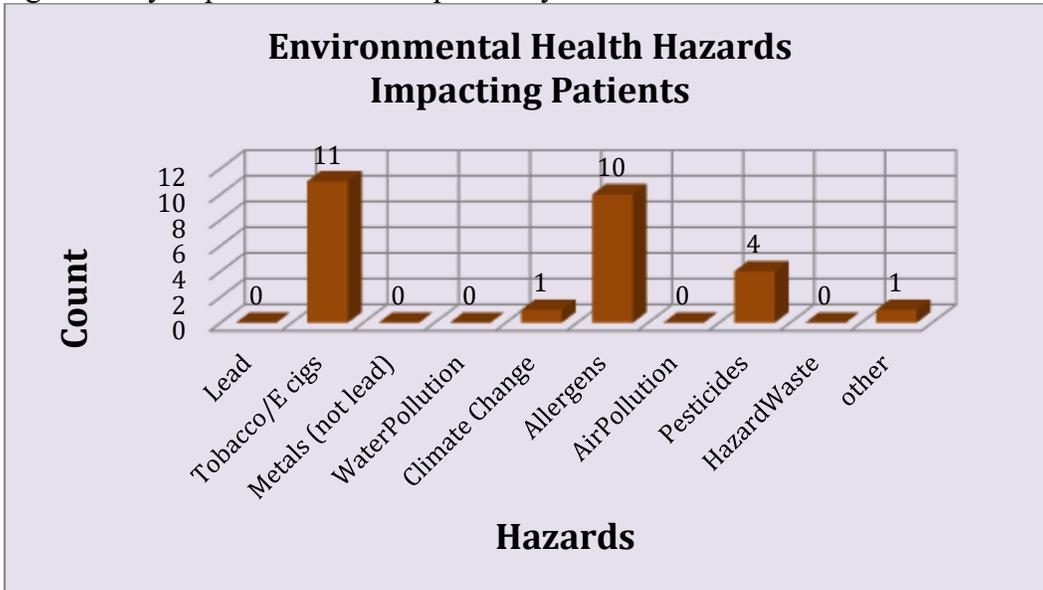


Figure 2. Phase one: question two results. What educational factors would increase the likelihood of you taking part in an environmental health education offering?

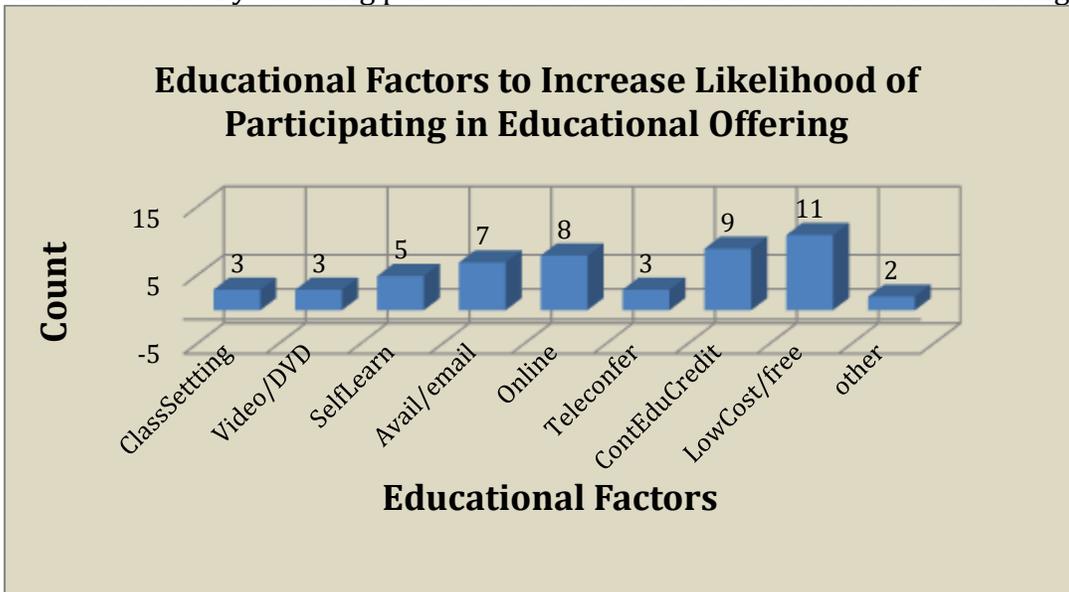
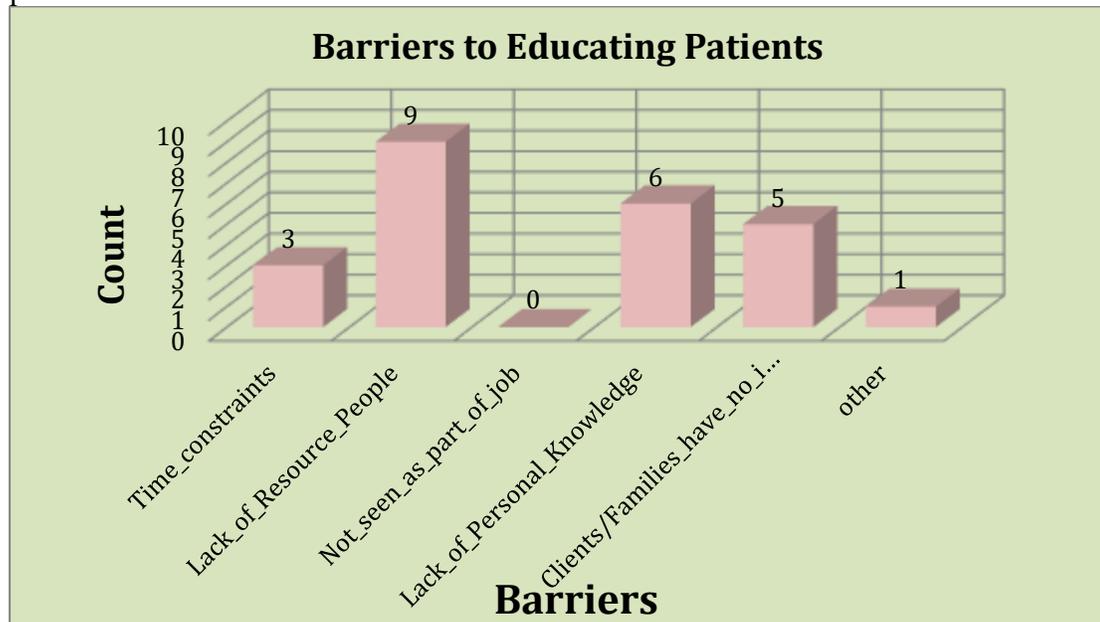


