4-2014

An Evidence-Based Approach for the Implementation of an Osteoporosis Educational and Exercise Intervention Among Perimenopausal Women

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AN EVIDENCE-BASED APPROACH FOR THE IMPLEMENTATION OF AN OSTEOPOROSIS EDUCATIONAL AND EXERCISE INTERVENTION AMONG PERIMENOPAUSAL WOMEN

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A Dissertation Submitted to the Faculty of

GRAND VALLEY STATE UNIVERSITY

In

Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF NURSING PRACTICE

Kirkhof College of Nursing

April 2014

Dedication

"The friends we have lost do not repose under the ground…they are buried deep in our hearts. It has been thus ordained that they may always accompany us…" (Dumas).

As I complete the final educational chapter of my life's journey, I am especially indebted to family members and friends who are no longer present. They include my parents, grandparents, Sr. JoAn Brown, OP, and Dianne Sherwood.

Special thanks to the physicians and interprofessional team members at the University of Michigan who restored my health. They include surgeons John D. Birkmeyer, M.D., George D. Zuidema, M.D., Professor of Surgery; Paul S. Cederna, M.D., Robert Oneal, M.D., Collegiate Professor; and Dr. Lauren Zoschnick, Professor of Obstetrics and Gynecology. Team members include Pamela Galofaro, P.A.-C.; Catherine Kraus Nay, M.Ed, RD, CHES; and Tonyia Seeland, P.A.-C.

To my husband, Thomas R. Finazzi: Thank you for supporting and directing me during the practicum and immersion experiences. Additionally, thank you for seeing me through this final nursing terminal degree.

To my professional colleagues: Dr. Jay M. Daitch, Wendy Cook, BSN, RN, and staff members at Freedom Medical Clinic. Thank you for your professional and personal support during my Grand Valley State University practicum experiences.

I am deeply indebted for the prayers, encouragement, and sacraments, especially the Sacrament of the Sick, provided by Monsignor Ernest P. Schneider.

To my preceptor and teaching assistant mentors Joy Washburn, Ed.D., RN, WHNP-BC and Cynthia Beel-Bates, Ph.D, RN. Thank you for being inspiring examples of dedication to undergraduate nursing education and research.

To my dear friends: Kerri, Linda, Cindy, Lisbeth, Jack, Patty, Michelle, Sydney, and Julie. Special thanks for your friendship, prayers, and encouragement.

To my cohorts from the Grand Valley State University Doctor of Nursing Practice Program: Anna, Jeff, James, Michael, Alice, Monica, Cindy B., Julieanne, Teresa, Jennifer, Tom, Cindy S., Grace, and Carolyn. "Rather, ten times, die in the surf, heralding the way to a new world, than stand idly on the shore" (Nightingale).

Acknowledgements

"One's work may be finished someday, but one's education never" (Dumas).

I am deeply indebted to the wise direction, passion for lifelong learning, and support provided by my dissertation chairperson, Cynthia Coviak, Ph.D., RN, CNE, Professor and Associate Dean for Nursing Research and Faculty Development. Her knowledge of research and the Institutional Review Board process provided timely and expert direction for this pilot study.

I wish to acknowledge Kirkhof College of Nursing committee member Ruth Ann Brintnall, Ph.D., AOCN, CHPN, APRN-BC. Your understanding of the Institutional Review Board process and scholarly projects contributed to the development of this pre-experimental study. Thank you for your encouragement.

I wish to acknowledge Claudia Leiras Ph.D., Assistant Professor, Allied Health Sciences and Public Health, College of Health Professionals Grand Valley State University. Your passion for research study endeavors with bone mineral density associated with gender, race, and cancer risk brought depth to this pre-experimental pilot study.

The successful development and implementation of this pilot study was made possible by my preceptor and dissertation committee member, Angela Horjus, BA, NASM-CPT, Health and Wellness Coach, AFAA, and Megagenics FLT. I am thankful for your mentorship at East Hills Athletic Club.

I am grateful to Mr. Michael Wood, MHA, BA, for participation on my dissertation committee. Mr. Wood is the former Vice President of Administration, Katherine

Hamilton Community Mental Health, Vice President for Administration at Lutheran General Hospital, Vice President for Administration for the Hospital Sisters Health System, and Cherry Street Health Center Board of Directors since 2002 to present. His expertise in health care administration brought business and financial depth to this pilot study.

I wish to acknowledge Mr. Donald (Dr.Tex) Bryant, MS, from Bryant's Healthcare Solutions and Ms. Ashley Eckard, MS, from Grand Valley State University Research Lab for providing biostatistical educational support, and Mr. Jack M. Eichner IDSA, JME Consulting for providing photographic and public relations direction regarding poster and flyer development.

I wish to acknowledge the support of Kappa Epsilon-at-Large Chapter of the Honor Society of Nursing - Sigma Theta Tau International (STTI). I am indebted to Adjoke Ayoola, Ph.D., RN and Calvin College Department of Nursing President for STTI, Kappa Epsilon-at-Large Chapter. Thank you for the research grant.

The successful development this pilot study was made possible by Phyllis Gendler, Ph.D., RN and Kirkhof College of Nursing Dean Emeritus. Thank you for your direction and approval for use of the Revised Osteoporosis Knowledge Test, Osteoporosis Self-Efficacy Scale, and Osteoporosis Health Belief Scale.

Finally, I am grateful to Grand Valley State University faculty members and Dean Cynthia McCurren. Thank you for your inspiring example of dedication to excellence in nursing education, professional practice, active scholarship, and public service endeavors.

Abstract

According to the osteoporosis criteria developed by the World Health Organization, 10 million individuals residing in the United States are estimated to have osteoporosis, and 8 million of these individuals are women (National Osteoporosis Foundation [NOF], 2009). Educational and exercise interventions (Bohaty, Rocole, Wehling, & Waltman, 2008) have been developed in an effort to prevent osteoporosis. However, medical record reviews reveal that only 18% of patients receive counseling regarding osteoporosis educational interventions and exercise preventive measures during health care visits (Lee, Zuckerman, & Weiss, 2002).

The purpose of the pilot study was to examine the effectiveness of a 4-week, 4-session osteoporosis education and exercise intervention among a convenience sample of eight perimenopausal women at a community health club in west Michigan. Specifically, participant osteoporosis knowledge, self-efficacy, and health beliefs were evaluated pre- and post-osteoporosis educational and exercise intervention. The specific question that directed the study was, *In a population of perimenopausal women, what is the effect of an osteoporosis educational and exercise intervention on osteoporosis knowledge, self-efficacy, and health beliefs?*

The design of the study involved a one-group, pre-experimental, pretest, posttest approach to evaluate the intervention. The Health Belief Model (HBM) and Iowa model were utilized as the conceptual frameworks. The Statistical Package for the Social Sciences (SPSS), Version 20 was used to analyze data. Demographic data were analyzed with descriptive statistics. The paired *t*-test was used to analyze the pretest and posttest data. Pearson product-moment correlation coefficient was utilized to determine

associations among variables. The measurement instruments included the Osteoporosis Health Belief Scale (OHBS), Osteoporosis Self-Efficacy Scale-12 (OSES-12), and Revised Osteoporosis Knowledge Test (ROKT).

Statistical analysis of this preliminary study indicated that a 4-week, 4-session osteoporosis educational and exercise intervention increased osteoporosis knowledge among perimenopausal women in the health club setting. The intervention elicited a high self-reported confidence level regarding increased self-efficacy in nutrition and exercise along with health belief changes associated with susceptibility, benefits of exercise, benefits of calcium intake, barriers of exercise, health motivation, and total score. These findings suggested that an educational intervention and exercise practice for perimenopausal women increased knowledge and confidence regarding measures for preventing osteoporosis.

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CHAPTER 1

INTRODUCTION

The purpose of this chapter is to introduce the dilemma of osteoporosis and the problem of this degenerative bone disease among women. The statement of purpose regarding this pilot study is addressed, and the scope of the problem with osteoporosis is highlighted. Additionally, the population of interest, setting, and recruitment along with eligibility, study design, and hypotheses are addressed. Finally, the relevance of osteoporosis is emphasized from a health, economic, and an advanced practice registered nurse (APRN) perspective.

Background

Osteoporosis is a chronic degenerative and systemic disease process that has an adverse impact on health due to disease, disability, and death (Lespessailles et al., 2009). The disease process impacts 1.5 million residents among the population of Michigan, with one in two women experiencing an osteoporotic fracture (Michigan Department of Community Health [MDCH], 2013). In Michigan, at least 15% of the population has osteoporosis or low bone mass with over 66% representing women (Healthy Michigan 2010, 2004). Twenty percent of this population is comprised of non-Hispanic Caucasian and Asian women aged 50 years and older (Healthy Michigan 2010). Healthy Michigan 2010 indicates that by 2020 the number of women impacted by osteoporosis in Michigan may increase to over 1.2 million.

The disease process associated with osteoporosis is multifactoral. Alterations in the aging skeletal system occur as a result of an increase in osteoclast activity or resorption and a decrease in osteoblast activity or formation (Seidel, Ball, Dains, &

Benedict, 2006). On the micro-structural level, the quality of bone tissue is disrupted resulting in asymptomatic geometric alterations in bone density (Licata, 2007). The skeletal changes may cause osteoporotic fractures involving the vertebrae, hip, pelvis, shoulder, forearm, and sternum (Licata). The osteoporotic fractures may result from insignificant injuries or minor falls as a result of the osteoporotic changes in the bone structure, reduced bone density, and weakened bone strength (Ontjes, 2009).

Potential approaches to address this health care problem are available. Healthy Michigan 2010 (2004) identifies that health interventions and educational endeavors should focus on reducing risk factors, such as physical inactivity, through prevention measures. The U.S. Department of Health and Human Services [USDHHS] (2012) suggests weight bearing exercises be included in the treatment and prevention regimen. Qi, Resnick, Smeltzer, and Bausell (2011) suggest the promotion of educational interventions that emphasize an increase in osteoporosis knowledge level and prevention activities, such as participation in exercise regimens.

Statement of the Problem

According to the osteoporosis criteria established by the World Health Organization, 10 million individuals residing in the United States are estimated to have osteoporosis, and 8 million of these individuals are women (NOF, 2009). In the United States annually, 1.5 million patients with fractures are diagnosed with osteoporosis, the most common degenerative bone disease (USDHHS, 2004). However, osteoporosis is an under-recognized bone disease and viewed as a normal consequence of the aging process (World Health Organization [WHO], 2004). Even though current intervention strategies are available to assist in preventing osteoporosis and maintaining or increasing bone

mass, research studies identify that this common bone disease continues to be overlooked, under-recognized, and under-diagnosed with most cases preventable (NOF, 2010).

Educational and exercise interventions (Bohaty et al., 2008; Cao, Maeda, Shima, Kurata, & Nishizono, 2007; Ciaschini et al., 2010; Sedlak, Doheny, Estok, Zeller, & Winchell, 2007) have been developed in an effort to prevent osteoporosis. The number of research studies have increased to support evidence-based practice and osteoporosis interventions (Babatunde, Himburg, Newman, & Campa, 2011; Nieto-Vazquez, Tejeda, Colin, & Matos 2009; Qi et al., 2011). However, current research suggests that health care providers do not always institute osteoporosis interventions or appropriate risk evaluations (Freedman, Potter, Nesti, Cho, & Kuklo, 2007). Medical record reviews reveal that only 18% of patients receive counseling regarding exercise preventive interventions for osteoporosis during health care visits (Lee et al., 2002). Gourlay, Preisser, Callahan, Linville, and Sloane (2006) indicate that less than 50% of women interact with their health care providers about osteoporosis prevention and interventions during office visits. Additionally, even though basic osteoporosis recommendations for screening have been available since 2002 (U.S. Preventive Services Task Force [USPSTF], 2011), the screening rate for this bone disease continues to be at an alarmingly low level, 19% among some provider groups (Cohen & Maier, 2008). These findings suggest most patients in primary care are not screened according to published recommendations and subsequently do not receive preventive educational and exercise interventions. Recent findings from an osteoporosis study with a sample of women exposed to an osteoporosis exercise intervention (Warren, Petit, Hannan, & Schmitz,

2008), however, support promise for further research with susceptible perimenopausal populations.

Statement of Purpose

The purpose of this pre-experimental pilot study was to examine the effectiveness of a four week, four-session osteoporosis educational and exercise intervention on osteoporosis knowledge level, self-efficacy, and health beliefs among a convenience sample of eight perimenopausal women at a community health club in west Michigan. The specific question that directed the review process was, *In a population of perimenopausal women, what is the effect of an osteoporosis educational and exercise intervention on osteoporosis knowledge, self-efficacy, and health beliefs?* The purpose of this pilot study was to specifically address three questions:

1. Does osteoporosis knowledge level increase with exposure to an osteoporosis educational and exercise intervention among perimenopausal women?
2. Does self-efficacy increase with exposure to an osteoporosis educational and exercise intervention among perimenopausal women?
3. Do health beliefs regarding osteoporosis change with exposure to an osteoporosis educational and exercise intervention among perimenopausal women?

A review of relevant literature was completed to evaluate the educational and exercise approaches that were utilized for osteoporosis prevention and determine if a specific intervention or approach was more effective than other interventions. Following the review, the Health Belief Model, initially developed by Hochbaum (Hochbaum, 1958) and later revised (Rosenstock, Strecher, & Becker, 1988), was utilized as the conceptual framework in implementing the osteoporosis educational and exercise

intervention. The Iowa model, depicted in Figure 1 (see page 50) and developed by Titler and associates (Titler et al., 2001), was used to implement and evaluate the intervention from a health club organizational change perspective. Additionally, written permission to use the Iowa model was obtained as shown in Appendix A.

Scope of the Problem

From a health and economic perspective, osteoporosis poses a major threat to a significant segment of the population (Blazkova et al., 2010). From a health perspective, osteoporosis accounted for over 2 million fractures in the United States during 2005, and osteoporosis incidence was higher than onset of type 1 and type 2 diabetes mellitus, cerebrovascular accidents, congestive heart failure, malignant neoplasm of the breast, coronary heart disease, and all carcinoma cases (American Cancer Society, 2010; Burge et al., 2007; Rosamond et al., 2008). Even though osteoporosis can be present at various stages of the life cycle, the disease process primarily occurs in the period of life after menopause; nearly 80% of clients with osteoporosis in the United States are women (NOF, 2009). Researchers estimate that one in two women may experience an osteoporotic fracture during her lifetime (NOF). According to Burge et al., an increase of over 175% in osteoporosis-related care is projected to occur for the Hispanic population, and an increase of over 87% is projected to occur for individuals aged 65 to 70 years by the year 2025.

From an economic perspective, researchers estimate that the financial burden of osteoporosis in the United States related to annual direct care in 2002 ranged from 12 billion to 18 billion per year (USDHHS, 2004). Health care costs are substantially impacted by this disease process, and costs are projected to climb at an alarming rate over

the next 15 years (Burge et al., 2007). Health care costs are incurred because of osteoporosis-related fractures, and these costs are increased as the population ages. Burge et al. identify that women account for over 75% of the financial burden of osteoporosis-related fractures care. The researchers cite that fracture costs are predicted to increase at a rate of 50% by 2025 in relation to the 2005 total care cost of 19 billion (Burge et al.). The researchers identify that federal and state government leaders are requesting these projected costs for the osteoporosis disease burden be identified "by demographic subgroups and skeletal sites to effectively target osteoporosis interventions and treatment programs" (Burge et al., p. 465).

Population of Interest

The community of interest for this pilot study involved perimenopausal women from a community located in west Michigan. It is an area characterized by predominately Caucasian perimenopausal middle-class women, a susceptible population for osteoporosis. According to the United States Census Bureau (2012), population estimates in the county of interest, the fourth largest county in the state, includes a total estimated of over 602,622 with 83.8% Caucasian and 51% female. The community itself lies in an affluent western Michigan region. Osteoporosis affects 1.5 million residents among the total population of Michigan, with one in two women impacted by an osteoporotic fracture (MDCH, 2013).

Perimenopause involves the time frame from the beginning of symptoms associated with menopause, which involves a decrease in the functional properties of the ovaries, to menopause, which includes the termination of progesterone and estrogen production (Holloway, 2011). During this entire period, women experience loss of

trabecular bone and diffuse bone changes (Seifert-Klauss et al., 2012). Sowers et al. (1998) indicate bone loss associated with perimenopause involves the femoral neck and lumbar spine sites along with decreases in muscle mass. This susceptible population experiences rapid bone loss changes from the onset of perimenopause and throughout this transitional time period (Holloway). Therefore, women in this population are at high risk for the development of osteoporosis, and they may not be aware of their susceptibility to osteoporosis and the severity of this disease process.

Community Health Club Setting

Researchers suggest that educational osteoporosis programs instituted in the community health club setting increase lifestyle changes and prevention behaviors among women (Bohaty et al., 2008; Ciaschini et al., 2010; & Huang, Su, Chine, & Goo, 2011). Cao et al. (2007) suggest that a physical exercise intervention for osteoporosis prevention is effective in the community health club setting. East Hills Athletic Club (EHAC) was the setting for this pilot study. EHAC was owned and operated by Mercy Health Saint Mary's, a partnership of health care facilities, physicians, and hospitals in west Michigan. Therefore, the selected setting provided an appropriate milieu for this osteoporosis educational and exercise intervention.

Intervention

This pilot study was designed to evaluate the impact of an osteoporosis educational and exercise intervention on osteoporosis knowledge level, self-efficacy, and health beliefs among perimenopausal women. Three valid and reliable measurement tools were utilized: the Revised Osteoporosis Knowledge Test [ROKT] (Gendler et al., 2013), Osteoporosis Self-Efficacy Scale-12 or short version [OSES-12] (Horan, Kim,

Gendler, Froman, & Patel, 1998), and Osteoporosis Health Belief Scale [OHBS] (Kim, Horan, Gendler, & Patel, 1991b). Written permission to utilize the measurement instruments was obtained (see Appendix B). Perimenopausal status was determined with the Osteoporosis Research Study Checklist (see Appendix C). Demographic data were obtained with a demographic survey. All data were obtained by self-report at baseline and at the last class date with the utilization of confidential, unmarked envelopes and pen and paper.