Figure 3. Phase one: question three results. What are barriers to educating your patients about environmental health hazards?



Phase Two Results

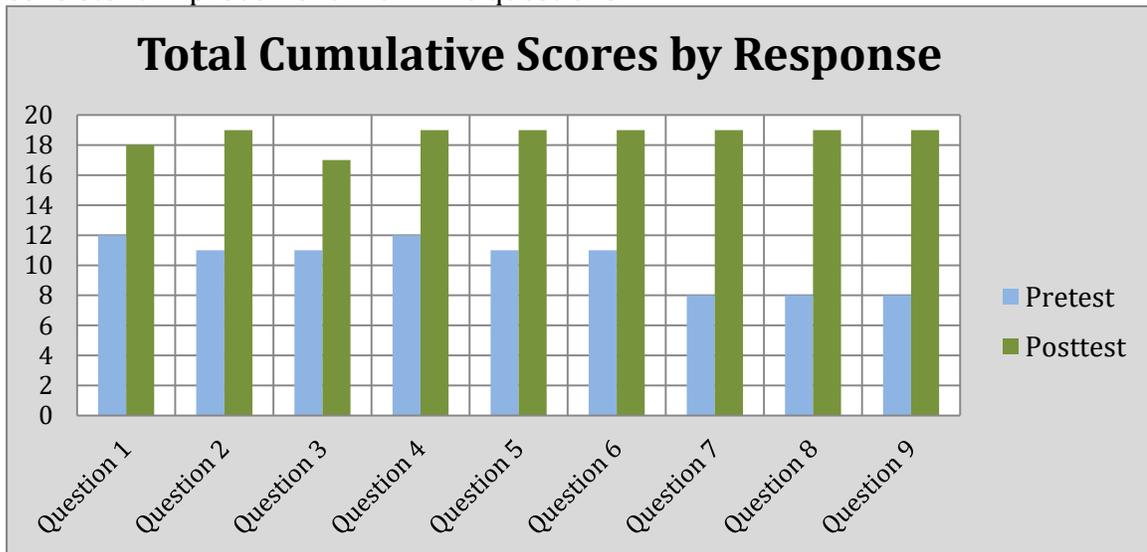
Five ($n = 5$) the hospital staff nurses participated in the phase two pre-test, educational modules and post-test, and received continued education credits. The pre-test and post-test consisted of 9 identical statements regarding the (a) participant's self- perception of awareness, (b) preventative strategies and (c) resources related to tobacco and e-cigarettes, rural specific allergens and rural specific environmental health concerns. Microsoft Excel was used to calculate improved scores with numerical scores given as follows: strongly disagree (1), disagree (2), undecided (0), agree (3) and strongly agree (4).

Post -test scores were compared to the pre-test scores and evaluated for overall improvement where higher scores demonstrated information learned. The

five pre and post-test scores were combined to create cumulative scores for each question, allowing for overall score improvement evaluation (Table 4). Question one asked to rate the statement: "I have adequate knowledge to educate my patients regarding tobacco, second-hand smoke and e-cigarettes as sources of environmental health risk," with a cumulative post-education score improvement of 50%. Question two asked to rate the statement: "I have adequate knowledge to educate my patients regarding sources of allergens that are specific to rural communities," with a cumulative post-education score improvement of 73%. Question three asked to rate the statement: "I have adequate knowledge to educate my patients about sources of environmental health risks that most often occur in rural communities," with a cumulative post-education improvement of 55%. Question four asked to rate the statement: "I have adequate knowledge to educate my patients about prevention of exposure to second hand smoke and e-cigarette emissions," with a cumulative post education improvement of 58%. Question five asked to rate the statement: "I have adequate knowledge to educate my patients about prevention of exposure to rural specific allergens," with a cumulative post education improvement score of 73%. Question six asked to rate the statement: "I have adequate knowledge to educate my patients about prevention of environmental health risks that impact rural communities," with a cumulative post-education improvement score of 73%. Question seven asked to rate the statement: "I am aware of resources I can refer myself and my patients to regarding tobacco cessation," with a cumulative post-education improvement score of 138%. Question eight asked to rate the statement:

“I am aware of resources I can refer myself and my patients to for additional information about environmental risks in rural communities,” with a cumulative post-education improvement score of 138%. Question nine asked to rate the statement: “I am aware of resources I can refer myself and my patients to for additional information about rural allergens,” with a cumulative post-education improvement score of 138%.

Figure 4. Phase two cumulative pre-test and post-test scores. Demonstrating consistent improvement in all nine questions.



DISCUSSION

The purpose of the Rural Nurse Environmental Health Education (RNEHE) Project was to: (a) explore nurses' perception of priority environmental health topics within a specific rural community, (b) identify learning methods that increase the probability of nurse participation in an EH learning activity, and (c) provide environmental risk reduction knowledge that is locally relevant. The anticipated outcome of the project is empowered rural nurses to be prepared to educate and advocate for EH in the communities in which they provide care.

Phase one of the RNEHE Project had a participation rate of thirteen staff nurses ($n = 13$). The findings of phase one confirm the unique perspective and challenges of rural nursing, highlighted in the Rural Nursing Theory (RNT) (Lee & McDonagh, 2013). The findings from the RNEHE project can be validated by looking specifically at RNT theoretical statement # 1 and #2, which provides insight into rural dwellers definition of health, their motivation to seek health care and tendency toward self-reliance. The nurse's primary barrier to patient EH education was reported to be: "clients/families have little interest in understanding how the environment can affect their health." The findings are congruent with the RNT, theoretical statement #1 where "rural residents define health as being able to do what they want to do; it is a way of life and state of mind" (Lee & McDonagh, 2013, p. 22). This definition of health plays a role in the uniquely high rate of tobacco use in rural communities and the challenge of providing preventative education to rural patients (Cox, Mahone & Merwin, 2008; American Lung Association, 2012). The RNT

theoretical statement #2 also provides an explanation for the participant's most commonly reported EH concerns impacting patients at TMC, those being allergens and tobacco/e-cigarettes. The RNT theoretical statement #2 states: "Rural Residents are self-reliant and make decisions to seek care for illness, sickness or injury depending on their self-assessment of the severity of their present health condition and of the resources needed and available...." (Lee & McDonagh, 2013, p.22). Rural dwellers are less likely to present for vague complaints that they can work through, but are more likely to present with symptoms impacting breathing, as they cannot work and move about without adequate oxygenation.

The results of question one also serve as a reminder that while tobacco use has decreased nationally, rural tobacco use remains increased relative to urban tobacco use rates. Tobacco use is deeply rooted in the social environment in many rural communities. The tobacco industry has targeted young rural men, especially with the appealing imagery of rugged individualism (American Lung Association, 2012). In addition, E-cigarettes are marketed as a healthier alternative to tobacco smoking, as useful for quitting smoking and reducing cigarette consumption. Unfortunately, health claims and claims of efficacy for quitting smoking are unsupported by the scientific evidence to date (Grana, Benowitz & Glantz, 2014).

The TERRA framework further provides guidance and explanation for the challenges faced when addressing EH in rural communities. The participants reported that additional top-rated barriers to providing EH patient education included: few or no resource people with expertise related to environmental health

and personal lack of knowledge about how the environment can affect human health. These reported barriers are not unique to rural nursing as they were derived from and were also reported as significant barriers in previous studies done throughout Wisconsin and Idaho (Elison-Bowers, Otterness & Pritchard, 2011; Van Dongen, 2002). The unique combination of these barriers however, represents macrodeterminants of EH and EH inequalities as described in the TERRA framework. Lack of resources and communities facing ill-defined EH hazards is definitive of rural living and rural nursing (Butterfield & Postma, 2009).