Hypotheses

It was hypothesized that perimenopausal women participating in more than 70% of the osteoporosis educational and exercise intervention would experience (a) an increase in osteoporosis knowledge, (b) increase in self-efficacy concerning confidence in osteoporosis preventive behaviors, and (c) a change and improvement in osteoporosis health beliefs.

Significance to Advanced Practice Nursing

In the past, nursing interventions related to osteoporosis management and prevention involved education in diet and exercise (Walker, 2010). According to Milstead (2009), APRNs now embrace multiple roles in the health care environment, such as primary care educators and nurse researchers. As professional members of the health care team, nurses must "serve as the link between human responses to actual and potential health problems …" (Milstead, p. 295). However, knowledge and the mastery of specific skills from health promotion endeavors and educational programs do not consistently translate into healthy beliefs or behaviors. Therefore, it is essential that APRNs consider the impact of other psychological factors that modify and transform

human behavior and beliefs.

APRNs in the educator role are challenged to use new approaches in addressing the osteoporosis educational needs of perimenopausal women. APRNs must now also consider the psychological variables that impact behavior change in this susceptible patient population. Nursing efforts should be directed to evaluate levels of self-efficacy for the purpose of measuring confidence in behavior (Horan et al., 1998) and evaluate health beliefs for the purpose of measuring beliefs related to the chronic disease of osteoporosis (Kim et al., 1991b).

APRNs are partners in practice-based research, and they translate external evidence to the clinical practice setting (Dreher & Glasgow, 2011). In the enactment of scholar roles, they are encouraged to engage in translating external evidence related to health, disease processes, and health care outcomes such as those associated with osteoporosis. APRNs can become involved with projects that address and evaluate osteoporosis knowledge, health beliefs, and self-efficacy (Horan et al., 1998). They must consider the psychological variables that impact health beliefs and behaviors in the design of studies and subsequently translate or implement evidence-based practice in the management and prevention of osteoporosis.

Summary

Osteoporosis educational and exercise interventions are important for perimenopausal women, and these interventions may prevent osteoporosis. This pre-experimental pilot study was developed to examine the effectiveness of an osteoporosis educational and exercise intervention among perimenopausal women in a west Michigan

health club setting. This was accomplished by comparing the pretest and posttest scores associated with the ROKT, OSES-12, and OHBS.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to provide the formal definition of osteoporosis. Next, measurement instruments utilized to evaluate interventions in the prevention process of this disease are described. Then, a literature review is completed to examine the educational and exercise interventions used in osteoporosis prevention. Furthermore, an assessment of the barriers in the implementation of an osteoporosis educational and exercise intervention is highlighted. Finally, the conclusions and health care implications for this pilot study are summarized.

Definitions

Over the past twenty years, the definition of osteoporosis has expanded (Herndon, Schwartz, Woloshin, & Welch, 2007). Initially in the 1980s, osteoporosis involved a diagnostic category designated for patients with non-traumatic vertebral fractures, symptomatic with significant pain (Herndon et al.). Then, the WHO (1994) introduced the definition of osteoporosis from an operational standpoint on specific characteristics associated with bone mineral density (BMD) evaluation. According to the WHO during this initial period, diagnostic criteria to define osteoporosis involved a BMD *T*-score less than -2.5 *SD* below the young adult mean value. The *T*-score standard used a statistical computation comparing the BMD of an individual relative to an average for Caucasian women aged 20 to 29 years (Herndon et al.). Kanis, Melton, Christiansen, Johnson, and Khaltaev (1994) established that severe osteoporosis involved a BMD with a *T*-score less than -2.5 *SD*, or below the mean value with a subsequent fragility fracture, and one or more fragility fractures.

Next, the National Osteoporosis Foundation proposed the expansion of the definition of osteoporosis to include women with a denser quality of bone structure (*SD* < -2.0) to be part of the threshold associated with osteoporosis (Herndon et al., 2007). Additionally, the American College of Obstetrics and Gynecology (ACOG) supported the NOF with these proposed changes (Herndon et al.). According to Herndon et al., the NOF and ACOG also advocated that a definition of osteopenia included a *T*-score < -1.5 *SD* as the threshold, with at least one or more osteoporosis risk factors. These risk factors included nicotine use, deficit in calcium ingestion, early menopause at 45 years of age or earlier, history of skeletal fractures, and intake of oral corticosteroids lasting three months or more (Herndon et al.).

At the present time, the USDHHS (2010) cites the diagnosis of osteoporosis through the occurrence of fragility fracture and bone mineral density criteria. Currently, the definition of osteoporosis involves a BMD with a *T*-score measurement of -2.5 *SD*. This was the initial definition from the WHO in 1999 (USDHHS). The fragility fractures are primarily prevalent at the proximal humerus and hip; however, they may occur at every potential human skeletal site (USDHHS). Osteoporotic fractures have a tendency to develop at the proximal ends of long bones due to trauma (Baron, Barrett, & Kalagas, 1996). Fragility fractures characteristically develop with minor trauma associated with falls from the standing position or compression fractures, abnormal conditions to produce fracture (USDHHS).

Educational Strategies and Interventions

A variety of strategies from an educational and intervention perspective have been used to address osteoporosis knowledge and exercise interventions (Bohaty et al., 2008;

Ciaschini et al., 2010; & Huang et al., 2011). Six databases were searched for publications from 2000 through to 2012 with key articles retrieved from CINAHL (Cumulative Index to Nursing and Allied Health Literature), Institute for Scientific Information (ISI) Web of Knowledge, and MEDLINE (Medical Literature On-Line), PsycINFO, Cochrane Library, and British Nursing Index. In addition, PubMed was used to search the MEDLINE database. A review of unpublished literature was conducted because an integrative literature review seeks data from all sources. To obtain the unpublished literature, the current Grey Literature Report was searched for relevant theoretical and empirical literature. In addition, *Dissertation Abstracts International* was searched for unpublished doctoral dissertations. Finally, a comprehensive search was completed using Internet resources in the United States. A number of sites were extensively searched, although the primary sites involved the National Osteoporosis Foundation; U.S. Department of Health and Human Services; Health Resources and Services Administration; and Bone Health and Osteoporosis. Additional sites searched included The National Women's Health and Information Center, and Scholarly Internet Resource Collections.

Specific key words to direct the literature search were identified by means of a PICO (Population, Intervention, Comparison, and Outcome) question (Melnyk & Fineout-Overholt, 2011) regarding osteoporosis educational and exercise strategies. An extensive search process was completed in a systematic manner with the utilization of the keywords and bibliographic databases. The keyword searchers included: "osteoporosis," "osteoporosis prevention," "health education," "women's health," "perimenopausal osteoporosis," "patient education," "bone health," "bone mineral density," "osteopenia,"

"exercise," "osteoporosis prevention," "self-efficacy," "health beliefs," and "osteoporotic fractures."

A theoretical approach was utilized to provide the framework for the literature review. In framing the review, the literature was divided into common themes and categories. A thematic review of the captured literature was organized around the topic of interest. This approach allowed for the "integration of theoretical and empirical (research) literature" (Cronin, Ryan, & Coughlan, 2008, p. 42). The literature was categorized according to general and central literature. The general literature involved categories, such as theoretical approaches, topics of interest, and empirical approaches. The central literature consisted of categories, such as analysis of theoretical outcomes and examination of significant empirical study findings.

In the integrative literature review process, six bibliographic database searches, plus citations identified through the Web-based sources, *Dissertation Abstracts International*, and grey literature resulted in a total of 54 articles. As a result of an evaluation process, 20 studies were selected for the final literature review process.

Types of Osteoporosis Educational Interventions

It was suggested that osteoporosis knowledge provided through various educational methods was an essential predictor of increased knowledge level, self efficacy (Babatunde et al., 2011; Chan, Kwong, Zang, & Wan, 2007; Huang et al., 2011; Qi et al., 2011; Sedlak et al., 2007) and improved health beliefs (Nieto-Vazquez et al., 2009). The methods utilized for osteoporosis educational strategies involved single group discussion sessions with PowerPoint and visual aids, directed by nurse researchers (Qi et al.); group educational sessions (Bohaty et al., 2008; Chan et al.; Hazavehei,

Taghdisi, & Saidi, 2007; Manios et al., 2009); individual educational session with bone screening health program (Gaines, Narrett, & Parrish, 2010; Nieto-Vazquez et al., 2009); and group educational classes with one individual consultation session along with telephone interventions (Huang et al.). Additional educational strategies included written material and videocassette (Laslett, Lynch, Sullivan, & McNeil, 2011); computerized study tools; individual counseling; physician educational sessions (Bessette et al., 2011); and web contact information (Majumdar et al., 2008).

Visual Aids

Several research studies incorporated various types of visual aids, such as handouts, booklets, PowerPoints, websites, and videocassettes. In particular, some of these educational modalities were utilized for the control group in research studies using additional interventions with the experimental group, such as educational sessions in addition to the visual aids. Research studies were present in the literature search that only used visual aids as the intervention for osteoporosis education among the experimental groups (Bessette et al., 2011). Generally, the visual aids were utilized as a supplement to the primary osteoporosis educational interventional strategy (Bessette et al.; Laslett et al, 2011; Majumdar et al., 2008; Qi et al., 2011).

Qi et al. (2011) conducted a randomized controlled repeated-measure pretest/ posttest study with the use of visual aids and a PowerPoint instructional presentation. They included a nurse directed discussion concerning the book *Bone health and osteoporosis: A guide for Asian women aged 50 and older*. The data were obtained at baseline and 2 weeks following the educational intervention. The purpose of the study was to assess if the educational intervention was effective in improving osteoporosis

knowledge and changing behaviors in exercise and osteoporosis drug compliance among Mandarin-speaking Chinese immigrants aged 45 years and above. Specifically, the researchers desired to utilize a "self-efficacy-based intervention to increase adoption of behaviors known to prevent osteoporosis" (Qi et al., p. 394). The theoretical model used in this research study was the Theory of Self-Efficacy from Bandura's Social Learning Theory (Qi et al.).

Qi et al. (2011) selected the Theory of Self-Efficacy because this theory suggests that change in client behavior is the "function of self-efficacy expectations and outcome expectations" (Qi et al., p. 394). Data were collected using face-to-face interview with Mandarin-speaking interpreters. The outcome measures were identified as reliable and valid. The Osteoporosis Knowledge Test (OKT) was used to measure knowledge, and the Self-Efficacy for Exercise Scale was utilized to measure self-efficacy and osteoporosis prescription medication use (Qi et al.). The Yale Physical Activity Survey was used to measure time spent in exercise and energy expenditure (Qi et al.).

Qi et al. (2011) concluded that study participants in the experiment group experienced statistically significant increases in osteoporosis knowledge measured with the use of the OKT, $F(1, 69) = 2.63$, $p < .001$; and exercise self-efficacy, $F(1, 69) = 9.00$, $p < .01$; along with an improvement in the use of prescribed osteoporosis medication associated with medication self-efficacy, $F(1, 69) = 11.24$, $p < .01$. Statistically significant changes also occurred in time spent in exercise, $F(1, 69) = 4.92$, $p < .05$; and energy expenditure, $F(1, 69)$, $p < .05$ in the experimental group compared to the control group. According to the researchers, self-efficacy educational interventions increased osteoporosis knowledge and improved behaviors related to bone health among these

Chinese immigrants. However, the authors concluded that further research was required to assess the long-term impact of this intervention on bone health changes and behaviors (Qi et al.).

Sedlak et al. (2007) conducted a longitudinal experimental research study in a convenience sample of 203 healthy women aged 50 to 60 years of age. Their purpose was to evaluate whether an intervention of dual energy X-ray absorptiometry (DXA) screening impacted osteoporosis prevention behaviors (OPB) within the experimental group. The independent variable was knowledge, and the dependent variables were exercise, calcium consumption, smoking, alcohol ingestion, and osteoporosis preventing drugs. The control group did not receive the DXA screening. Both groups received osteoporosis educational pamphlets.

The study participants completed questionnaires at baseline, 6 months, and 12 months. The instruments utilized for testing included the Osteoporosis Preventing Behavior Survey (OPBS), OKT, OHBS, and OSES (Sedlak et al., 2007). Additionally, the experimental group was exposed to the DXA and DXA *T*-score.

The revised health belief model [RHBM] (Connell, Sharpe, & Gallant, 1995) was utilized as the theoretical framework for the study. The researchers looked at perceived susceptibility, decreased calcium barriers, calcium intake, and use of medications to address bone loss (Sedlak et al., 2007). Statistical data were analyzed with repeated measures analysis of variance (ANOVA) and Wilk's Lambda *F*.

Sedlak et al. (2007) concluded that intervention information obtained at DXA screening was effective in increasing perceived susceptibility to osteoporosis, Wilk's $F = 4.6$, $p < .05$; calcium ingestion, Wilk's $F = 11.684$, $p < .011$; and reducing perceived

barriers to calcium intake, Wilk's $F = 4.6$, $p < .011$ among participants in the experimental group compared to the control group. The researchers identified that the health behavior associated with the RHBM involved the concept that "health beliefs cause the health behaviors" (Sedlak et al, p. 754).

Summary

The results of research studies suggested that visual aids increased osteoporosis knowledge level, exercise time, exercise self-efficacy, and energy expenditure. Visual aids improved the use of osteoporosis medications, calcium intake, and reduced perceived barriers to calcium intake. Additionally, visual aids improved and changed health beliefs associated with osteoporosis susceptibility.

Group Educational Sessions

Several research studies evaluated the impact of group educational classes on osteoporosis knowledge, self efficacy, and health beliefs. In certain research studies, group class interventions were offered once as the primary intervention (Gaines, 2010; Nieto-Vazquez et al, 2009). Other research studies involved the use of several group educational sessions (Bohaty et al., 2008; Chan et al.; Hazavehei et al., 2007; Manios et al., 2009). In one study, a telephone intervention was supplemental to the group educational classes (Huang et al., 2011).

The theme of osteoporosis educational intervention was addressed by Chan et al. (2007) in a quasi-experimental approach to assess the dependent variables of osteoporosis knowledge and health beliefs. Chan used a convenience sample of 13 male and 32 female study participants aged 18 to 23 years. The study involved a control group and an experimental group with a pretest posttest and follow-up design. The purpose of the

study was to evaluate the effectiveness of an osteoporosis educational intervention regarding osteoporosis knowledge, health beliefs, and self-efficacy.

Chan et al. (2007) used the HBM as the theoretical framework for this study, and measurement instruments utilized included the OHBS, OSES, and OKT. The intervention consisted of three educational sessions for a total of 6 hours. Subjects addressed in the educational intervention included the importance of calcium consumption, exercise, dairy product intake, and lifestyle in relation to osteoporosis prevention. After the educational intervention, the researchers evaluated the changes in osteoporosis knowledge level, perceived osteoporosis susceptibility, perceived seriousness, and perceived osteoporosis benefits and barriers to preventive actions and self-efficacy (Chan et al.).

Data analysis was completed with the use of descriptive statistics, chi-square test, and independent *t*-test. Chan et al. (2007) identified that statistically significant increases were described by the intervention group associated with osteoporosis knowledge. The OKT risk factor knowledge in the intervention group increased from pretest, $M = 4.4$, ($SD = 2.0$); to posttest, $M = 10.3$, ($SD = 1.0$), $p < .001$; and follow-up survey, $M = 10.2$, ($SD = 1.1$), $p < .001$ (Chan et al.). The OKT exercise subscale score in the intervention group was low at pretest, $M = 3.2$, ($SD = 1.3$); increased at posttest, $M = 7.0$, ($SD = 0.0$), $p < .001$; and maintained at follow-up survey, $M = 7.0$, $SD = 0.0$, $p < .001$ (Chan et al.). The OKT calcium subscale score in the intervention group increased from pretest, $M = 2.8$, ($SD = 1.4$); to posttest, $M = 7.7$, ($SD = 0.5$), $p < .001$; and follow-up survey, $M = 7.9$, ($SD = 0.4$), $p < .001$ (Chan et al.).

Chan et al. (2007) identified that statistically significant increases associated with

osteoporosis health beliefs were evident in the intervention group. The OHBS subscale score for susceptibility in the intervention group was on average, M = 16.2, (SD = 3.4) at pretest; increased at posttest, M = 22.9, (SD = 4.6), $p < .001$; and follow-up survey, M = 22.8, (SD = 3.2), $p < .001$ (Chan et al.). The OHBS subscale score for seriousness in the intervention group was pretest, M = 18.2, (SD = 4.7); increased at posttest, M = 27.2, (SD = 2.6), $p < .001$; and follow-up survey, M = 26.6, (SD = 2.4), $p < .001$ (Chan et al.). The OHBS subscale score for benefits of exercise in the intervention group was pretest, M = 22.4, (SD = 3.9); increased at posttest, M = 28.5, (SD = 2.0), $p < .001$; and follow-up survey, M = 29.0, (SD = 1.9), $p < .001$ (Chan et al.). The OHBS subscale score for benefits of calcium in the intervention group was pretest, M = 22.0, (SD = 3.3); increased at posttest, M = 28.0, (SD = 2.7), $p < .001$; and follow-up survey, M = 29.0, (SD = 2.0), $p < .001$ (Chan et al.). The OHBS subscale score for barriers to exercise in the intervention group was pretest, M = 15.0, (SD = 3.5); decreased at posttest, M = 9.3, (SD = 3.5), $p < .001$; and follow-up survey, M = 8.8, (SD = 2.8), $p < .001$ (Chan et al.). The OHBS subscale score for barriers to calcium in the intervention group was pretest, M = 14.5, (SD = 4.6); decreased at posttest, M = 7.7, (SD = 1.8), $p < .001$; and follow-up survey, M = 7.8, (SD = 2.3), $p < .001$ (Chan et al.). The OHBS subscale score for health motivation in the intervention group was pretest, M = 20.7, (SD = 3.7); increased at posttest, M = 23.4, (SD = 3.1), $p < .001$; and maintained at follow-up survey, M = 23.4, (SD = 2.8), $p < .001$ (Chan et al.).