The participants response when asked about the educational factors that would increase their likelihood of participation in an EH offering included low cost or free, providing continuing education credit, online or available by email. Overall, rural and remote nurses are routinely faced with a lack of time, support, and financial resources. The results from this project coincide with a study done by Penz, D'Arcy, Kosteniuk and Morgan (2007), who investigated preferred continuing education methods among rural nurses ($n = 2,838$) in Canada. The participants, in this Canadian study reported most frequently that they would most likely participate in a continued education offering that is low cost/free, provides continuing education credits and is available online (Penz, D'Arcy, Stewart, Kosteniuk, Morgan & Smith, 2007).

Phase two of the RNEHE Project had a low participation rate of five out of seventeen staff nurses ($n = 5$), but the educational method demonstrated increased knowledge. The participation rate may be impacted by lack of insider buy-in or

project design. Several studies provide some insight into reduced continuing education participation. Fayram and Anderko (2009) recognized the need to educate rural nurses regarding the epidemiology surrounding environmental hazards and other public health threats; an epidemiological educational offering was created and offered in both an in-person and online format. Thirty two ($n = 32$) nurses completed the educational offering ($n = 24$ in-person course and $n = 8$ online course). Fayram and Anderko (2009) found that despite demonstrated interest and need for the epidemiological education offering several challenges existed for both the in-person and online continuing education offering. Distance and travel time were the greatest challenges for those who participated in the in-person education. The online offering demonstrated a lower commitment, where only a small number of those who registered ($n = 20$) actually completed ($n = 8$) the learning modules. It is suggested that when planning continued education aimed at rural nurses, there is a need to address barriers, specifically scheduling, cost, and familiarity with online formats. Rural access to Internet and familiarity with software devices should not be assumed (Fayram & Anderko, 2009). In addition, the *National Strategies for Healthcare Providers: Pesticide Initiative* provided motivation for Balbus, Harvey and McCurdy (2006) to interview health care providers (pediatricians, nurses practitioners, physician's assistants) and nurses in Washington D.C. and surrounding rural areas, assessing their attitudes, beliefs and practices regarding pesticide toxicity and continued education on pesticide toxicity. One hundred and sixty ($n = 160$) health care providers and forty-three ($n = 43$) nurses were

interviewed. Most health care providers and nurses did not frequently diagnose or ask questions about pesticide toxicity in patient histories. In addition, 64 % of health care providers and 69% of nurses felt poorly prepared to answer questions about pesticides when asked by their patients. Forty percent of health care providers and 26 % of nurses felt it was important to obtain increased information about pesticides. Both health care providers and nurses felt it was important that continued education about pesticides should be clinically relevant and included in a multi-topic conference; lectures and short courses were not preferred modes of continued education. The findings of the Balbus, Harvey and McCurdy (2006) and the Fayram and Anderko (2009) study suggest that despite the obstacle of distance and time an EH offering may be more well received and beneficial when provided in-person at a multi-topic conference. Finally, Sharff (2013) found that rural nurses identified their fellow nurses as their most important source of information and out of town workshops as the second most important source of information. Rural nurses reported that while cost was a factor, it was not central in the decision to attend out of town workshops. Local applicability was a central factor where rural nurses expressed the need for presenters to acknowledge the uniqueness of their rural practice (Scharff, 2013).

The challenge of educating primary care and hospital nurses about EH is not unique to this rural community in Montana . Anaker, Nilsson, Holmner and Elf 's (2015) study confirms the reality of educating primary care and hospital nurses about EH, where a gap exists between a nurse's core responsibility to address EH

and the required time and knowledge to do so. Anaker, Nilsson, Holmner & Elf (2015) interviewed eighteen nurses ($n = 18$) working in hospitals and primary care, aiming to view their perceptions of their role in climate change and EH concerns. Anaker, Nilsson, Holmner and Elf (2015) concluded that nurses have a core responsibility to address climate and environmental issues, but their sense of responsibility is overshadowed by other job requirements that are considered more important. Further, Nurses require greater knowledge to become involved in and support actions targeting climate change mitigation and to adapt to protect human health (Anaker, Nilsson, Holmner & Elf, 2015).

Limitations

There is an established insider/outside concept within rural communities (Long & Weinert, 2013). In working to provide an EH intervention among a rural community, a choice was made, by the graduate nursing student, to work as an outsider instead of an insider within her own rural community. Long and Weinert (2013) conclude that successful work within a rural community requires an extended period of time to gain trust and acceptance. Isreal, Eng, Schulz and Parker (2013) enforce the need for a comprehensive and participatory approach. Finally Butterfield and Postma (2009) recognize that rural nurses are both integral members of rural healthcare systems and rural communities. Researchers and practitioners must acknowledge the need for extended periods of time to establish relationships and locally relevant interventions with mutual goals, to increase

sustainability. The RNEHE project was limited in the time frame the DNP graduate program at Montana State University. Increased participation rates, local relevance and sustainability could be gained by following the community-based participatory research model, where more time could be committed to an educational project.