Chan et al. (2007) identified that statistically significant increases were described by the intervention group associated with osteoporosis self-efficacy. The OSES for exercise in the intervention group was pretest, M = 36.5, (SD = 13.7); increased at

posttest, M = 46.5, (SD = 8.4), $p < .001$; and follow-up survey, M = 47.0, (SD = 8.4), $p < .001$ (Chan et al.). The OSES for calcium in the intervention group was pretest, M = 35.2, (SD = 13.2); increased at posttest, M = 50.00, (SD = 6.9), $p < .001$; and follow-up survey, M = 50.7, (SD = 6.6), $p < .001$ (Chan et al.).

Babatunde et al. (2011) completed a randomized repeated measures experimental design with pretest and posttest to evaluate the effectiveness of an osteoporosis education endeavor to improve dietary calcium use, knowledge level, and self-efficacy among community-dwelling African Americans aged 50 years or older. Analysis was completed with the use of "descriptive summary statistics, repeated measures analysis of variance, and regression analysis" (Babatunde et al., p. 434). The RHBM and Bandura's theory of self-efficacy were used as the theoretical frameworks. The authors hypothesized an increase in knowledge, self-efficacy and personal health beliefs among the experimental group improved dietary calcium intake as compared to the control group (Babatunde et al.).

Babatunde et al. (2011) focused on variables associated with prior research to assess osteoporosis knowledge, health beliefs, and self-efficacy. The standardized instruments utilized to evaluate these characteristics included the OKT, OHBS, OSES, and Random Assessment Method [RAM] for dietary calcium (Babatunde et al.).

Babatunde et al. (2011) concluded that a theory-driven strategy for an osteoporosis educational intervention with the RHBM and theory of self-efficacy was instrumental in producing an increase in dietary calcium intake, Wilk's F = .047, $p < .001$; osteoporosis knowledge, Wilk's F = 38.56, $p < .001$; and self-efficacy, Wilk's F = 30.26, $p < .001$. However, the health belief subscales were not impacted by the

educational intervention (Babatunde et al.). Nevertheless, the theory-driven method was beneficial in improving bone health behavior among older African American adults.

Huang et al. (2011) conducted a research study in Taiwan during a 12 week period with 35 women in the intervention group and 35 women in the comparison group. The study participants were not randomly assigned to a group. The purpose of the study was to evaluate the effectiveness of an osteoporosis education program among women older than age 40 years. The theoretical framework used for this research study was the HBM.

Huang et al. (2011) utilized three primary components associated with the HBM. These components included "individual perceptions, modifying factors, and likelihood of action" (Huang et al., p. e30). The researchers also incorporated additional modifying factors, such as knowledge level, self-efficacy, and social support. Specific components associated with the likelihood of action factor included perceived benefits and barriers. The health beliefs were evaluated using an HBM-based questionnaire. The researchers hypothesized that the osteoporosis education intervention would have an impact among women in Taiwan providing an increase in osteoporosis perception of susceptibility and severity and benefits of preventive actions (Huang et al.)

The investigators concluded that the osteoporosis intervention increased preventive behaviors regarding perceived barriers among the study participants in the intervention group (pretest, $M = 213.55$, ($SD = 36.53$); to posttest, $M = 240.45$, ($SD = 22.04$), $p < .01$) (Huang et al., 2011). The researchers also concluded that the intervention increased perceived benefits (pretest $M = 87.48$, ($SD = 22.03$); posttest, $M = 97.61$, ($SD = 43.5$), $p < .05$). Bone mineral density also increased (pretest $M = -.129$, (SD

= 0.93); posttest M = -.119, (SD = 0.95), $p < .05$) in the intervention group (Huang et al.). Statistically significant improvements were not observed for perceived susceptibility and perceived severity.

The randomized, controlled study conducted by Hazavehei et al. (2007) among 206 Iranian females from Garmsar was completed over a 4 week period. The purpose of the study was to evaluate the effectiveness of the educational intervention based on the HBM for osteoporosis risk factors and the effect on subsequent behavior changes. Study participants were randomly assigned to three groups. Group I participants were assigned to the experimental group, and they were exposed to two osteoporosis educational interventions based on the HBM. Group II participants were assigned to an experimental group, and they were exposed to a traditional osteoporosis educational program without the HBM framework. The control group participants, Group III, were not exposed to any osteoporosis educational intervention.

The HBM was utilized in the study in the following manner. Perceived susceptibility was addressed by educating the participants about their susceptibility to osteoporosis as the result of decreased activity and exercise level. Perceived severity of osteoporosis was addressed with educational interventions about the outcome of osteoporosis. Cues to action were noted through workshops, support groups, and personal encouragement. Perceived benefits and barriers were addressed with the educational intervention identifying prevention of pain and obesity along with increased muscle strength, self-efficacy, and quality of life. Taking health action was addressed by proposing actions to increase calcium consumption, participate in physical exercise, and provide proper exposure to sunlight.

The instrument was identified as valid and reliable, and it was created based on the "HBM domains: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and health behavior action for osteoporosis prevention" (Hazavehei et al., 2007, p. 1). Data were analyzed using descriptive statistics, analysis of variance (ANOVA), *t*-test, and Kruskal-Wallis test. The design of the study involved pretest, posttest, and one month follow-up scores.

Hazavehei et al. (2007) concluded that statistically significant increases occurred for Group I study participants in the areas of osteoporosis knowledge. The mean score for osteoporosis knowledge at pretest was 49.44, (SD = 13.59); at posttest, M = 91.82, (SD = 8.48), $p < .05$; and at follow-up, M = 85.52, (SD = 12.80), $p < .05$. The pretest mean score for perceived susceptibility was 65.71, (SD = 10.78). It was increased at posttest, M = 93.49, (SD = 7.55), $p < .05$; and remained above baseline at follow-up, M = 85.59, (SD = 12.80), $p < .05$. The pretest mean score for perceived severity was 64.34, (SD = 19.27); increased at posttest, M = 98.94, (SD = 4.18), $p < .05$; and at follow-up survey, M = 96.44, (SD = 9.60). At pretest the mean score for perceived benefits associated with decreasing osteoporosis risk factors was 62.67, (SD = 32.88). Scores increased at posttest, M = 91.98, (SD = 19.86), $p < .05$; and remained so at follow-up survey, M = 91.02, (SD = 20.27), $p < .05$. Group II study participants only showed statistically significant increases in the area of osteoporosis knowledge and perceived susceptibility. The mean score for osteoporosis knowledge was 47.77, (SD = 12.92) at pretest; increased at posttest, M = 59.91, (SD = 14.17), $p < .05$; and follow-up survey, M = 55.96, (SD = 15.16), $p < .05$. The mean score for perceived susceptibility was 62.68, (SD = 13.06) at pretest and increased at posttest, M = 68.98, (SD = 14.54), $p < .05$

(Hazavehei et al.). Group III control group participants did not demonstrate any statistically significant changes.

Manios et al. (2009) conducted a randomized controlled research trial to evaluate if a dairy nutrition and educational intervention compared to a calcium supplementation approach was more effective among Greek women aged 55 to 65 years. A pretest and posttest design was utilized. The group receiving the dairy and educational intervention attended classes biweekly during the study period of 5 months. Even though the researchers indicated that the study was based on a holistic intervention approach, no specific conceptual model was identified.

Statistical analysis was completed using descriptive statistics, the Kolmogorov-Smirnov test, one-way analysis of variance, repeated-measures analysis of variance, and *post hoc* comparisons. Pretest and posttest measurement evaluations were carried out with several tools. Bone mineral density of the lumbar spine along with total body composition was assessed with dual-energy x-ray absorptiometry. Anthropometrical measurements included weight, height, and body mass index. Dietary evaluation was completed with the use of the 24-hour recall method. Dietary intake information was evaluated with the Nutritionist V diet analysis software. Biochemical analysis was completed through fasting blood specimens to assess lab values, such as serum calcium, phosphorus, osteocalin, insulin-like growth factor, and parathyroid hormone.

Research study participants in the dairy intervention group noted a decrease in fat intake (pretest, $M = 38.5$, ($SD = 5.6$); posttest, $M = 36.4$, ($SD = 5.0$), $p < .05$); an increase in calcium intake (pretest, $M = 682.5$, ($SD = 210.4$); posttest, $M = 1253.0$, ($SD = 513.3$), $p < .001$); and vitamin D product intake (pretest, $M = 0.40$, ($SD = 0.25$); posttest

M = 6.52, (SD = 1.69), p < .001) compared with the calcium supplemental group and control group (Manios et al., 2009). The nutritional program positively impacted the intake of food associated with bone health. Changes in the bone remodeling biomarkers associated with serum osteocalcin levels did not occur (pretest, M = 4.45, (SD = 1.69); posttest M = 4.19, (SD = 1.62)). Serum CTx levels also remained the same (pretest, M = 0.40, (SD = 0.12); posttest M = 0.31, SD = 0.12) (Manios et al.). The researchers suggested that the intervention may need to occur longer than 5 months in order for a positive impact be seen in the bone remodeling biomarkers.

Summary

Group osteoporosis educational interventions improved osteoporosis knowledge in risk factors, exercise, and calcium intake. The group interventions improved osteoporosis health beliefs in susceptibility, seriousness, benefits of exercise, benefits of calcium intake, barriers of calcium intake, barriers of exercise, and health motivation. Additionally, the group interventions improved osteoporosis exercise self-efficacy and osteoporosis calcium self-efficacy.

Single Educational Class

Nieto-Vazquez et al. (2009) conducted a randomized control study with pretest and posttest design to evaluate the impact of a single osteoporosis education intervention in osteoporosis knowledge level, health beliefs, and self-efficacy among Puerto Rican women aged 18 years to 25 years. The study involved a convenience sample of 105 study participant who were randomized into the control and experimental group. The HBM was used as the theoretical framework for the study, and the Purnell Model of Cultural Competency was utilized to provide specific direction for the application of the

HBM (Nieto-Vazquez et al.).

The authors provided a detailed account regarding the HBM and Purnell Model of Cultural Competency. However, they did not provide a description of the actual educational intervention or how the HBM and Purnell Model of Cultural Competency were used to develop the intervention. Measurement instruments were a demographic questionnaire, OKT, OHBS, and the OSES (Nieto-Vazquez et al., 2009). The data were obtained by self-report at baseline and one week after the intervention.

Nieto-Vazquez et al. (2009) concluded that the osteoporosis educational intervention increased total osteoporosis knowledge scores $F(1, 103)$, 4.42, $p = .038$ and produced positive changes in health belief total scores $F(1,103)$, 3.96, $p = .049$ among Puerto-Rican women in the experimental group compared to control group. However, the osteoporosis educational intervention did not have a statistically significant effect on self-efficacy. The researchers noted that future studies should include women from all age groups and cultures.

Summary

A single educational class intervention improved osteoporosis knowledge among Puerto-Rican women in the experimental group. Osteoporosis health beliefs improved among participants in the experimental group. However, the intervention did not influence osteoporosis self-efficacy among Puerto-Rican women in the experimental group.

Osteoporosis Exercise Interventions

Cao et al. (2007) conducted an intervention study during a 12 month period to assess the effectiveness of a physical exercise and nutrition intervention for improving

bone health and reducing fracture risk among women aged 55 years and older. The intervention consisted of several components. Additionally, a flow chart was provided regarding the actual study participation outline. The exercise interventions included aerobic exercises, antigravity exercises, and circuit training. The nutritional interventions involved the use of a diet diary and cooking classes.

Evaluation of study participants occurred at baseline and after one year. The measurement instruments included physical measurements of bone health with ultrasound of the right heel. Physical performance was measured with the use of a physical performance testing questionnaire. Even though the researchers alluded to the use of such concepts as health consciousness and health habits, they never utilized a conceptual framework to organize the study.

Statistical analysis was completed with the use of descriptive statistics and two-way repeated ANOVA. Cao et al. (2007) concluded that the exercise and nutrition intervention group after one year showed statistically significant improvements with calcium intake (pretest, M = 647.0, (SD = 166.0); posttest, M = 715.0, (SD = 160.0), $p < .05$); and bone stiffness (pretest, M = 1531.8, (SD = 15.1); posttest, M = 1539.5, (SD = 14.3), $p < .001$). The exercise group and nutrition intervention group also showed statistically significant improvements in balance (pretest, M = 68.1, (SD = 45.7); posttest, M = 104.2, (SD = 30.8), $p < .001$); and walking capacity (pretest, M = 7.2, (SD = .09); posttest, M = 6.2, (SD = 0.8), $p < .001$). However, the control group did not demonstrate significant changes in components associated with the exercise and nutritional interventions. These results suggested that a combination of the exercise and nutrition

intervention may provide an effective way to achieve bone health and reduce fracture risk.

Warren et al. (2008) conducted a 2 year randomized controlled trial that included 164 healthy women. The premenopausal women were aged 25 to 44 years and had a sedentary lifestyle, and the researchers evaluated the effectiveness of a twice-weekly strength training intervention on bone mineral content and areal bone mineral content. The control group interventions involved the use of brochures recommending the use of daily exercises according to the American Heart Association guidelines (Warren et al.). In addition, the control group and the experimental group were advised to not alter their diets. However, variations associated with the changing season were accepted. The researchers did not use a conceptual framework with their research study.

Measurements were obtained at baseline, 1 year, and 2 years after the beginning of the research study. Bone mineral content, areal bone mineral content, and bone areas were evaluated at the lumbar spine and proximal femur with the use of dual x-ray absorptiometry (DXA). Muscle strength was evaluated, and strength training was assessed based on actual attendance at strength training sessions. Additionally, dietary intake was assessed using the National Institutes of Health Diet History Questionnaire (Warren et al., 2008).

The researchers also used repeated-measures ANCOVA, Chi-square tests, and *t*-tests. They found that the 2-year strength training intervention in the intervention group did not affect areal bone mineral content in the lumbar spine or proximal femur. The strength training group experienced no bone mass loss at the femoral neck area in the intervention group. However, the control group displayed a 1.5% decrease in bone

mineral content. The researchers suggested that further research was required to develop an understanding regarding bone dimension changes with strength training among this population (Warren et al. (2008).

Gomez-Cabello, Ara, Gonzalex-Aguero, Casajus, and Vicente-Rodriguez (2012) completed a systematic review regarding the impact of exercise interventions on bone mass among older adults. They included "59 controlled trials, 7 meta-analyses and 8 reviews" (p. 302) in their systematic review. In the studies, the researchers found that exercise programs associated with improvement and maintenance of bone mass included strength exercises along with multi-component regimens with strength, weight-bearing, and aerobic exercises. High-impact exercises positively influenced bone health, especially among postmenopausal women. The length of the programs ranged from 12 weeks to 52 weeks (Gomez-Cabello et al.).

Kemmler, Engelke, Weineck, Hensen, and Kalender (2003) conducted a 2-year controlled research trial to evaluate the effect of strength, high-impact and endurance exercises on bone health and BMD among postmenopausal women with a history of osteopenia. Study participants included 87 women in the exercise program and 51 women in the control group (Kemmler et al.). Bone mineral density was measured pretest and after 12 months by dual-energy x-ray absorptiometry, quantitative computed tomography, and ultrasound. The researchers concluded that a comprehensive exercise regimen with aerobics, strength training, running, and high-impact exercises improved BMD at the spine with an increase of 1.3%, $p < .01$ in the experimental group, while the BMD of the control group decreased by 1.2%, $p < .01$.(Kemmler, et al.).

According to Irion and Irion (2010), physical therapists and health care providers

must focus on osteoporosis education regarding knowledge about osteoporosis, osteoporotic fracture preventive measures, bone health maintenance, and the prescription of suitable exercise interventions. They maintain that the exercise intervention regimen should be instituted to maintain or improve bone health and bone mass along with the morphologic components associated with the actual size and geometric shape. Additionally, they assert that the goal of the intervention should address prevention of falls with appropriate balance interventions. The overall program may include interventions to decrease pain and possible spinal deficits and deformities (Irion & Irion).

Summary

Osteoporosis exercise interventions improved balance and walking capacity among participants in the intervention groups. Comprehensive exercise interventions increased and/or maintained BMD among participants in the experimental groups. Additionally, individuals in the control groups experienced a decrease in BMD, especially in the spine.

Safe Exercise Interventions and Modifications

According to Irion and Irion (2010), exercise intervention guidelines for some participants may need to include exercises that exclude high-impact and high loads associated with the spine, specifically the vertebral bodies. They indicate that spinal flexion interventions should be excluded and spinal extension exercise should be included with individuals diagnosed with osteoporosis or DEXA *T*-scores between the levels of 0 and -2.5. The spinal flexion exercise exclusions involve toe touches and sit-ups (Irion & Irion). They further caution that exercise equipment associated with loaded rotation force or machines with rowing functions should be avoided. Trunk flexion and

trunk rotation movements should only be utilized with the spine unloaded through a prone position with slow movements (Irion & Irion).

Barriers to Osteoporosis Prevention Programs

Barriers were present regarding the implementation of bone health and osteoporosis education and exercise programs. According to Colon-Emeric et al. (2004) reimbursement for osteoporosis programs and health care endeavors were a problem. Even in the west Michigan health club setting, programs are privately funded for cancer and diabetic programs regarding exercise and educational interventions (A. Horjus, personal communication, May 16, 2013). However, bone health programs currently do not exist in the health club environment in west Michigan (K. Tuck, personal communication, May 16, 2013).

Critique of Literature Review

From the literature review, it was evident that perimenopausal women may benefit from osteoporosis educational and exercise interventions to positively impact bone health management and health promotion activities. Review of the literature revealed that osteoporosis educational and exercise interventions had a significant impact on osteoporosis knowledge, lifestyle changes, and the utilization of exercise interventions among women. Strengthening and weight bearing exercise interventions positively impacted BMD. Furthermore, the community health club setting offered a common setting for complete weight training, fitness instruction and group classes with qualified fitness and exercise experts.

The primary limitations of the literature review were related to several factors

including limited time duration for the studies, small sample sizes, homogeneous populations, self-report methods, and inconsistencies regarding the designs, interventions, and measures. The research study durations were of various time periods and involve two weeks (Qi et al., 2011); 4 weeks (Hazavehei et al., 2007); 8 weeks (Bohaty et al., 2008); 12 weeks (Huang et al., 2011); 5 months (Chan et al., 2007; Manios et al., 2009); 12 months (Cao et al., 2007, Ciaschini et al., 2010); and two years (Gaines et al., 2010). A second set of limitations included characteristics of the participants and sample sizes. The research included 46 study participants (Chan et al., 2007); 68 study participants (Huang et al., 2011); 75 study participants (Manios et al., 2007); 80 study participants (Bohaty et al., 2008); 105 study participants (Nieto-Vazquez et al., 2009); 110 study participants (Qi et al., 2011); 201 study participants (Ciaschini et al., 2010); and 203 study participants (Sedlak et al., 2007). Across the various studies, the study participants were heterogeneous in terms of demographics, such as education, culture, social and economic status.

Various research methods and designs were used to evaluate the effectiveness of the interventions, and they included randomized controlled repeated-measure or pre-test/posttest designs (Ciaschini et al., 2010; Majumdar et al.,2008; Manios et al., 2007; Manios et al., 2009; Nieto-Vazquez et al., 2009; Qi et al., 2011; Warren et al., 2008); quasi-experimental designs (Chan et al., 2007; Gaines et al., 2010); one non-randomized, single-blinded, prospective research study (Laslett et al., 2011); and one longitudinal experimental research study (Sedlak et al., 2007). Variations were also present in the number and combination of educational classes, written materials, videocassettes, telephone inquiries, and the content in educational sessions. Finally, inconsistencies were

found regarding specific measured outcomes or multiple combinations of outcome variables, such as osteoporosis knowledge; lifestyle changes in exercise; osteoporosis medication; dietary quality; nutritional intake of vitamin D and calcium; calcium supplementation; health beliefs; calcium or exercise activity self-efficacy; improvement of bone health; bone mineral content; and fracture risk. The limitations associated with this literature review impacted the external validity of outcomes, as different types of interventions produced divergent findings.

Recommendations and Summary

Primary findings from the literature review included the use of a wide variety of educational and exercise interventions. However, the findings among the research studies suggested that among study participants osteoporosis educational endeavors and exercise interventions provided an increase in osteoporosis knowledge and lifestyle changes regarding exercise. Therefore, given the significant level of evidence concerning benefits associated with osteoporosis educational and exercise interventions among women, these interventions in the health care and community settings may have a positive and profound influence, improving bone health among perimenopausal women. Additionally, osteoporosis educational and exercise interventions may positively impact all individuals, including members of susceptible and vulnerable populations.

CHAPTER 3

CONCEPTUAL FRAMEWORK

The purpose of this chapter is to introduce the theoretical frameworks that are used to guide this pilot study. The HBM and Iowa Model are highlighted along with the framework for phases of the DNP practice immersion process developed by Grand Valley State University Kirkhof College of Nursing (2013-2014). In addition, the theoretical applications associated with the research study outcomes are highlighted.

The HBM was utilized as the primary theoretical framework for the conceptual foundation of this pilot study. This prevention model was devised to explain why some individuals were motivated to change lifestyle and behaviors while some individuals were not motivated to engage in change (Janz & Becker, 1984). The HBM provided a beneficial framework for examining the effectiveness of osteoporosis educational content and health prevention strategies (Janz & Becker) during the perimenopausal period. Therefore, the HBM was used to evaluate how the osteoporosis educational and exercise interventions affected osteoporosis knowledge, self-efficacy, health beliefs, and lifestyle change outcomes.

In addition, the Iowa Model (see p. 50) was used in this research study as a conceptual framework for an organizational change perspective. According to Titler et al. (2001), the Iowa Model incorporates evidence-based practice and directs the decision making and implementation process in the clinical setting from the health care provider and organizational perspective. The Iowa Model identifies "how the infrastructure to support research use must involve every level of the organization, from high-level management to front-line clinicians" (Melnyk & Fineout-Overholt, 2005, p. 197).

Finally, the framework associated with phases of the Doctor of Nursing Practice (DNP) immersion process was incorporated into the design of the pilot study (Grand Valley State University Kirkhof College of Nursing, 2013-2014). The phases included the development of an initial or design stage and middle or implementation stage. The final stage involved the development of a final or expected outcome stage.

Figure 1: The Iowa Model

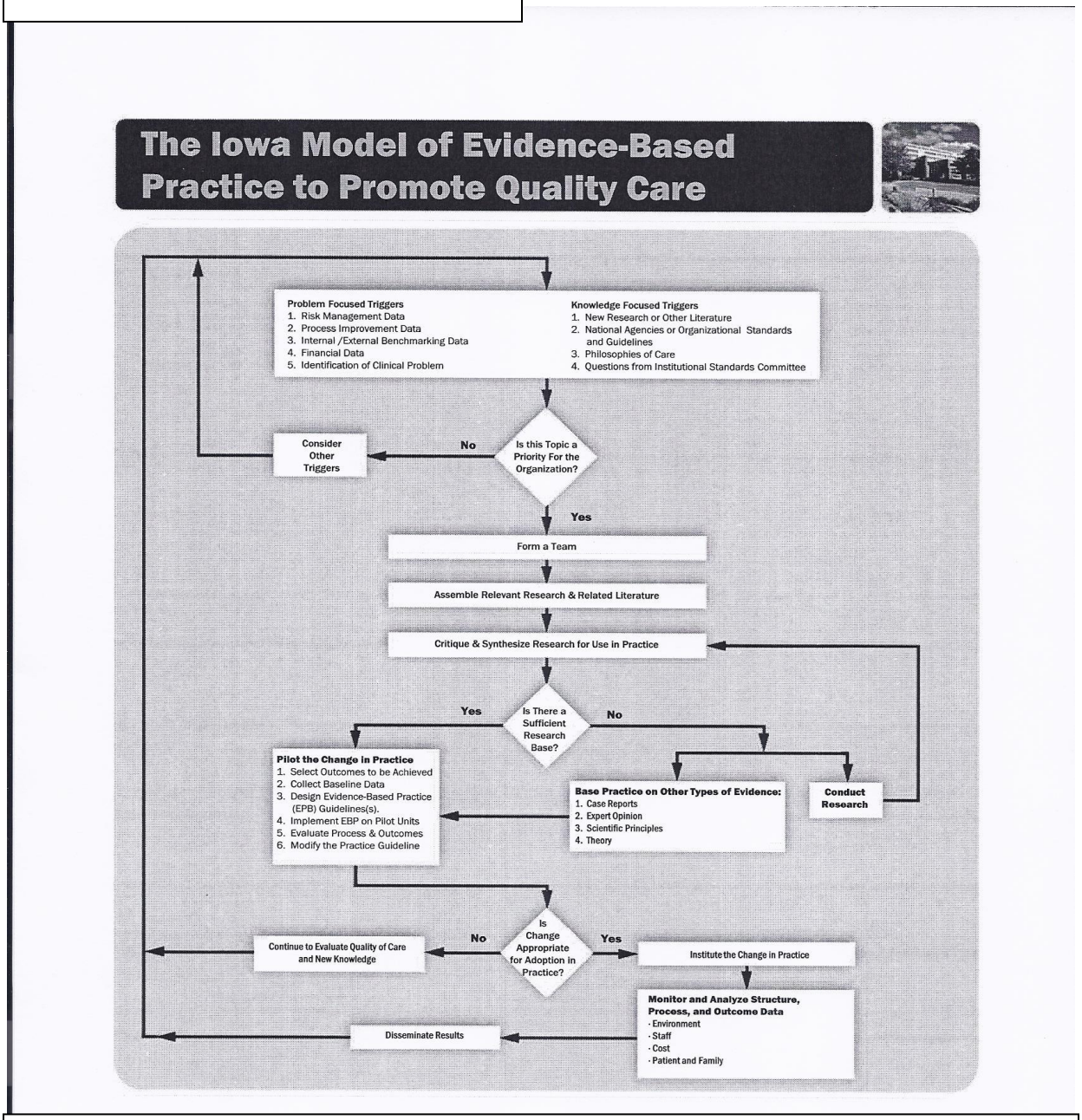

Figure 1. Iowa Model (2001). From "The Iowa Model of Evidence-Based Practice to Promote Quality Care," by M. G. Titler, V. J. Steelman, B. A., Rakel, G. Budreau, L. Q Everett, K. C. Buckwalter, T. Tripp-Relmer, & C. Goodeman, 2001, *Critical Care Nursing Clinics of North America, 13,* 497-509. Copyright 1998 and Used/Reprinted with permission from the University of Iowa Hospitals and Clinics and Marita G. Titler, PhD, RN, FAAN.

Conceptual Framework Health Behavior Model Overview

The HBM was initially established to serve as the framework in health care screening and immunization behaviors (Rosenstock, 1960). During the past decade, the use of the HBM has expanded to include other health problems, such as osteoporosis (Chan et al., 2007; Gaines et al., 2010; Hazavehei et al., 2007; Huang et al, 2011; Manios et al., 2007; Nieto-Vazquez et al., 2009; Sedlak et al., 2007). According to Rosenstock et al. (1988), the HBM is suitable for use as a conceptual model concerning disease-prevention behaviors.

The HBM primary core constructs include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Janz & Becker, 1984; Rosenstock et al., 1988). Perceived susceptibility involves the opinion of an individual from the population at risk regarding the chances of contracting a specific health condition (Janz & Becker; Rosenstock et al.). Perceived severity includes an individual's perspective of the severity of a health condition and the outcome or consequences (Janz & Becker). Perceived benefits involve the individual's belief in the efficacy of the advised action to decrease risk or impact health condition consequences (Janz & Becker). Perceived barriers include the individual's view of the physical and psychological expense of the recommended action (Janz & Becker). Cues to action involve methods or tactics to actuate the recommended action (Janz & Becker). Self-efficacy includes confidence in the individual's capability to take the advised action (Janz & Becker; Rosenstock et al.).

Rosenstock et al. (1988) identified that self-efficacy was the last construct added to the HBM after over two decades of use. Prior to this event, self-efficacy was

extensively acknowledged to have a significant impact on health behavior (Bandura, 1977). As depicted in Figure 2, self-efficacy involves the level of confidence individuals possess to perform a specific behavior. Written permission to use the source of self-efficacy model was obtained (see Appendix D). The sources of self-efficacy include accomplishments, experience, verbal persuasion, and physiological and psychological factors, such as emotional arousal (Bandura). Particularly, a number of research studies have identified self-efficacy to influence osteoporosis knowledge and exercise (Babatunde et al., 2011; Bohaty et al., 2008; Qi et al., 2011).

Figure 2. Sources of Self-Efficacy

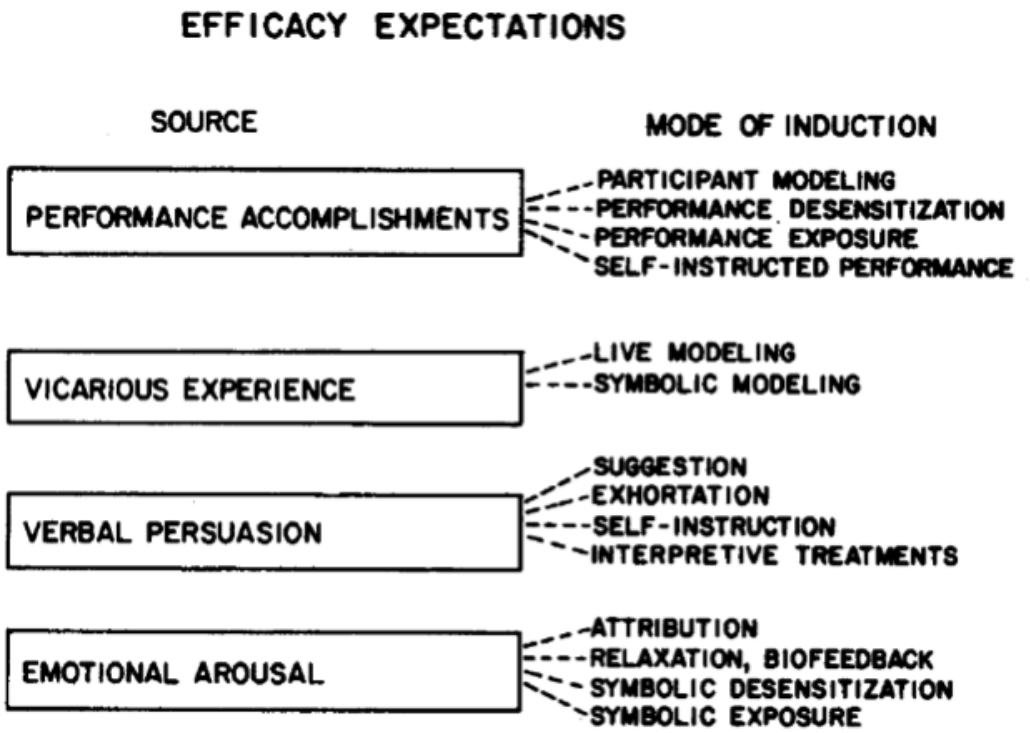

Figure 2. Major sources of self-efficacy information and the primary sources that treatment modalities operative. From "Toward a unifying theory of behavior change," by A. Bandura, 1977, *Psychology Review*, *84*, p. 191- 215. Copyright 1997 and Used/Reprinted with permission from Dr. A. Bandura.

Three basic assumptions are associated with the HBM. The first assumption is based on the perception that individuals will undertake health actions if they think harmful or negative consequences can be avoided (Janz & Becker, 1984; Rosenstock et al., 1988). The second assumption is based on the belief that individuals will have a positive expectation associated with taking recommended actions and thereby, avoid negative health outcomes (Janz & Becker). The third assumption is based on the perception that individuals believe they can successfully implement the recommended actions (Janz & Becker; Rosenstock et al.).

According to Conner and Norman (1996), the scope of the HBM impacts several areas. First, the HBM may be utilized to address disease-prevention health behaviors which relate to actually promoting health, such as exercise and nutrition interventions (Conner & Norman). Second, the HBM can be used to address health risk behaviors, such as smoking and substance abuse (Conner & Norman). Finally, the HBM can be applied to prevention measures in the use of immunization and contraceptive practices (Conner & Norman).

In contrast, limitations are present with the HBM. First, the HBM does not take into account cultural, social context, and economic characteristics (Poss, 2001). Geeraert and Yzerbyt (2007) suggest that culture strongly influences behavior. According to Joseph, Burke, Tuason, Barker, and Pasick (2009), social context plays a significant role in directly influencing behavior through individual beliefs. Financial resources available also impact health behaviors (Lucan, Barg, Karasz, Palmer, & Long, 2012), such as food intake, because of characteristics and cost. Nevertheless, the HBM is effectively utilized to explain, understand, and predict health behavior (Chan et al., 2007; Gaines et al.,

2010; Hazavehei et al., 2007; Huang et al, 2011; Manios et al., 2007; Nieto-Vazquez et al., 2009; Sedlak et al., 2007).

Conceptual Framework Iowa Model Overview

Since the origination of the Iowa Model in 1994, it has been utilized extensively in clinical research endeavors (LoBiondo-Wood & Haber, 2006). The Iowa Model emphasizes the significance of taking into account the entire health care structure from the perspective of the health care provider, patient, and organization through the use of "research within the context to guide practice decisions" (Dontje, 2007 p. 1). The primary focus of the Iowa Model involves using research and evidence at the organizational facility level (Titler, 2004). This process is accomplished through the application of seven steps to assist in the determination of the actual problem and development of the resolution (Titler). The seven steps include: topic selection, team formation, evidence retrieval, evidence grading, evidence-based standard development, implementation, and evaluation (Doody & Doody, 2011).

Framework for Stage Development Overview

The framework associated with stage development or phases was developed for DNP immersion projects at the graduate level (Grand Valley State University Kirkhof College of Nursing, 2013-2014). The phases include the development of an initiation stage and middle or implementation stage. The final stage involves the development of a final or expected outcome stage.

Theoretical Applications to Addressing Intervention Outcomes

The HBM suggests that if individuals become aware of a high probability of contracting a disease process, such as osteoporosis, they are more likely to take steps in

preventing the health problem (Janz & Becker, 1984; Rosenstock et al., 1988). This elevated perception of susceptibility may also be associated with increased osteoporosis knowledge levels (Nieto-Vazquez et al., 2009; Saw et al., 2003; Sedlak et al., 2007). Notably, Wallace (2002) identifies that perceived susceptibility is the leading predictor of exercise self-efficacy associated with weight-bearing exercise.

Next, according to the HBM, individuals who perceive osteoporosis to cause a significant level of severity are more likely to engage in disease prevention activities (Janz & Becker, 1984; Rosenstock et al., 1988). Therefore, individuals who consider osteoporosis to result in fractures, pain, and decreased quality of life may be more likely to participate in weight-bearing exercise. During an osteoporosis research study using the HBM, Hazavehei et al. (2007) concluded that statistically significant increases occurred for the experimental study participants in the areas of perceived susceptibility, perceived severity, and perceived benefits associated with decreasing the osteoporosis risk factors with health behavior changes, such as implementing an exercise program.

Furthermore, McGinley (2004) suggested that the HBM construct of perceived barriers offered a level of insight into intention regarding health issues and influences that impact the decision-making approach. The likelihood of a health action taking place was designated by the individual's decision to take an action minus the perceived barriers associated with the action (McGinley). According to McGinley, greater perceptions of barriers resulted in a decrease in health actions.

Summary

In summary, osteoporosis knowledge alone does not explain health behaviors due to personal beliefs and perceptions. The HBM suggests that health behavior is influenced

by perceived susceptibility, perceived seriousness regarding the disease process, and perceived benefits and barriers associated with engaging in actions of disease prevention (Janz & Becker, 1984; Rosenstock et al., 1988). If individuals increase their self-efficacy and identify the perceived benefits associated with exercise, as well as prevail over perceived barriers to exercise, they are more likely to become involved in health prevention behaviors associated with osteoporosis. This pilot study evaluated how osteoporosis knowledge, self-efficacy and health beliefs were related to exercise behavior as a result of the implementation of the educational and exercise intervention among perimenopausal women in the health club setting.