Despite interviewing several state and local community experts, including the county public health nurse, the county extension agent and the Montana state vital statistics expert, no unique environmental health concerns came to light. The graduate nursing student developed the phase two educational offering based on phase one findings and generic environmental health concerns common to many rural communities, which may have been less stimulating to the staff nurses, leading to decreased participation.

Phase one, question one and all of phase two, pre tests and and post tests were developed by the graduate nursing student specifically for the purpose and goals of the RNEHE project. Phase one, question one and phase two tests have not been tested for reliability and validity.

Finally, Penz, D'Arcy, Kosteniuk and Morgan (2007) and Fitzpatrick-Lewis, Yost, Cliliska, and Krishnaratne (2010) suggested that the unique demographics and characteristics of the nurse-learner should be considered when providing continuing education. This project did not consider the participants demographics or history, such as area in which one grew up, whether one commuted a long distance to work, level of education, marital status, number of dependents, age or

work history; investigating these factors may be able to provide insight into what determines the likelihood of participation in an EH continued education offering.

Implications

EH and Nursing Education

The Institute of Medicine's, (IOM) report (1995): *Nursing, Health, and the Environment: Strengthen the Relationship to Improve the Public's Health* highlighted that while nursing is one of the largest groups of health professionals they were poorly prepared to identify and address environmental hazards in the workplace, home, and in their communities. The IOM made recommendations to nurses at all levels of preparation. These recommendations included that nurses: (a) be educated to identify environmental risks, methods of prevention, and risk reduction; and (b) have knowledge in accessing resources to make referrals and provide assistance to individuals and communities. In 2010 the American Nurses Association (ANA) published Scope and Standards of Practice: Standard 16: enforcing that nurses have competence in EH for professional practice. The ANA Standard 16 mandates EH knowledge and skills with an emphasis on all nurses (Leffers, McDermott-Levy, Smith, & Sattler, 2014; Leffers et al., 2015)

Nursing has responded to the IOM report and the ANA standard 16 recommendations with informal educational programs, continuing education for nurses, workshops, symposia, regional faculty development trainings and most importantly the development and collaborative efforts of the Alliance of Nurses for

Healthy Environments (ANHE). The ANHE have worked to develop curriculum recommendations for the educational standards for undergraduate and graduate level nurses (Leffers, McDermott-Levy, Smith, & Sattler, 2014). The ANHE has developed teaching strategies and resources for educators. The recommendations and strategies are useful in guidance for BSN, ADN and graduate nursing curriculum. Currently, many nursing programs are working to infuse these recommendations into current curriculum throughout courses such as maternal child health, pediatrics, nutrition and pharmacology (Leffers et al., 2015; Beitz & de Castro, 2010). Nursing faculty, time and financial constraints are the most common limitations to adequately infusing EH in formal education Leffers et al., 2015; Beitz & de Castro, 2010). Several facilitators that have been suggested throughout literature to overcome these constraints include: nursing faculty collaboration with experts in epidemiology, occupational health and EH to provide insight into curriculum and guest-lectures (Leffers et al, 2015; Beitz, 2010). Additional methodologies that have been recommended include EH case studies, environmental hazard site visits, and inter-disciplinary collaboration within the academic setting (Mogk, 2014; Carnegie & Kiger, 2010; Beitz & de Castro, 2010).

EH Education in Rural Nursing Practice

The findings from this project confirm that providing applicable environmental health education to practicing rural nurses can be challenging due to the unique nature of rural communities, rural dwellers, and rural nursing practice (Scharff, 2013). Several recommendations have emerged from the RNEHE project

and associated literature review. First, each rural community and the nurses that provide care are unique, and time should be allowed to understand factors that make them different in order to enhance educational projects (Long & Weinert, 2013). Second, rural nurses face unique challenges to acquiring continuing education credit. Previous literature that was reviewed and guided the RNEHE project suggested that continued education provided to rural nurses would be most effective when it is low cost, available online, provides continued education credits, is collaborative with academic partners and public health professionals, and is accessible from work or home with flexible learning options (Elison-Bowers, 2011; Hill et al., 2010; McCurdy, Roberts, Rogers, & Love, 2004; Van Dongen, 2002). The RNEHE project followed these principles, with low participation rate. The results of the RNEHE project and further literature review emphasize the need for insider buy-in where learning objectives are increasingly relevant to every day rural practice and locally applicable (Isreal, Eng, Schulz & Parker, 2013). The rural nurse is viewed as an integral part of the community in which they provide care (Butterfield & Postma, 2009). Education projects involving EH within a specific community requires sensitivity, recognizing that a community members view themselves as part of the environment (Barber, personal communication, January 10, 2014). It may be concluded that when providing EH education within a community of rural nurses, methodology may not be as important as insider participation through all phases of planning and implementation. Insider buy-in involves engaging nurses, and other key-stakeholders within the community in

recognizing priority EH concerns, developing education methodology and direct involvement in providing education (Isreal et al., 2008).