CHAPTER 4

PROJECT, PLAN, AND METHODS

The purpose of this chapter is to describe the project, plan, methods, and expected outcomes. The chapter describes the methodology utilized for the development of an evaluation approach to answer the question as to what effect the osteoporosis educational and exercise intervention had on osteoporosis knowledge, self-efficacy, and health beliefs among perimenopausal women. This chapter includes a discussion of pilot study design, investigator information, environmental setting, recruitment and eligibility, human subject considerations, informed consent process, and data comparison with identification of participants. Specifically, interventions, measurement instruments, data analysis plans, information storage and data management, budget, design stages, dissemination of results, and summary are included.

Pilot Study Design

The design of the pilot study involved a one-group, pre-experimental, pretest, posttest approach with use of an osteoporosis educational and exercise intervention among eight perimenopausal women at a community health club in western Michigan. Specifically, osteoporosis knowledge, self-efficacy, and health beliefs were evaluated pre- and post- osteoporosis educational and exercise intervention. Duration of the pilot study was four weeks and four sessions. The study was conducted from Monday, December 2, 2013 to Monday, December 23, 2013.

Participants completed surveys before the first program session and at the end of the program's last class session. They were asked to avoid placing their names, addresses, or other personal identification information on the surveys, but instead to place

identification numbers randomly assigned by the primary investigator on the pretest and posttest so that answers could be compared from before and after the research study. The anonymous pretest and posttest questionnaires were matched to each other for data comparisons though the above described process.

Investigator Information

Key research personnel and their affiliations included Joanne Finazzi MSN, RN and Doctor of Nursing Practice Student from Grand Valley State University and preceptor/mentor Angela Horjus BA and NASM Certified Personal Trainer and Fitness Counselor and Wellcoaches Health and Wellness Coach from EHAC. The faculty advisor was Cynthia Coviak, Ph.D., R.N., CNE, Professor and Associate Dean for Nursing Research and Faculty Development.

Setting

The setting for this project was East Hills Athletic Club in West Michigan. This athletic club was initiated in 1972, and the club was a member of Mercy Saint Mary's Health Care Network. Additionally, EHAC was part of a family of clubs including the Michigan Athletic Club (MAC), Orchard Hills, and Orchard Hills Pool. This facility offered 130,000 square feet for recreation. Membership packages were available for all age ranges and included Student, Single, Couple, Family, and Prime Plus Memberships. However, non-members were able to enjoy the club programs for a nominal fee.

The vision statement and core values of the athletic club included the desire to inspire healthy lifestyle through fitness, health education, relationship building, and service to the community. The areas of programming included group fitness centers, dance and spinning studios, gymnastics rooms, indoor pool area, tennis, aquatics,

basketball, volleyball, racquet sports, education rooms, and spa facilities. Services available involved personal training, wellness coaching, stress release therapy, therapeutic massage, and core conditioning along with exercise programs designed for cancer and diabetic patients. Therefore, the community health club setting offered a common setting for complete weight training, fitness instruction and group classes with qualified fitness and exercise experts. At the time of the intervention, an osteoporosis educational and exercise program was not available at EHAC.

Identification of Clinical Question

The initial step in the Iowa model directs health care providers to identify a specific topic or clinical question, through recognition of a clinical or health care dilemma (Doody & Doody, 2011). An educational and exercise intervention for osteoporosis prevention, the topic for this pilot study, was identified through discussion with EHAC management staff and health care members. Some health care members verbalized that their health club did not address the topic of education and exercise interventions to prevent osteoporosis, while others said that the exercises may be covered in group classes. However, the specific information and benefits of exercise for prevention of osteoporosis were not discussed. Management staff members indicated that they were trained in osteoporosis prevention exercises and educational interventions. However, an osteoporosis educational and exercise program was not available at the health club.

The Doctor of Nursing Practice (DNP) student or primary investigator assigned to EHAC had the opportunity to participate in management and administration meetings during a 10 month period. The purpose of these meetings was to provide educational

information and support regarding the institution of a bone health program. The DNP student also had the opportunity to work directly with health club members and assess their bone health needs. During one of the meetings, staff members indicated that health club members were requesting a bone health program to address educational and exercise concerns. Upon further questioning, the staff members indicated that physicians and members desired to have exercise and educational program at EHAC that addressed health promotion and disease prevention strategies. A bone health program was recommended.

Organizational Commitment

The second step associated with the Iowa model involves obtaining a commitment from the organization that a health care intervention is important to address (Doody & Doody, 2011). In this case, it was beneficial for EHAC and Mercy Health Saint Mary's to develop a bone health program. The DNP student met with the EHAC Director of Health Club Fitness and wellness coaches to discuss the osteoporosis educational and exercise pilot study. During these meetings, the DNP student obtained full support for the study and the proposed educational and exercise strategy. Additionally, health care members supported the pilot study focus and the educational and exercise approach.

Evidence Retrieval

The next step associated with the Iowa model involves retrieving evidence from pertinent research with an extensive literature search with the use of appropriate keywords (Krom, Batten & Bautista, 2010). In addition to the review for relevant research literature, the current exercise programs at EHAC were evaluated. Feedback was obtained from the management staff and fitness coaches in evaluating the design of

the osteoporosis educational and exercise intervention. The management staff agreed to allow an osteoporosis educational and exercise intervention with a focus on providing information regarding osteoporosis prevention, risk factors, and an exercise program. The exercise program would consist of core, balance, pulley system, and stability exercises along with weight bearing activities, such as walking, jogging, and propulsions.

Recruitment and Eligibility

This project was part of a course learning requirement involving methods for the collection and systematic analysis of information with results of the data designed to contribute to generalizable knowledge or research publication. A convenience sample of eight perimenopausal women were informed of the research study through the institution's electronic mail member list and by posting the research study flyer (see Appendix E) on club bulletin boards. Eligibility to participate in the research study included: (a) health club membership; (b) completion of the Osteoporosis Research Study Checklist; (c) Demographic Survey; (d) ability to speak English; and (e) perimenopausal status. Exclusion criteria included a known diagnosis of osteoporosis; osteopenia; chronic renal failure; diabetes mellitus; cancer; heart failure; pregnancy; hip flexor and joint flexor problems; and postmenopausal status. Participants were provided with informed consent (see Appendix F). For this pilot study, participation was voluntary and could be stopped or suspended at any time for any reason without any type of penalty. Compensation or incentives were not a benefit. Recipients were assured of confidentiality of their responses with the use of unmarked envelopes, if they chose to voluntarily participate in the pilot study. Additionally, fees associated with the classes were paid for by the primary investigator through a Sigma Theta Tau International Honor

Society Kappa Epsilon Chapter-at-Large research award. The fees consisted of $124.00 per participant for 4 sessions during a 4 week period.

Human Subject Considerations

The pilot study was approved by Mercy Health Saint Mary's Institutional Review Board at Mercy Health Saint Mary's Campus (see Appendix G) and the Human Research Review Committee at Grand Valley State University in Grand Rapids, Michigan (see Appendix H). The Human Research Review Committee amendment modification was approved (see Appendix I). An informed consent process was completed for the intervention with all participants.

Informed Consent Process

The informed consent process included having the primary investigator read the consent form to each participant in a private room at the health club. The primary investigator answered questions posed by each participant. The participants initialed each page of the consent form and voluntarily confirmed their willingness to participate in the research study after being informed of all aspects of the pilot study. The participants were provided with an opportunity to ask about the details of the pilot study and decide without pressure whether or not to participate in the study. A copy of the signed consent form was provided to each participant immediately after the informed consent process.

The informed consent forms were kept in the locked research room at Grand Valley State University in a file cabinet with only investigator access. Informed consent continued throughout the research study via a dialogue between the primary investigator and the participants. Participation in this project was entirely voluntary, and participants

were able to withdraw from the research study at any time. No participants withdrew from the project; however, all were assured that if they decided to discontinue participation in the pilot study, they would continue to be treated as they were usually treated as members of the health club. These assurances were verbally provided by the primary investigator to the participants during the informed consent process.

Identification and Data Comparison

Participants completed questionnaires at the first session and at the end of the program's last class session. The participants were randomly assigned individual study participation identification tracking numbers by the primary investigator prior to the pilot study. The participants were asked to use the numbers for identification on all pretest and posttest questionnaires and to avoid placing their names, addresses, or other personal identification information on the questionnaires. The pre- and post- survey answers were matched to each other for data comparisons through the above process. Missed questions or errors on the surveys were slated to be addressed by the primary investigator by assigning missing code values using 9.

Educational and Exercise Intervention

The osteoporosis educational and exercise interventions was a 4 week period of one-hour weekly classes involving 15 minutes of education and 45 minutes of exercise intervention under the direction of the primary investigator and mentor. The educational endeavors consisted of education in the following areas: osteoporosis definition; causes of osteoporosis; benefits of specific exercises; self-efficacy; health beliefs; health belief model; bone density improvement; and nutrition. The exercise interventions during the 4-week period consisted of cardiovascular exercises; resistance; flexibility; propulsions, resistance-strength; balance; circuit training; upper extremity exercises; lower extremity

exercises; antigravity exercises; and putting the routines together. In the activities completed for this pilot study, there was no more risk to the participants than in their regular exercise classes guided by their trainers. The minimal risks from participating in the prescribed exercises potentially included muscle soreness and stiffness for a day or two following the exercises. Increased hydration helped to minimize this risk. The primary investigator in the study assisted participants to perform the exercises correctly, but not beyond what they could do safely under the health club guidelines.

Measurement Instruments

During the past twenty years, professors at Grand Valley State University have developed instruments for use in osteoporosis research and scholarly projects. These instruments include the ROKT (Gendler et al., 2013), OHBS (Kim et al., 1991b), and OSES (Horan et al., 1998). These instruments meet criteria for reliability and validity.

Revised Osteoporosis Knowledge Test (ROKT)

The ROKT is a 32-item testing tool involving a multiple choice format for questions regarding osteoporosis knowledge (Gendler et al., 2013). Kuder-Richardson 20 (KR20) reliability coefficients for internal consistency involve a total scale: .85; nutrition subscale: .83; and exercise subscale: .81 (Gendler et al.). Test-retest analysis was completed with data from adults who completed forms 2 weeks apart. The validity associated with the original OKT is supported due to widespread utilization in various settings and cultures (Gendler et al.; Kim, Horan, & Gendler, 1991a). The Pearson product-moment correlation coefficient of .87 (Gendler et al.) was obtained indicating the stability of answers over time.

The ROKT addresses an individual's osteoporosis knowledge on several topics,

such as the relationship of exercise, calcium ingestion, and activity level to prevention of osteoporosis (Gendler et al., 2013). The ROKT has two subscales: ROKT Nutrition (items 1-11 and 18-32) and ROKT Exercise (items 1- 17 and 30-32) (Gendler et al.). These two subscales depict 14 common items (1-11 and 30-32) which involve Risk Factor Knowledge. The potential score range is 0 to 32.

Osteoporosis Health Belief Scale (OHBS)

The OHBS is a widely utilized standardized instrument to measure osteoporosis health beliefs (Kim et al., 1991b). The OHBS is a 42-item measurement instrument. Seven subscales are present within this test, and they involve "perceived susceptibility, perceived seriousness, benefits of exercise, benefits of calcium ingestion, exercise barriers, calcium barriers, and health motivation" (Kim et al., p. 155). Each statement of the scale is rated by respondents using a 5-point scale with 1 corresponding to *strongly disagree* to 5 indicating *strongly agree* (Kim et al.). The potential range of scores for each subscale is 6 to 30, with an associated possible range of 42 to 210 for the OHBS scale total score (Kim et al.). According to Kim et al., with initial testing, the OHB Calcium Scale demonstrated internal consistency of each calcium subscale with Cronbach's alpha reliability coefficients ranging from .61 for health motivation to .80 for susceptibility (Kim et al.). Internal consistency associated with the OHB Exercise Scale for each exercise subscale demonstrates Cronbach's alpha coefficients ranging from .61 for health motivation to .80 for susceptibility (Kim et al.).

Perceived susceptibility involves an individual's opinion from the population at risk regarding the chances of contracting a specific disease (Janz & Becker,1984;

Rosenstock et al., 1988), such as osteoporosis. The score attained on the OHBS susceptibility subscale (items l-6) evaluates perceived susceptibility to developing osteoporosis (Kim et al., 1991b). Perceived seriousness includes an individual's perspective of the severity of a disease condition and the personal outcome or potential consequences (Janz & Becker, 1984). The score on the OHBS associated with the seriousness subscale (items 7-12) evaluates the perceived seriousness of becoming ill with osteoporosis (Kim et al., 1991b).

Perceived benefits of exercise involve the individual's outlook on the effectiveness of the recommended action to decrease the risk or seriousness of the outcome (Janz & Becker, 1984), in this case the development of osteoporosis. The score attained on the OHBS the Benefits Exercise subscale (items 13-18) assesses perceived benefits of exercise for preventing the outcome of osteoporosis. Perceived benefits of calcium ingestion involve the individual's outlook on the efficacy of the recommended action to decrease the risk or seriousness of the outcome (Janz & Becker, 1984), the development of osteoporosis. The score on the OHBS achieved from the Benefits of Calcium subscale (items 19-24) evaluates perceived benefits of calcium intake for preventing the outcome of osteoporosis.

Perceived barriers to exercise involve the individual's outlook regarding the physical and psychological expense of the recommended action (Janz & Becker, 1984), in this case, exercise. The score on the OHBS obtained from the Barriers to Exercise subscale (items 25-30) evaluates barriers to performing exercise in the prevention of osteoporosis. Perceived barriers to calcium intake include the individual's outlook on the physical and psychological sacrifice of the recommended action (Janz & Becker, 1984),

which in this case is calcium intake. The score on the OHBS obtained on the Barriers Calcium subscale (items 31-36) evaluates barriers to calcium ingestion.

The final construct of the OHBS is health motivation. Health motivation includes the concern for general health and indicates several levels of readiness for involvement in general health behaviors (Becker, Stuifbergen, Oh, & Hall 1993). The score attained on the OHBS Health Motivation subscale (items 37-42) evaluates health motivation for osteoporosis prevention.

Osteoporosis Self-Efficacy Scale-12 (OSES-12)

The OSES-12 is a self-evaluation 12-item instrument (Horan et al., 1998). The OSES-12 is comprised of 6 exercise and 6 calcium items. For each, a 100 mm visual analogue scale is provided for responses. Respondents rate their confidence in their ability to increase or maintain calcium consumption and their exercise level by placing a vertical line at the point in the 100 mm line that corresponds to their confidence to perform the activity described in the item (0 indicates least confident; 100 indicates most confident) (Horan et al.). The potential score range for each item is 0 through 100, with a possible total score of 0 through 1200 (Horan et al.). The subscale reliability coefficients for internal consistency are .90 (Horan et al.). Construct validity was captured for the calcium subscales with factor loadings of .38 to .86 and for exercise subscale factors from .70 to .83 with the utilization of factor analysis and discriminant function analysis (Horan et al.).

Data Analysis

The Statistical Package for the Social Sciences, Version 20 (IBM Corporation, 2011) was used to analyze the study data. Demographic data were analyzed using descriptive statistics, such as frequencies and percentages. Additionally, the paired *t*-test

was used to identify differences between the pretest and posttest scores. The Pearson product-moment correlation coefficient was utilized to measure associations between variables. The desired significance level was .05. Research study results were available in March 2014 to the participants.

Data Management and Information Storage

The confidential survey data were stored according to Grand Valley State University security standards in an encrypted manner using a MXI Stealth Key M500 FIPS Encrypted USB/drive. During the data entry process dates at EHAC, the data and UBS mobile device were stored in a locked computer brief case and locked room at the athletic club. The encrypted drive was transported immediately after the EHAC sessions to the Kirkhof College of Nursing by the primary investigator. When the MXI Stealth Key M500 FIPS Encrypted UBS drive was transported between the health club and the university, a locked briefcase was used. The encrypted USB mobile device was stored at Kirkhof College of Nursing, Grand Valley State University, in the locked nursing research lab in a locked file cabinet. The informed consent forms for each participant were kept in the locked research lab at Grand Valley State University in this cabinet for a storage period of 3 years. Only the primary investigator had access to the identified data throughout these processes.

Budget

A grant award was available from Sigma Theta Tau International, Kappa Epsilon Chapter-at-Large for EHAC charges. The budget for the project consisted of $124.00 per participant for 4-sessions (total cost for eight participants $992.00). The EHAC facility charge included 42% of the total payment for use of the facility conference room and

exercise equipment. The facility staff support charge involved 58% of the total payment for the use of check-in clerical support and presence of exercise staff during the exercise portion of the program. Payment was provided directly to EHAC by personal check. This was the recommended EHAC charge for these services with the breakdown of the charges according to the payment structure at this club. The charge for Joanne Finazzi, primary investigator, was waived. However, the primary investigator spent 10 hours per week for 4 weeks in implementing the research study, for a total cost of $32.00 per hour and total cost of $1,280 in waived fees. Cost for paper to print research tools and flyers was $25.00. The MXI Stealth Key M500 FIPS Encrypted USB cost was $189.00

Initial (Design Stage)

Specific phases of the DNP practice immersion process were incorporated into the design of this pilot study (Grand Valley State University Kirkhof College of Nursing, 2013-2014). Two phases were involved in the initial phase or design stage (D) which occurred during Winter Term 2013, January through April. Phase D1 involved the initial investigation of collaborative efforts between EHAC and GVSU, Kirkhof College of Nursing (KCON). After dialogue between the Doctor of Nursing Practice student and EHAC management staff members, it was determined that perimenopausal women members at EHAC would benefit from a collaborative effort with KCON for the purpose of providing an osteoporosis educational and exercise intervention among perimenopausal women. A prospectus was submitted to the EHAC personal fitness leader and KCON faculty members highlighting the primary rationale for the intervention, study design, measurement instruments, and nursing/healthcare implications. The prospectus allowed for leadership members to view the process and

outcomes and to confirm all parties were aware of the process and shared the same vision for the pilot study.

Phase D2 was directed by the understanding that any implementation study required evidence-based knowledge and a theoretical framework to establish a context for application of the intervention. According to Polit and Beck (2008), the conceptual framework allows for a perspective regarding context, assumptions, and relationships. Therefore, a comprehensive literature review was completed to explore conceptual frameworks and models for use with osteoporosis interventions along with research studies to evaluate the use of interventions with osteoporosis knowledge and exercise regimens among women. As a result of the review, the HBM was identified as the appropriate theoretical framework to utilize with the pilot study.

Middle (Implementation Stage)

The middle phase involved the Implementation Stage (I) of the proposed process. The timeline for implementation was December 2, 2013 through December 23, 2013 after approval by the Institutional Review Board at Mercy Health Saint Mary's and the Human Research Review Committee at Grand Valley State University in Grand Rapids, Michigan. I1 Stage was the period of time in which the one-hour osteoporosis educational and exercise intervention was implemented at EHAC with eight perimenopausal women. Fifteen minutes of the program were devoted to an educational presentation, and the last 45-minutes were used for the exercise interventions.

According to A. Horjus (personal communication, January 3, 2013), the exercise intervention classes at East Hills were usually 4-week programs. A 4-week timeframe

was found to be effective for osteoporosis educational and exercise interventions among prior research studies (Bohaty et al., 2008; Huang et al., 2011; Shirazi et al., 2007). Stage I1 also included the beginning of the Fall Term 2013, which was the first clinical immersion semester for the GVSU Doctor of Nursing Practice Student. As previously indicated from the beginning of Winter Term 2013, the DNP student (primary investigator) had been working with the health club staff members to plan the implementation process. During the implementation process and immersion experience, the DNP primary investigator was placed in the health club center to allow the process to be completed within the organizational environment.

Prior to entering the osteoporosis educational and exercise intervention at EHAC, participants signed a written consent form. Then, during the first session, the participants completed the pretest. The pretest included the Osteoporosis Research Study Checklist, ROKT, OHBS, and OSES.

The educational intervention was focused on a different topic every week to correspond with the specific exercise intervention. Table 1 provides a detailed review of the osteoporosis educational and exercise interventions implemented in the study.

Table 1

Osteoporosis Intervention

Session Number	Educational Topic(s)	Exercises
1	Osteoporosis: Definition; Disease process; Impact on women; Health Belief Model; Posture core exercise benefits; Balance exercise importance; Goals of exercise for osteoporosis; and Self-efficacy	Practice in: Warm-up exercises Posture core exercises Safe movement Stability exercise
2	Osteoporosis: Risk factors; Benefits of weight bearing exercises; Benefits strength training upper extremities; Benefits of strength training; Health belief concepts; and Importance of sleep and nutrition	Practice in: Warm-up exercises; Resistance exercises; Flexibility exercises; Strength training upper extremities; Walking; Jogging; and Propulsions
3	Osteoporosis: Benefits strength training lower extremities; Benefits of impact exercises; and Review causes of osteoporosis	Practice in: Warm-up exercises; Strength training lower extremities; Pulley systems for exercise; and High loads and low repetition exercise associated with resistance exercises
4	Osteoporosis: Interventions to prevent osteoporosis – as lifelong process; and Importance of incorporating exercise modalities into daily events	Practice in: Putting it all together with all exercise modalities presented in sessions 1 through 3

Final (Expected Outcome Stage)

During the final phase or Expected Outcome Stage (E) of the intervention, three sub-stages were emphasized. The period from December 2, 2013 through December 23,

2013 was stage E1. This stage involved the posttest assessment for the participants in the intervention. This was accomplished by using the ROKT, OHBS, and OSES instruments to evaluate the educational interventions. Stage E2 involved the development of the ongoing implementation plan that suggested the manner in which to sustain the proposed osteoporosis educational and exercise intervention. The implementation plan included the business plan, executive summary with associated goals, and financial plan. Additionally, the executive summary included the proposed intervention service, management requirements, information technology needs, and possible partnerships with associated health clubs in the Saint Mary's Health Care Network and the PREP 90 endeavors. PREP 90 is a program developed to allow health care providers the ability to access the west Michigan health club environments for their patients. Health care providers are allowed to write prescriptions for patients to be assigned to a specific health club program with personal wellness trainers for a specific medical purpose over a 90 day period for 90 dollars.

Phase E3 involved the utilization of the evaluation plan. This included the review of posttest evaluations for the interventions. Additionally, the evaluation plan also included a process to evaluate how the new intervention was measured regarding participant outcomes and business financial outcomes. These included benchmarks that must be achieved for the intervention to be considered successful, profitable, and sustainable.

Dissemination of Results and Publication Policy

Research study results were available to participants at private meetings with the primary investigator in March 2014 at Kirkhof College of Nursing. The plan for

reporting out or disseminating pilot study results took place in the context of the dissertation presentation in March 2014 at Kirkhof College of Nursing, Grand Valley State University. Additionally, the pilot study and its results were reported in the Doctor of Nursing Practice dissertation completed by Joanne Finazzi, MSN, RN, Doctor of Nursing Practice Student. The document will be stored on the GVSU library electronic archive, called ScholarWorks.

Summary

The pilot study employed a convenience sample of perimenopausal women in a community health club setting in one western Michigan, suburban community. The design of the research study involved a one-group, pre-experimental, pretest, posttest approach with use of an osteoporosis educational and exercise intervention that occurred in four weekly sessions. Specifically, osteoporosis knowledge, self-efficacy, and health beliefs were evaluated pre and post intervention with the ROKT, OSES-12, and OHBS.

CHAPTER 5

RESULTS

The results of the pilot study, as reported in this chapter, reflect responses from participants to the pretest Osteoporosis Research Study Checklist, and pretest posttest OKT, OHBS, and OSES questionnaires. Specifically, this chapter supports the impact of osteoporosis educational and exercise interventions among perimenopausal women associated with osteoporosis knowledge, self-efficacy, and health beliefs. For this research study, the Iowa Model served as a framework to articulate knowledge translation at the organizational change and health care system level. The HBM served to examine how the osteoporosis educational and exercise interventions affected osteoporosis knowledge, self-efficacy, and health beliefs.

Iowa Model Framework

The Iowa Model is a multifaceted conceptual framework that depicts seven steps to develop and evaluate clinical practice changes based on current evidence (Bergstrom, 2011; Doody & Doody, 2011). The Iowa model directs this process from the perspective of the health system at the organizational change level (Bergstrom). The seven steps include: topic selection, team formation, evidence search, evidence grading, evidence-based practice information, implementation, and evaluation (Doody & Doody).

Topic Selection

Several aspects must be appraised in topic selection. Key factors include the presence of a significant problem and addressing the magnitude of the problem (Doody & Doody, 2011). Next, resolution of the problem should lead to an improvement in health care (Doody & Doody). Finally, the problem should involve a multifaceted issue

(Doody & Doody).

In this case, three primary wellness coaches with personal training in bone health and osteoporosis prevention were employed at EHAC. Without a formal bone health program present at this health club, the coaches were unable to utilize their formal training to develop and administer an osteoporosis prevention and bone health endeavor. Health club members frequently requested the presence of a bone health program. However, staff and health club members were unable to secure the placement of this type of program within the monthly activity program guide.

Team Formation

The makeup of the team should be guided by the topic and involve multidisciplinary team members who are interested in the topic (Doody & Doody, 2011). In this pilot study, the class schedule activity guide was directed by Ms. Kristi Tuck, EHAC Fitness Director. Therefore, Ms. Tuck provided scheduling direction for the osteoporosis educational and exercise class interventions. Flyers and advertisements were developed by Mr. Jack Eichner and distributed by EHAC staff members. Staff members were instrumental in advertising this new program and encouraging the enrollment of participants. Ms. Angela Horjus, wellness coach and personal trainer, assisted with the development of the osteoporosis exercise interventions. The primary investigator, a Grand Valley State University Doctor of Nursing Practice graduate student, along with the wellness coach and mentor, developed and taught the osteoporosis educational and exercise components of the intervention. A strong team formation approach occurred in this pilot study.

Evidence Search

According to Doody and Doody (2011), a literature search should be completed to identify relevant sources and key words to direct the evidence search. In this pilot study, the primary investigator conducted an extensive literature search with the use of appropriate keywords and an appropriate date range. The researcher used the selection protocol associated with the Cochrane Collaboration literature search approach. The primary investigator utilized data bases including CINAHL, PsycINFO, Cochrane Library, and British Nursing Index. Additionally, PubMed was used to search the MEDLINE database. The current Grey Literature Report was searched for relevant theoretical and empirical literature along with sites associated with the National Osteoporosis Foundation; U.S. Department of Health and Human Services; Health Resources and Services Administration; and Bone Health and Osteoporosis. During the integrative literature review process, six bibliographic database searches, plus citations identified through the web-based sources, *Dissertation Abstracts International*, and grey literature yielded a total of 54 articles. As a result of the evidence search, 20 studies were selected for the final literature review.

Evidence Grading

According to Doody and Doody (2011), the evidence obtained from the literature search should be graded according to specific criteria. The areas for grading literature include effectiveness, meaningfulness, appropriateness, and feasibility (Doody & Doody; Joanna Briggs Institute, 2013). Recommendations involve grading literature as A, B, or C that designates (A) as strong support of the literature and intervention; (B) as moderate support for attention to the literature and interventions; and (C) as no support for the

literature and intervention. Evidence grading criteria were considered in the evidence search process.

Evidence-Based Practice Information

After an evaluation of the literature, the primary investigator and team members should develop recommendation for the proposed intervention to address the problem (Doody & Doody, 2011). It was determined that the literature suggested osteoporosis educational and exercise programs in the community health club setting were successful in increasing self-efficacy, osteoporosis knowledge, and improving health beliefs among health club participants. Thereby, it was recommended that EHAC implement an osteoporosis educational and exercise intervention series for perimenopausal women who met the inclusion and exclusion criteria. This change addressed the current gap in bone health coverage for programs at East Hills Athletic Club. Therefore, an innovative program to prevent osteoporosis and improve bone health was placed in the EHAC activity roster.

Implementation

The osteoporosis educational and exercise intervention was trialed in this pilot program at EHAC as a scholarly Doctor of Nursing Practice project through GVSU. The pilot study was conducted at this community health club in west Michigan from Monday, December 2, 2013 to Monday, December 23, 2013. Therefore, the organizational culture at EHAC experienced a readiness for change with the implementation of this intervention. The organizational change primarily affected Angela Horjus, wellness coach and personal trainer. The change allowed for an increase in her exercise class program schedule and a monthly payment benefit increase due to the addition of exercise

participants. It was expected that the osteoporosis program could be assumed by future graduate students or the addition of a Doctor of Nursing Practice position at the health club. However, as will be discussed, the sale of the facility changed these expectations.

Evaluation

Outcomes are evaluated according to system factors, such as services or interventions for specific population groups in the community (Doody & Doody, 2011). For example, the Vice President of Organization and Talent Effectiveness at Mercy Health Saint Mary's was interested in the cost and outcomes associated with the implementation of the osteoporosis educational and exercise intervention. Healthcare organizations are in the tight grip of change with associated needs in developing adaptive and operational capacity-building plans (Venture Philanthropy Partners, 2001). Especially, healthcare organizations with investments in community health clubs are experiencing increased pressure by health care providers and health club members for changes in exercise and educational program development. In particular, with the new PREP-90 program at EHAC, health care providers wanted to refer their patients/health club members through the PREP-90 and basic membership format for educational and exercise interventions in bone health and osteoporosis prevention. In order to meet the standards associated with capacity for change, leadership staff members in these healthcare organizations must strategically plan for new program develop and assess gaps in the existing program structure. In keeping with the Mercy Health mission, the community is better served with these changes.

In this case, the evaluation included a cost benefit analysis to evaluate the program as a solution to meet the healthcare organizational need for a bone health

educational and exercise practice offering at EHAC. The cost analysis (see Table 2) was based on the current payment structure for exercise and educational endeavors at EHAC. Therefore, with the addition of a bone health program, a net benefit was realized with each class session. Additional employees were not necessary because the primary trainer was adding a new class to her basic schedule. The current educator and primary investigator was a Doctor of Nursing Practice Student at Grand Valley State University. However, for future classes an advanced practice registered nurse could assume the educator role in this setting.

Table 2

Cost Analysis

Total Costs	
Payment to Trainer and for facility charges associated with cleaning, facility upkeep, and administrative staff for registration and publicity (58%)	**$575.36 Total Costs**
Benefits	
8 Participants in Class for 4 Sessions	**$992.00 Total Benefits**
Total Benefits	**$992.22**
Total Costs	**- $575.36**
Net Benefit – Return on Investment	**$416.64**

Unfortunately, Mercy Health Saint Mary's Health Care decided to no longer operate EHAC. This decision was made based on major financial challenges faced by this health care organization. On November 11, 2013, real estate developers and a local partner purchased EHAC and local health clubs. Then, the owner of MVP, a national health club, purchased EHAC and Orchard Hills At this time, it was unsure what the future plans were for EHAC. Therefore, as of January 5, 2014, EHAC was permanently closed.

Health Belief Model Framework

The HBM was used as the primary conceptual framework for this pilot study. This prevention model was designed to explain why some perimenopausal women were motivated to change lifestyle and behaviors while some others were not motivated to engage in lifestyle or behavior change. The HBM was effective in evaluating how the intervention of osteoporosis education and exercise interventions affected osteoporosis knowledge, self-efficacy, health beliefs, and lifestyle change outcomes. The HBM core constructs addressed in this pilot study included perceived susceptibility, perceived severity, perceived benefits and barriers to exercise, perceived benefits of and barriers to calcium ingestion, cues to action, and self-efficacy (Janz & Becker, 1984; Rosenstock et al., 1988).

Data Analysis

Quantitative data analyses were conducted utilizing SPSS, Version 20 (IBM Solutions, 2012). Descriptive statistics (frequencies and percentages) were used to compare the demographic variables from the Osteoporosis Research Study Checklist. The paired *t*-test was utilized to compare the pretest and posttest data for this single group, pre-experimental pilot study. Additionally, Pearson's product moment coefficient correlation was conducted to assess relationships among variables. The desired significance level was .05.

Sample Size

A total of eight perimenopausal women were recruited at EHAC, and they completed the osteoporosis educational and exercise intervention during a four week, four-session experience. All eight perimenopausal participants completed the pretest

ROKT, OHBS, and OSES-12 at the initial class session and posttest ROKT, OHBS, and OSES-12 at the last class session. There was no missing information in pretest and posttest questionnaires.

Demographics

Overall, 100% (N = 8) of the participants were perimenopausal and Caucasian. Participants were between the ages of 39 and 50 years of age (see Table 3).

Table 3

Demographic Characteristics Participants

Variable	**Frequency**	**%**
Race		
White	8	100
Marital Status		
Married	7	87.5
Separated/Divorced	1	12.5
Educational Status in Years		
16 years	5	62.5
17 years	1	12.5
18 years	2	25.0
Age in Years		
39 - 41 years	1	12.5
42 - 44 years	1	12.5
45 - 47 years	3	37.5
48 - 50 years	3	37.5

Note: N = 8

Revised Osteoporosis Knowledge Test

The first pilot study question was addressed with the ROKT. It was hypothesized that osteoporosis knowledge level increased with exposure to an osteoporosis educational

and exercise intervention among perimenopausal women. The paired *t*-test was performed to identify if this intervention impacted participants' osteoporosis knowledge level. Table 4 depicts the pretest and posttest scores for osteoporosis knowledge regarding nutrition intake and exercise. The results suggested that the osteoporosis educational intervention and exercise practice increased osteoporosis knowledge level among perimenopausal women.

Table 4

ROKT Scores

Pretest	Mean % Correct	SD			
Risk Factors	32.14	3.251			
Nutrition	41.83	5.731			
Exercise	38.13	4.173			
Total Score	42.97	6.777			
Posttest	Mean % Correct	SD	*p*	*t*	*df*
Risk Factors	92.86	1.309	< .001***	-6.121	7
Nutrition	91.83	1.458	< .001***	-5.673	7
Exercise	91.88	2.066	< .000***	-5.506	7
Total Score	91.80	1.808	< .001***	-5.499	7

Note: N = 8; significant at the * < .05 level; ** $p < .01$; *** $p < .001$

Osteoporosis Self-Efficacy Scale-12

The second pilot question was addressed with the OSES-12. It was hypothesized that self-efficacy increased with exposure to an osteoporosis educational and exercise intervention among perimenopausal women. The paired *t*-test was conducted to identify if this intervention impacted participants' self-efficacy (see Table 5). The results suggested that the osteoporosis educational and exercise intervention increased exercise and calcium intake self-efficacy among perimenopausal women.

Table 5

OSES - 12 Scores

Pretest	Mean	SD			
Exercise OSES	354.25	198.658			
Calcium OSES	341.25	188.488			
Total OSES	695.50	382.673			
Posttest	Mean	SD	*p*	*t*	*df*
Exercise OSES	537.63	46.785	.014*	-3.232	7
Calcium OSES	541.50	40.764	.009*	-3.590	7
Total OSES	1079.13	85.178	.011*	-3.455	7
Note: N = 8; alpha established for significance .05					

Osteoporosis Health Belief Scale

The third pilot study question was addressed with the OHBS. Research study participants were directed to complete the OHBS and appraise their osteoporosis health beliefs. It was hypothesized that a change in health beliefs occurred with exposure to an osteoporosis educational and exercise intervention among perimenopausal women. The paired *t*-test was conducted to identify if this intervention impacted participants' health beliefs. Table 6 depicts the pretest and posttest scores for health beliefs towards susceptibility, seriousness, benefits of exercise, benefits of calcium intake, barriers exercise, barriers to calcium intake, and health motivation. The intervention elicited a self-reported health belief changes in susceptibility, benefits of exercise, benefits of calcium intake, barriers of exercise, health motivation, and total score. The results suggested that the osteoporosis educational and exercise intervention changed and improved osteoporosis health beliefs in these areas among perimenopausal women.