Finally, current literature emphasizes the potential role of rural nursing regional conferences, where multiple topics could be addressed that are locally appropriate, providing opportunity for nursing collaboration and practical learning (Balbus, Harvey and McCurdy , 2006 ; Fayram and Anderko ,2009 & Scharff, 2013).

Conclusion

Environmental health is directly connected to human health. The IOM and the ANA both enforced the need for all nurses to reconnect and maintain nursing involvement with EH. Recommendations have been developed, by the ANHE, to instill EH into formal nursing curriculum but continued education of EH topics remains challenging, particularly in rural communities. There are EH concerns specific to each rural community and there is a need for rural nurses to access the knowledge about these concerns.

The RNEHE Project sought to provide EH education to a group of practicing rural nurses, aiming to provide community specific information. The RNEHE provided information on topics that were reported as top-priority EH concerns by the participants and used educational methods that were reported to increase the likelihood of participation. Despite utilization of topics that were top-rated, using preferred educational methods, the EH education offering had a low participation rate. The participants that were involved in the education project all demonstrated a

positive learning experience. Recommendations for providing EH to rural nurses, based on the RNEHE project results and literature review include: increased in-sider participation, increased collaboration with local and regional EH experts, and inclusion of EH education at multi-topic and/or in-person conferences.

REFERENCES CITED

- American Lung Association. (2012). Cutting Tobacco's Rural Roots. Tobacco Use in Rural Communities. Retrieved from: <http://www.lung.org/assets/documents/research/cutting-tobaccos-rural-roots.pdf>.
- Anåker, A., Nilsson, M., Holmner, Å., & Elf, M. (2015). Nurses' perceptions of climate and environmental issues: a qualitative study. *Journal of Advanced Nursing*, 71(8), 1883-1891. doi: 10.1111/jan.12655
- Balbus, J. M., Harvey, C. E., & McCurdy, L. E. (2006). Educational Needs Assessment for Pediatric Health Care Providers on Pesticide Toxicity. *Journal of Agromedicine*, 11(1), 27-38. doi: 10.1300/J096v11n0104
- Barber-Franklin, L. Personal Communication, January 10, 2014.
- Beitz, M. J., & de Castro, A. B. (2010). Integrating environmental health into nurse practitioner training—Childhood pesticide exposure risk assessment, prevention, and management. *AAOHN journal: official journal of the American Association of Occupational Health Nurses*, 58(8), 349.
- Bonnel, W. & Smith, K. (2014). *Proposal Writing for Nursing Capstones and Clinical Projects*. New York, NY: Springer Publishing Co.
- Butterfield, P., Postma, J., & Team, E. R. (2009). The TERRA framework: conceptualizing rural environmental health inequities through an environmental justice lens. *Advances in Nursing Science*, 32(2), 107-117.
- Butterfield, P. G., & Postma, J. (2009). The TERRA framework: conceptualizing rural environmental health inequities through an environmental justice lens... translational environmental research in rural areas. *Advances in Nursing Science*, 32(2), 107-117. doi: 10.1097/ANS.0b013e3181a3ae93
- Carnegie, E. & Kiger, A. (2010). Developing the community health role of the nurse. *British Journal of Community Nursing*. 15(6), 298-305.
- Cox, K., Mahone, I., & Merwin, E. (2008). Improving the quality of rural nursing care. *Annual Review of Nursing Research*, 26, 175-194.
- Echeverri, R. C. (2007). Barriers to participation in cardiac rehab: a rural perspective. *Theses and Dissertations at Montana State University*.

- Elison-Bowers, P. (2011). Environment, Health, & Nursing Practice. *Creative Education, 02*(03), 321-326. doi: 10.4236/ce.2011.23045
- Findholt, N. (2013). The Culture of Rural Communities: an Examination of Rural Nursing Concepts at the Community Level. In C. Winters (Ed.), *Rural Nursing Concepts, Theory and Practice* (Fourth Edition ed., pp. 367- 376). New York, NY: Spring Publishing Co. .
- Fitzgerald, C. E., & Townsend, R. P. (2012). Assessing the continuing education needs and preferences of rural nurses. *J Contin Educ Nurs, 43*(9), 420-427. doi: 10.3928/00220124-20120615-76
- Fitzpatrick-Lewis, D., Yost, J., Ciliska, D., & Krishnaratne, S. (2010). Communication about environmental health risks: A systematic review. *Environmental Health, 9*(1), 1.
- Grana,R.,Benowitz,N., Glantz,S. (2014).Contemporary Review of Cardiovascular Medicine:E-Cigarettes A Systematic Review.*Circulation (129). 1972-1986.*
- HealthyPeople.gov. (2016, 1/12/16). Environmental Health. Retrieved 1/12/16
- Hill, W. G., & Butterfield, P. (2013). Environmental Risk Reduction for Rural Children. In C. Winters (Ed.), *Rural Nursing Concepts, Theory and Practice* (fourth edition ed., pp. 357-366). New York, NY: Springer Publishing Company.
- Hill, W. G., Butterfield, P., & Kuntz, S. (2010). Barriers and facilitators to the incorporation of environmental health into public health nursing practice. *Public Health Nurs, 27*(2), 121-130. doi: 10.1111/j.1525-1446.2010.00835.x
- Isreal, B., Eng, E., Schulz, A., Parker, E. (2013). Introduction for methods for cbpr for health. In B. Isreal, E. Eng, A. Schulz & E. Parker (eds.), *Methods for Community-Based Participatory Research for Health*. (Second edition. Pp. 4-35). San Francisco, CA: Jossey-Bass.
- Isreal, B., Schulz, A., Parker, E, Becker, A., Allen, A., Guzman, R. (2013). Critical issues in developing and following cbpr principles. In M. Minkler & N. Wallerstein (eds.), *Community-Based Participatory Research for Health From Process to Outcomes*. (Second ediction. pp. 47-64). San Francisco, CA: Jossey-Bass.
- Jonckheer, P., & De Brouwer, C. (2009). Education in environmental health of health care professionals: What needs to be done? *Environ Int, 35*(4), 694-699. doi: <http://dx.doi.org/10.1016/j.envint.2009.01.004>

- Jonckheer, P., & De Brouwer, C. (2009). Education in environmental health of health care professionals: what needs to be done? *Environ Int*, 35(4), 694-699. doi: 10.1016/j.envint.2009.01.004
- Kosteniuk, J. G., D'Arcy, C., Stewart, N., & Smith, B. (2006). Central and peripheral information source use among rural and remote Registered Nurses. *Journal of Advanced Nursing*, 55(1), 100-114. doi: 10.1111/j.1365-2648.2006.03879.x
- Fayram, E. S., & Anderko, L. (2009). Applied epidemiology for public health and community-based nurses. *Journal of Continuing Education in Nursing*, 40(8), 361-366. doi: 10.3928/00220124-20090723-05
- Larsson, L. S., Butterfield, P., Christopher, S., & Hill, W. (2006). Rural community leaders' perceptions of environmental health risks: improving community health. *AAOHN Journal*, 54(3), 105-112.
- Lee, H. J., & McDonagh, M. K. (2013). Updating the Rural Nursing Theory Base. In C. Winters (Ed.), *Rural Nursing Concepts, Theory and Practice* (fourth edition ed., pp. 15-34). New York, NY: Springer Publishing Company.
- Leffers, J., McDermott-Levy, R., Smith, C. M., & Sattler, B. (2014). Nursing education's response to the 1995 Institute of Medicine Report: Nursing, Health, and the Environment. *Nurs Forum*, 49(4), 214-224. doi: 10.1111/nuf.12072
- Leffers, J. M., Smith, C. M., McDermott-Levy, R., Resick, L. K., Hanson, M. J., Jordan, L. C., ... & Huffling, K. (2015). Developing Curriculum Recommendations for Environmental Health in Nursing. *Nurse Educator*, 40(3), 139-143.
- Long, A. K. & Weinert, C. (2013). Rural Nursing: Developing the Theory Base. In C. Winters (Ed.), *Rural Nursing Concepts, Theory, and Practice* (Fourth edition ed., pp. 1-14). New York, NY: Springer Publishing Company.
- McCurdy, L. E., Roberts, J., Rogers, B., & Love, R. (2004). Incorporating Environmental Health into Pediatric Medical and Nursing Education. *Environ Health Perspect*, 112(17), 1755-1760.
- Mogk, D. (Personal Communication. January 2, 2015)
- Medves, J., Edge, D. S., Bisonette, L., & Stansfield, K. (2015). Supporting Rural nurses: Skills and Knowledge to Practice in Ontario, Canada. *Online Journal of Rural Nursing & Health Care*, 15(1), 7-41. doi: 10.14574/ojrnhc.v15i1.337