However, the intervention did not elicit health belief changes in seriousness and barriers in calcium intake.

Table 6

OHBS Scores

Pretest	Mean	*SD*			
Susceptibility	17.14	4.224			
Seriousness	19.38	3.777			
Benefits Exercise	23.13	4.970			
Barriers Exercise	15.25	6.319			
Benefits Calcium Intake	19.38	3.852			
Barriers Calcium Intake	15.50	6.782			
Health Motivation	22.63	4.749			
Total Score	131.63	8.959			
Posttest	Mean	*SD*	*p*	*t*	*df*
Susceptibility	24.25	5.036	.040*	-2.522	7
Seriousness	24.25	4.950	.119	-1.778	7
Benefits Exercise	29.25	.880	.013*	-3.318	7
Barriers Exercise	10.75	3.694	.027*	-5.042	7
Benefits Calcium Intake	28.00	2.000	.001*	2.787	7
Barriers Calcium Intake	10.00	2.390	.058	2.259	7
Health Motivation	26.38	2.875	.028*	-2.758	7
Total Score	152.75	13.874	.023*	-2.908	7

Note: N = 8; alpha established for significance at .05

Correlations

Although the research questions were not associated with assessing relationships among variables, the primary investigator decided to evaluate these relationships for potential use with future studies. Table 7 depicts the pretest correlation relationships

between health beliefs and self-efficacy. Specifically, there were very strong positive correlations between osteoporosis health beliefs in susceptibility and osteoporosis calcium self-efficacy. Additionally, there were very strong positive correlations among osteoporosis health beliefs in benefits of exercise and osteoporosis exercise and calcium self-efficacy; and osteoporosis health beliefs in health motivation and osteoporosis exercise and calcium self-efficacy. There were very strong negative correlations among health beliefs in barriers of exercise and osteoporosis exercise and calcium self-efficacy. There were very strong negative correlations among health beliefs in barriers of calcium intake and osteoporosis exercise and calcium self-efficacy. There were strong positive correlations among osteoporosis health beliefs in susceptibility and osteoporosis exercise self-efficacy and osteoporosis health beliefs in seriousness and osteoporosis exercise and calcium self-efficacy. Finally, there were strong positive correlations between osteoporosis health belief total score and osteoporosis self-efficacy total score.

Table 7

Correlations Between OHBS and OSES-12 at Pretest

	OSES-12 Exercise	OSES-12 Calcium	Total
OSES-12 Pretest OHBS Subscales	*r*	*r*	*r*
Susceptibility	.687	.892*	.765*
Seriousness	.671	.468	.579
Benefits-Exercise	.923**	.963**	.954**
Benefits-Calcium	.947**	.919**	.944**
Barriers-Exercise	-.765*	-.894**	-.837**
Barriers-Calcium	-.744*	-.897**	-.828*
Health Motivation	.809*	.923**	.875**
Total Score	.747*	.609	.688

Note: N = 8; significant at the * $p < .05$; ** $p < .01$; *** $p < .001$

Table 8 depicts posttest correlation relationships between health beliefs and self-efficacy. Notably, there were very strong positive correlations among osteoporosis health beliefs in benefits of exercise and osteoporosis exercise and calcium self-efficacy. There were strong negative correlations among osteoporosis health beliefs in seriousness and osteoporosis exercise and calcium self-efficacy; very strong osteoporosis health beliefs in barriers of exercise and osteoporosis exercise and calcium self-efficacy; and moderate to strong osteoporosis health beliefs total score and osteoporosis self-efficacy total score. Next, there were strong negative correlations among osteoporosis health beliefs in susceptibility and osteoporosis exercise and calcium self-efficacy and osteoporosis health beliefs in barriers in calcium intake and osteoporosis exercise and calcium self-efficacy. Furthermore, there were moderate negative correlations between osteoporosis health

beliefs in health motivation and osteoporosis calcium intake self-efficacy. Finally, there were weak negative correlations among osteoporosis health beliefs in benefits of calcium and osteoporosis exercise and calcium self-efficacy and osteoporosis health beliefs in health motivation and osteoporosis exercise self-efficacy.

Table 8

Correlations Between OHBS and OSES-12 at Posttest

OSES-12 Posttest OHBS Subscales	OSES-12 Exercise *r*	OSES-12 Calcium *r*	Total *r*
Susceptibility	-.597	-.493	-.564
Seriousness	-.626	-.568	-.614
Benefits-Exercise	.998***	.852***	.928***
Benefits-Calcium	-.215	-.180	-.205
Barriers-Exercise	-.938**	-.860**	-.927**
Barriers-Calcium	-.483	-.406	-.460
Health Motivation	-.241	-.352	-.301
Total Score	-.730*	-.611	-.693

Note: N = 8; significant at the * $p < .05$; ** $p < .01$; *** $p < .001$

Table 9 depicts pretest correlation relationships between osteoporosis knowledge and self-efficacy. Particularly, there were very strong positive correlations among osteoporosis knowledge in exercise, calcium intake, and risk factors and osteoporosis exercise and calcium self-efficacy. In fact, there were very strong positive correlations between total osteoporosis knowledge and total self-efficacy scores.

Table 9

Correlation Between ROKT Subscales and OSES-12 Pretest

OSES-12 Pretest OKT Subscales	OSES-12 Exercise *r*	OSES-12 Calcium *r*	Total *r*
Exercise	.952**	.924**	.950**
Calcium	.865**	.835**	.950**
Risk	.826*	.826*	.796*
Total	.921**	.917**	.930**

Note: N = 8; significant at the * $p < .05$; ** $p < .01$; *** $p < .001$

Summary

Research study results from eight participants were presented. The perimenopausal women were Caucasian and aged 39 to 50 years. Years of education ranged from 16 years to 18 years. The majority of participants were married, over 86%.

When total scores were aggregated, the percentage of correct answers on the ROKT averaged 42.97% at pretest and 91.80% at posttest after exposure to the osteoporosis educational and exercise interventions. The most improved subscale ROKT scores occurred with the risk factor items. Pretest scores averaged 32.14%, and posttest scores averaged 92.86%. Actually, significant improvement occurred among participants in all items of the ROKT. The results suggested that an osteoporosis educational intervention and exercise practice increased osteoporosis knowledge among perimenopausal women in the health club setting.

Statistically significant improvements occurred among participants in OSES calcium intake and OSES exercise scores. These results suggested that the osteoporosis

educational and exercise intervention increased exercise and calcium intake self-efficacy among perimenopausal women in the health club setting.

Health beliefs among participants positively and significantly changed in several areas. These areas included susceptibility, benefits of exercise, benefits of calcium intake, barriers of exercise, health motivation, and total score. The results suggested a statistically significant change and improvement in health beliefs among perimenopausal women in these areas occurred after exposure to the osteoporosis educational intervention and exercise practice in the health club setting.

Posttest correlations were assessed among health beliefs and self-efficacy. Particularly, very strong positive correlations existed among osteoporosis health beliefs in benefits, osteoporosis exercise self-efficacy, and osteoporosis calcium self-efficacy. Additionally, very strong negative correlations were found among osteoporosis health beliefs in barriers to exercise and osteoporosis exercise and calcium self-efficacy. The health beliefs total score and osteoporosis self-efficacy total score did not exhibit a significant correlation.

CHAPTER 6

DISCUSSION

The purpose of this chapter is to discuss the community health club setting in which the pilot study was conducted as it relates to an osteoporosis educational and exercise intervention and the engagement of the interprofessional team. The osteoporosis questionnaire outcomes are discussed. Next, strengths and limitations of the research study are presented. In addition, implications for nursing practice are highlighted. Furthermore, this chapter includes a discussion of the implications for future research. Specifically, this final chapter emphasizes the development of a bone health program as part of a larger community project emphasizing the role of the DNP-prepared clinical community leader. Lastly, the sustainability of a bone health program in the community health club setting, and a conclusion are presented.

Health Club Environment and Interprofessional Team

During the pilot study, EHAC was sold to the MVP Sports Clubs LLC, an Orlando-based health club owned by Richard DeVos' RDV Corporation. Prior to this sale, EHAC since 1972 was part of a not-for-profit west Michigan health care system, Mercy Saint Mary's Health Care Network. Additionally, EHAC was part of a family of clubs that included the MAC, Orchard Hills, and Orchard Hills Pool. As of January 5, 2014, EHAC was closed, and the future of the club remained uncertain. The MAC was closed and rezoned to accommodate retail use on the existing site. Orchard Hills and Orchard Hills Pool Health Club were to remain open. However, expansion plans for this facility were proposed to take place during a 2-year period to accommodate displaced health club members and interprofessional health club team personnel.

Although plans were being made to expand the Orchard Hills and Orchard Hills Pool Health Club over a 2-year period, a significant loss of community health club space in west Michigan was realized with the closing of EHAC and the MAC. Over 300 interprofessional health club employees were expected to lose their jobs. As a result of these community health club center losses, over 5,000 members from two primary community health clubs were expected to lose their community center for health promotion and preventive activities, such as group fitness programs, dance and spinning classes, gymnastics, indoor swimming, tennis, aquatics, basketball, volleyball, racquet sports, and spa treatments. Additional services no longer available involved personal training, wellness coaching, the Cancer Wellfit exercise program, a Diabetes Wellness educational and exercise program, stress release therapy, therapeutic massage, weight training, core conditioning, and the future bone health program.

Osteoporosis Questionnaire Outcomes

As stated in previous chapters, eight perimenopausal women participated in the osteoporosis educational and exercise intervention at EHAC during a 4-session, 4-week period. Even though during the pilot study the health club was in the midst of a transitional stage of transfer to a new owner and closure, eight of the pretest posttest questionnaires were completed with an overall participation and attendance rate of 100%. All questions associated with the ROKT, OSES-12, and OHBS were answered, and no missing data were present.

Revised Osteoporosis Knowledge Test

As expected, the ROKT findings pointed to a statistically significant increase in osteoporosis knowledge with exposure to the osteoporosis educational and exercise

intervention. At pretest the average percentage of ROKT items answered correctly was 43%. The posttest average was 91%. Therefore, research findings supported the hypothesis that osteoporosis knowledge level would increase with exposure to an osteoporosis educational and exercise intervention among perimenopausal women in the community health club setting. This finding supported the dissemination of osteoporosis information through an educational and exercise program, especially within this susceptible population.

Osteoporosis Self-Efficacy Scale-12

The OSES-12 provided a way to quantitatively address the confidence among perimenopausal participants for osteoporosis preventive behaviors regarding physical exercise and calcium intake. Increases in OSES-12 scores supported effectiveness of the osteoporosis educational and exercise intervention in improving the self-efficacy or confidence levels among participants for ingesting calcium and engaging in exercise. Therefore, the hypothesis was supported that stated self-efficacy would increase with exposure to the osteoporosis educational and exercise intervention among perimenopausal women in the community health club setting.

Osteoporosis Health Belief Scale

Osteoporosis health beliefs were evaluated pretest and after the osteoporosis educational and exercise intervention. Health belief scores improved in the osteoporosis areas of susceptibility, benefits of exercise, benefits of calcium intake, health motivation, and barriers of exercise. The hypothesis was supported that stated that osteoporosis health beliefs would improve with exposure to an osteoporosis educational and exercise intervention among perimenopausal women in the community health club

setting.

Surprisingly, changes in health beliefs were not evident in the areas of seriousness of osteoporosis and barriers to calcium intake. Therefore, research findings did not support the hypothesis that an improvement in health beliefs would occur for seriousness of osteoporosis, and barriers for calcium intake following an osteoporosis educational and exercise intervention in these perimenopausal women. These findings suggested that the women did not believe that osteoporosis resulted in negative consequences. Also, they did not perceive they encountered barriers for calcium intake. Even though the group mean scores increased posttest regarding seriousness of osteoporosis and barriers to calcium intake, the results were not statistically significant. These scores suggested that osteoporosis educational and exercise programs were required for perimenopausal women.

Correlations

Even though the research questions were not associated with examining relationships among variables, the primary investigator decided to evaluate these relationships for the development of future osteoporosis studies. The correlations supported that relationships were present among several variables. Notably, relationships were examined pretest and posttest between health beliefs and self-efficacy and pretest between osteoporosis knowledge and self-efficacy. It was suggested when osteoporosis health beliefs were improved in the area of susceptibility that calcium self-efficacy was high. The pilot study results suggested when osteoporosis health beliefs in benefits of exercise were improved that exercise self-efficacy and calcium self-efficacy were high. Additionally, the study supported when osteoporosis knowledge regarding exercise,

calcium intake, and risk factors was increased that osteoporosis exercise and calcium self-efficacy were high.

Notably, there were very strong positive correlations at the pretest between osteoporosis health beliefs in susceptibility and osteoporosis calcium self-efficacy; very strong positive correlations among osteoporosis health beliefs in benefits of exercise and osteoporosis exercise and calcium self-efficacy; and osteoporosis health beliefs in health motivation and osteoporosis exercise and calcium self-efficacy. In addition, at the posttest very strong positive correlations among osteoporosis health beliefs in benefits of exercise and osteoporosis exercise and calcium self-efficacy were found. Furthermore, there were very strong positive correlations among osteoporosis knowledge regarding exercise, calcium intake, and risk factors and osteoporosis exercise and calcium self-efficacy.

Strengths

Several strengths were present with the pilot study. First, the study involved a theory-driven intervention. According to Moran, Burson, and Conrad (2014), the intervention in scholarly projects or studies is directed by the theoretical framework. The HBM and Iowa Model were used as the theoretical frameworks in this pilot study. The HBM provided a beneficial framework for evaluating the effectiveness of osteoporosis educational interventions and health prevention approaches (Janz & Becker, 1984), especially during the perimenopausal timeframe. The study also involved an opportunity for interdisciplinary collaboration in the community health setting. Furthermore, the pre-experimental study demonstrated that perimenopausal health club members were motivated to engage in an educational and exercise intervention, thereby increasing their

osteoporosis knowledge, self-efficacy, and improving most areas associated with osteoporosis health beliefs. Finally, the study was funded by a research grant award, thereby, validating the importance of osteoporosis pilot and research studies.

Limitations

This pilot study had limitations that need to be addressed when interpreting the results. First, the study used a pre-experimental pretest posttest design, without a comparison or control group. This type of research design is not as powerful as a randomized experimental research study, the gold standard, in showing relationships between the educational and exercise intervention and the results or outcomes (Polit & Beck, 2008). However, the use of an initial pre-experimental pilot study was important in highlighting the need for future osteoporosis research studies.

Next, a small sample size (N = 8) was used in the research study. In addition, the small convenience sample was comprised of perimenopausal women from one location in a midwestern and upper-middle class suburban site. The participants were Caucasian, and college educated perimenopausal women. This was a homogenous population, but they still had poor pretest osteoporosis knowledge. This particular setting was considered to reflect a location with a predominate focus on conservative Judeo-Christian heritage and values (Groenboom, 2013). Therefore, the results of the study were not generalizable to all perimenopausal women.

Finally, the self-report approach in obtaining the data through the ROKT, OSES, and OHBS questionnaires also posed possible problems regarding accuracy of the data. According to Polit and Beck (2008), self-report questionnaires are subject to potential

risk among participants, such as response bias. However, knowledge scores are more likely to represent participant knowledge of osteoporosis.

Implications for Future Research

The current pilot study utilized a small, homogeneous, convenience sample of perimenopausal women within a community health club environment. Further research recommendations include incorporating a larger sample size. According to Polit and Beck (2008), larger samples sizes are more apt to represent the desired research population. Therefore, the outcomes are more accurate (Polit & Beck). However, it is important for advanced practice registered nurses (APRNs) to translate external evidence into clinical practice for improving care, quality, and outcomes (Melnyk, 2013).

Additionally, future research studies should also concentrate on younger participants, namely college age students or adolescents, to improve their osteoporosis knowledge level, self-efficacy, and to change health beliefs. This may be beneficial because adolescence involves a crucial period for bone growth and development, as over 50% of peak bone mass is accrued during adolescence (Loud & Gordon, 2006). In fact, researchers suggest that peak bone mass may occur by the completion of the second decade or in the early part of the third decade of life (Baxter-Jones, Faulkner, Forwood, Mirwald, & Bailey, 2011). In this case, the intervention would be important to optimize bone health and development in peak bone mass.

Lastly, future research should evaluate a diverse population. Male adolescent and college age study participants may be included during these future research endeavors. Even though men may be at lower risk for the development of osteoporosis, according to

the osteoporosis criteria established by the World Health Organization, 2 million individuals residing in the United States estimated to have osteoporosis are men (NOF, 2009). Therefore, the osteoporosis educational and exercise intervention among this population would provide education in osteoporosis knowledge, prevention and exercise practice to encourage increased bone mineral density (Almstedt, Canepa, Ramirez, & Shoepe, 2011).

Doctor of Nursing Practice (DNP) Roles

Several benefits and significant roles are associated with the Doctor of Nursing Practice (DNP) degree. First, DNPs are focused on clinical practice at the highest standard level of specialty care and practice (American Association of Colleges of Nursing [AACN], 2006; Institute of Medicine [IOM], 2001). This specific degree prepares advance practice nurses to become innovative leaders in the transformation of the current health care system (AACN). Specifically, DNPs have advanced skills in leadership with an emphasis on advanced scientific knowledge and innovative approaches for improving complex health care practice and outcomes, especially among susceptible and vulnerable populations (AACN, 2004).

In the advanced provider leadership role, the understanding of healthcare organizational change with associated needs in developing adaptive and operational capacity-building plans (Venture Philanthropy Partners, 2001) directed this scholarly pilot study. Especially, interprofessional collaboration and communication among healthcare organization leaders with investments in community health clubs and a readiness for change was critical with the implementation of the osteoporosis educational and exercise intervention. This Capacity-Building for Nonprofit Organizational Model

was beneficial in guiding the original groundwork (Venture Philanthropy Partners) with the Vice President of Organization and Talent Effectiveness, EHAC Director, management staff, and health club members. Additionally, in the leadership role, APRNs engage in translating external evidence into the practice setting to enhance care, quality, and patient outcomes (Melnyk, 2013).