- Molinari, D., & Guo, R. (2013). The Rural Nursing Theory: A Literature Review. In C. Winters (Ed.), *Rural Nursing Concepts, Theory, and Practice* (Fourth edition ed., pp. 49-63). New York, NY: Springer Publishing Company.
- O'Fallon, L. R. (2006). Fostering the relationship between environmental health and nursing. *Public Health Nurs*, 23(5), 377-380. doi: 10.1111/j.1525-1446.2006.00576.x
- Organization, W. H. (2015). Environmental Health. Retrieved December 11, 2015 http://www.who.int/topics/environmental_health/en/
- Penz, K., D'Arcy, C., Stewart, N., Kosteniuk, J., Morgan, D., & Smith, B. (2007). Barriers to participation in continuing education activities among rural and remote nurses. *Journal of Continuing Education in Nursing*, 38(2), 58-68.
- Polivka, B. J., & Wills, C. (2014). Student nurses' risk perceptions of home environmental hazards. *Public Health Nurs*, 31(4), 298-308. doi: 10.1111/phn.12098
- Postma, J., Butterfield, P. W., Odom-Maryon, T., Hill, W. G., & Butterfield, P. G. (2011). Rural children's exposure to well water contaminants: implications in light of the American Academy of Pediatrics' recent policy statement. *J Am Acad Nurse Pract*, 23(5), 258-265. doi: 10.1111/j.1745-7599.2011.00609.x
- Pruss-Ustun, A., & Corvalan, C. (2006). Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease. Available from World Health Organization http://www.who.int/quantifying_ehimpacts/publications/preventingdisease.pdf?ua=1
- Rosas, L. G., Trujillo, C., Camacho, J., Madrigal, D., Bradman, A., & Eskenazi, B. (2014). Acceptability of health information technology aimed at environmental health education in a prenatal clinic. *Patient Educ Couns*, 97(2), 244-247. doi: 10.1016/j.pec.2014.07.018
- Scharff, J. E. (2013). The Distinctive Nature and Scope of Rural Nursing Practice: Philosophical Bases. In C. Winters (Ed.), *Rural Nursing Concepts, Theory and Practice* (fourth edition ed., pp. 241-258). New York, NY: Springer Publishing Company.
- Skinner, C., Herbert, A., Bahr, J., Bennett, P., Cantor, K., Centeno, J., . . . Pepper, I. (2007). *Earth Materials and Health Research Priorities for Earth Science and Public Health*. Washington, DC.

- Spackman, E., Freedman, T., Gabaldon, C, Baldwin, V. & Powell, J. (2005). The 2005 continued education survey: what science librarians want to know. *Issues in Science and Technology Librarianship*. doi: 10.5062/F4V9860G.
- USDA. (2013). Report of the Definition of "Rural". In T. Vilsack (Ed.): US Department of Agriculture.
- Van Dongen, C. J. (2002). Environmental health and nursing practice: A survey of registered nurses. *Applied Nursing Research*, 15(2), 67-73. doi: <http://dx.doi.org/10.1053/apnr.2002.29521>.

APPENDIX A

TOOLS

Phase 1 Questionnaire

1. What environmental health hazards most significantly impact the health of patients you care for?

PLEASE CIRCLE TOP TWO

- | | |
|----------------------------|-----------------|
| Lead | Allergens |
| Tobacco Smoke/E-cigarettes | Air Pollution |
| Metals (other than lead) | Pesticides |
| Water Pollution | Hazardous Waste |
| Climate Change | Other: _____ |

2. What educational factors would increase the likelihood of you taking part in an environmental health education offering? CIRCLE ALL THAT APPLY

- | | |
|-----------------------|---------------------------------------|
| Classroom setting | Online-based learning |
| Video/DVD | audio-conferences/teleconference |
| Self-learning | Obtaining continued education credits |
| Availability by email | low-cost / free |
| Other: _____ | |

3. What are barriers to educating your patients about environmental health hazards? CIRCLE ALL THAT APPLY

Little or no time to consider environmental health concerns in my clinical practice

Few or no resource people with expertise related to environmental health

Addressing environmental health concerns is not seen as a part of my nursing role

Personal lack of knowledge about how the environment can affect human health and what to do about it

Clients/families have little interest in understanding how the environment can affect their health

Other:
(specify) _____

Phase 2 Pre and Post Education - Likert Scale
To be completed before and after educational intervention

PLEASE CIRCLE RESPONSES

1. I have adequate knowledge to educate my patients about sources of TO BE DETERMINED BY PHASE 1

5 - Strongly Agree 4- Agree 3-Undecided 2- Disagree 1-Strongly Disagree

2. I have adequate knowledge to educate my patients about prevention of exposure to TO BE DETERMINED BY PHASE 1

5 - Strongly Agree 4- Agree 3-Undecided 2- Disagree 1-Strongly Disagree

3. I am aware of resources I can refer myself and my patients to for additional information about TO BE DETERMINED BY PHASE 1

5 - Strongly Agree 4- Agree 3-Undecided 2- Disagree 1-Strongly Disagree