Next, in the advanced practice and educator role, the primary investigator successfully designed and implemented the osteoporosis educational and exercise intervention among perimenopausal women in the community health club setting. This endeavor bridged the gap between primary care practice and community health in the health club setting among this susceptible population, thereby contributing to improving the health of the community. Notably, DNPs have advanced skills in population health associated with analyzing scientific data associated with population health and subsequently developing and implementing evidence-based interventions, especially among susceptible populations (AACN, 2004).

Furthermore, in the DNP scholar role, the primary investigator made valuable contributions to the profession of nursing and the community through clinical scholarship. This occurred through the implementation of the pilot study at EHAC. Furthermore, clinical scholarship encompassed looking for ways that the primary investigator could disseminate her knowledge (Smith & Crookes, 2011). This came about through various ventures, such as teaching of seminars or inservice programs and poster presentations. Finally, clinical scholarship involved the process of application (Fitzpatrick & McCarthy, 2010). Application included the utilization and incorporation of "knowledge from multiple sources" (Fitzpatrick & McCarthy, p. 121). This process

included working among interprofessional teams, such as the fitness and wellness experts in the community health club setting.

Finally, in the DNP innovator role, the primary investigator initiated change through an innovation regarding osteoporosis educational and exercise programs in the health club setting. Contributions were made to nursing through this pilot study. The outcomes of the study were discussed and shared with leaders in bone health endeavors at GVSU and the authors of the ROKT, OSES-12, and OHBS measurement tools. Future research evaluating the impact of osteoporosis educational and exercise interventions for women over time could thereby guide protocols for osteoporosis preventive care, especially among susceptible populations.

Sustainability

The Mercy Vice President of Organization and Talent Effectiveness and EHAC Fitness Director's long term goal for a bone health program in the health club setting served as a driving force for introduction of the osteoporosis educational and exercise research study. However, the health care facility was unable to operate EHAC and two additional health clubs after January 5, 2014 due to significant financial problems. Therefore, future health club owners must consider an innovative approach for sustaining the viability and financial stability of this health club in west Michigan. Specifically, health club managers and owners should develop strategic goals with a focus on communication, marketing, and educational endeavors to increase participation, referrals, and improve staff morale and productivity (A. Horjus, personal communication, May 16, 2013). Professional health care providers should be part of the interprofessional team. Particularly, DNPs could play a significant role in developing and implementing

programs with a focus on evidence-based practice and current research findings to support fitness and wellness programs.

The future of the bone health program and osteoporosis educational and exercise interventions will be determined by the future buyers of the health clubs. Furthermore, the bone health program and future interventions may be implemented at other local health clubs, such as the Cascade Hills Country Club Health Club, MVP Sports Clubs LLC, and university health clubs.

Conclusion

In conclusion, osteoporosis represents a widespread community health concern with significant health care and financial consequences (Singer & Boonen, 2008). Providing osteoporosis educational and exercise interventions in the community and primary care setting continues to be a complex and challenging endeavor. As osteoporosis continues to be an under-prevented, under-recognized, and under-treated condition, this disease process will continue to be a major local, national, and global health concern, especially among aging women (WHO, 2007).

Community, health care, and interprofessional systems must be in place to support health care providers in osteoporosis educational, exercise, and bone health endeavors. Additionally, health care providers in the primary and community setting need increased skill sets in addressing health promotion and disease prevention strategies to meet the bone health needs of all age groups and cultures, especially susceptible populations. Surely, meaningful efforts regarding bone health promotion and osteoporosis prevention according to evidence-based guidelines will positively affect quality of bone health outcomes.

APPENDICES

APPENDIX A

GRAND VALLEY STATE UNIVERSITY

Joanne Finazzi <finazzjo@mail.gvsu.edu>

Fwd: Permission to Use and/or Reproduce The Iowa Model

1 message

jmaura14@comcast.net <jmaura14@comcast.net> Sun, Apr 21, 2013 at 5:46 AM
To: "Finazzi, Joanne" <finazzjo@mail.gvsu.edu>

FYI

From: noreply@qemailserver.com
To: jmaura14@comcast.net
Sent: Sunday, April 21, 2013 5:44:44 AM
Subject: Permission to Use and/or Reproduce The Iowa Model

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If you have questions, please contact Kimberly Jordan at 319-384-9098 or kimberly-jordan@uiowa.edu.

APPENDIX B

April 29, 2013

Joanne Finazzi
DNP Student
Kirkhof College of Nursing

Dear Joanne,

Thank you for your interest in the Osteoporosis Health Belief Scale (OHBS), Osteoporosis Knowledge Test Revised 2011(OKT Revised 2011), Osteoporosis Self-Efficacy Scale-21(OSES) and Osteoporosis Self-Efficacy Scale-12 (OSES). You have my permission to use the instruments. Please keep us informed of any publications and/or presentations and send us an abstract or summarize your study results when completed.

I wish you much success with your study.

Sincerely,

Phyllis E Gendler

Phyllis Gendler, PhD, RN
Professor (Retired)
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Kirkhof College of Nursing
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301 Michigan St. NE
Grand Rapids, MI 49503

Phone: 616-331-7161
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04/29/13

April 29, 2013

Joanne Finazzi
DNP Student
Kirkhof College of Nursing

Dear Joanne,

Thank you for your interest in the Osteoporosis Research Project. The Osteoporosis Health Belief Scale (OHBS), Osteoporosis Knowledge Test (OKT) and Osteoporosis Self-Efficacy Scale (OSES) are based on our second project with 201 women, 35 years or older. The Osteoporosis Knowledge Test (Revised 2011) is based on 104 subjects, 18 years and older. When administering the OKT (revised 2011) with any other instrument, the OKT (revised 2011) should be administered first. This is to ensure that responses on the OKT (revised 2011) have not been influenced by information on the other instruments.

We are sending the instruments you have requested. You may make as many copies of the instruments for your own study as needed. However, please do not distribute the instruments to other investigators because they are copyrighted. Also note the copyright instructions specific for each instrument. Enclosed with the instruments, you will find scoring instructions, reliability and validity information, and permission letter so that you may use the instruments in your study. If you would like to modify the instruments, please request our permission, notify us, and send us your modified versions.

The OHBS has 42 items and consists of two subscales: The Osteoporosis Health Belief Calcium Scale (OHBC Scale) and The Osteoporosis Health Belief Exercise Scale (OHBE Scale). They share three subscales in common: perceptions of osteoporosis seriousness and susceptibility, and general health motivation. The subscales measuring the concepts of barriers and benefits are specific to calcium intake and exercise behavior and are different for the two scales. Copyright is Dr. Katherine Kim, Dr. Mary Horan & Dr. Phyllis Gendler. If modified include "Modified by (your Name)". Citation should be "developed by Katherine Kim, Ph.D., Mary Horan, Ph.D., and Phyllis Gendler, Ph.D.".

The OKT (revised 2011) has two subscales: OKT (revised 2011) Nutrition (items 1-11 and 18-32) and OKT(revised 2011) Exercise (items 1-17 and 30-32). That is the OKT (revised

2011) Nutrition and OKT(revised 2011) Exercise subscales both share 14 common items (items 1-11 and 30-32). Citation should be "developed by Katherine Kim, Ph.D., Mary Horan, Ph.D., and Phyllis Gendler, Ph.D." Revised by Phyllis Gendler, Ph.D., Cynthia Coviak, Ph.D., Jean Martin, Ph.D, and Katherine Kim, Ph.D. Question 27 was developed as an addition to the Osteoporosis Knowledge Test by Pamela Von Hurst (2006).

The OSES has two versions: one has 21 items and the other contains 12 items. When many instruments need to be administered and/or the subject is elderly or tires easily, the shorter version is preferred. Each version has two subscales: Osteoporosis Self-Efficacy Exercise Scale and Osteoporosis Self-Efficacy Calcium Scale. The shorter version of the Osteoporosis Self-Efficacy Exercise Scale includes items 1- 6 and the Osteoporosis Calcium Scale includes items 7-12. The longer version of the Osteoporosis Self-Efficacy Exercise Scale includes items 1-10 and the Osteoporosis Calcium Scale includes items 11-21. Copyright is Dr. Mary Horan, Dr. Katherine Kim, & Dr. Phyllis Gendler. If modified include "Modified by (your Name)". Citation should be "developed by Mary Horan, Ph.D., Katherine Kim, Ph.D. and Phyllis Gendler Ph.D.".

If you publish or present your study, we would appreciate if you would send us the citation or a copy of the article, report, and/or abstract. Please send us a descriptive summary or abstract on your overall study and its main findings. This will give us a better idea on how results from the instruments are adding to the knowledge on osteoporosis related knowledge, beliefs, and behaviors.

In addition, we would like to ask you to share the results of any psychometric testing that you do yourself on the scale(s). Researchers are often asking us for psychometric results on the scale(s); therefore we can share your findings with them, citing you as the source of the results. In this way we also build further psychometric support for the scales(s). Please also complete the form on the study source to cite for those results.

We also want to share with you our exciting news. Besides the original researchers, our team now includes Jean Martin, Ph.D. and Cynthia Coviak, Ph.D, experts in adolescent health. Our ultimate goal is to provide educational programs tailored to all ages and cultural backgrounds.

Thank you in advance for your cooperation with the above requests. I wish you much success with your study. Further correspondence or questions should be directed to me.

Sincerely,

Phyllis E Gendler

Phyllis Gendler, PhD, RN
Professor (Retired)
Cook-DeVos Center for Health Science

L:\Nursing\Osteo\LtrTypes\Send Instruments Merge.doc
04/29/13

Kirkhof College of Nursing
Grand Valley State University
301 Michigan St. NE
Grand Rapids, MI 49503

Phone: 616-331-7161
Fax: 616-331-7362
E-mail: gendlerp@gvsu.edu

Enclosures:

Permission letter
Instruments:

Request For Data From Osteoporosis Scales
Sample and Setting
Psychometric Analysis of the Osteoporosis Knowledge Test Revised 2011(OKT Revised 2011)
Osteoporosis Knowledge Test Revised 2011(OKT Revised 2011)
Osteoporosis Health Belief Scale Validity (OHBS)
Osteoporosis Health Belief Scale Self Administration (OHBS)
Osteoporosis Self-Efficacy Scale Scoring Instructions (OSES)
Osteoporosis Self-Efficacy Scale-12 (OSES)
Osteoporosis Self-Efficacy Scale- 21 (OSES)

APPENDIX C

	Osteoporosis Research Study Checklist	Yes	No
1	Are you a member of the East Hills Athletic Club?		
2	Has a doctor, nurse, or other health provider told you that you are have perimenopausal symptoms (hot flashes, night sweats, changes in menstruation with aging)?		
3	Are you able to speak and understand English?		
4	Has a doctor, nurse or other health provider told you that you have osteoporosis?		
5	Has a doctor, nurse, or other health provider told you that you have osteopenia?		
6	Has a doctor, nurse, or other health provider told you that you have chronic renal failure?		
7	Has a doctor, nurse, or other health provider told you that you have cancer?		
8	Has a doctor, nurse, or other health provider told you that you have diabetes mellitus?		
9	Has a doctor, nurse, or other health provider told you that you have heart failure?		
10	Has a doctor, nurse, or other health provider told you that you are pregnant?		
11	Are you between the ages of 39 and 50 years of age?		
12	Do you have hip flexor problems?		
13	Do you have joint flexor problems?		
14	Are you postmenopausal – have your menses (periods) ended?		

APPENDIX D

FW: Citation Permission - Sources of Self-Efficacy Information

From : Karen Thomas <kthomas@apa.org> Fri, Mar 07, 2014 11:49 AM
Subject : FW: Citation Permission - Sources of Self-Efficacy Information
To : jmaura14@comcast.net, finazzjo@mail.gvsu.edu 6 attachments

File: Finazzi, Joanne (author)
Reproduce Figure 2, p. 195, from Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191-215. doi:10.1037/0033-295X.84.2.191
Dear Joanne,
Thank you for contacting APA.
APA's policies on copyright and permissions can be found by visiting the Copyright and Permissions Information page located at http://www.apa.org/about/contact/copyright/index.aspx. In reading through our Policy, you will see that there are some instances under which formal APA permission is not required. *This is one of those instances*. However, an appropriate credit line is required (as outlined in our Policy). The attribution and credit line requirements can be found at http://www.apa.org/about/contact/copyright/index.aspx#attribution.
NOTE: The correct title of the APA journal is PSYCHOLOGICAL REVIEW, not PSYCHOLOGY REVIEW.
I hope this helps. We appreciate your interest in APA-copyrighted material.
Regards,

Karen Thomas| Permissions Supervisor
Sales, Licensing, Marketing and Exhibitions
Publications & Databases
American Psychological Association
750 First Street NE, Washington, DC 20002-4242
Tel: 202.336.5541 | Fax: 202.336.5633
email: kthomas@apa.org | www.apa.org

From: jmaura14@comcast.net [mailto:jmaura14@comcast.net]
Sent: Wednesday, March 05, 2014 7:42 PM
To: SM PsycINFO Permissions
Subject: Fwd: Citation Permission - Sources of Self-Efficacy Information
Good Evening,
Dr. Bandura directed me to obtain copyright permission also through the American Psychological Association. I am forwarding via attachment the APA form since this article was not listed in the Rightlink area.
Thank you,
Joanne Finazzi, MSN, RN
Doctor of Nursing Practice Student

From: "Albert Bandura" <bandura@stanford.edu>
To: jmaura14@comcast.net
Sent: Wednesday, March 5, 2014 4:42:52 PM

Subject: RE: Citation Permission - Sources of Self-Efficacy Information

Joanne,

You have my permission; you also need to get permission from the American Psychological Association.

Albert Bandura

From: jmaura14@comcast.net [mailto:jmaura14@comcast.net]
Sent: Monday, March 03, 2014 5:46 AM
To: albertob@stanford.edu
Subject: Citation Permission - Sources of Self-Efficacy Information

Good Morning Dr. Bandura,

I am a Doctor of Nursing Practice Student at Grand Valley State University in Grand Rapids, Michigan. I was directed to your email address regarding this request. I would like citation permission to use the following figure in my dissertation. What is the process for obtaining this level of permission?

Figure 2: Major sources of efficacy information and the principal sources through which different modes of treatment operate.

From

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavior change. *Psychology Review*, *84*, 191-215. doi: 10.1037/0033-295X.84.2.191

Regards,

Joanne Finazzi, MSN, RN

Doctor of Nursing Practice Student

APPENDIX E

Research Participation Opportunity

An Evidence-Based Approach For The Implementation Of An Osteoporosis Education & Exercise Intervention Among Perimenopausal Women

4 Week Research Study

When: Monday, December 2, 2013 through December 23, 2013

Time: 5:30 p.m. until 6:30 p.m.

Location: East Hills Athletic Club

Inclusion Criteria:

- EHAC Membership
- Completion of Osteoporosis Checklist
- Ability to speak & understand English
- Perimenopausal Status (hot flashes, night sweats, changes in menstruation with aging)

Exclusion Criteria:

- Known diagnosis of osteoporosis, osteopenia, diabetes, cancer, heart failure, pregnancy, hip flexor problems, joint flexor problems, and postmenopausal status.

The purpose of the research study is to examine the effectiveness of an osteoporosis education and exercise intervention on osteoporosis knowledge, self-efficacy and health beliefs.

Contact for Information:
Angie Horjus or Joanne Finazzi
angieh@ehac.com

Version 4: November 1, 2013

APPENDIX F

MERCY HEALTH

Research Informed Consent Form

Study Title: An Evidenced-Based Approach For The Implementation Of An Osteoporosis Educational and Exercise Intervention Among Perimenopausal Women

Principal Investigator: Joanne Finazzi, MSN, RN
Doctor of Nursing Practice Student, Grand Valley State University

Study Sponsor: Grand Valley State University Faculty Advisor is Cynthia Coviak, Ph.D., R.N., CNE. and current Professor and Associated Dean for Nursing Research and Faculty Development.

APPROVED BY MERCY HEALTH IRB
EFFECTIVE 11-4-13 TO 11-3-14

"You" refers to the subject.

"We" refers to Grand Valley State University; East Hills Athletic Club.

1. Introduction

You are being asked to participate in a clinical research study. Clinical research is the study of human diseases in an attempt to improve diagnosis and treatment. In order to decide whether or not you should agree to be part of this research study, you should receive enough information about its risks and benefits to make a judgment. This process is called informed consent.

This consent form gives detailed information about the research study, which will be discussed with you. If you wish to participate in this study you will be asked to sign this form. You are being asked to participate in this study because you are considered perimenopausal and have a current membership at East Hills Athletic Club. Perimenopausal means "around menopause" and refers to the time frame when a woman's body makes its natural transition toward permanent infertility, which is known as menopause. The perimenopausal period ends once you've gone through 12 consecutive months without a menstrual period, as this is considered menopause.

The study is being conducted by the investigator as part of a continuing education course learning requirement involving methods for the collection and analysis of information. The investigator does not know if the research study will be helpful for women in other places with different instructors. The instructor wants to find out how the members of the health club learn and benefit from this method of teaching

.

MERCY HEALTH

2. Purpose of This Research Study

The purpose of this study is to examine a 4-session osteoporosis education and exercise intervention on osteoporosis knowledge, self-efficacy, and health beliefs among perimenopausal women. Osteoporosis is a disease of bone structure that leads to weak and thin bones and risk for fractures. Self-efficacy is defined as an individual's belief in his or her ability to succeed in specific situations. Health beliefs are defined as an individual's personal convictions that impact his or her health behaviors.

Perimenopausal women are at higher risk for developing osteoporosis due to changes in estrogen level with the aging process. As women age, decreases in estrogen from being perimenopausal causes bone loss and the possible development of osteoporosis. This research study will evaluate whether 4 sessions of osteoporosis education and exercise conducted at a health club will have an effect on knowledge and awareness of osteoporosis, self-efficacy, and health beliefs of participants.

In order to participate in this study, you must meet certain criteria for enrollment. You have informed the investigator that you are perimenopausal. You are being asked to be part of this study because you meet the criteria to be part of the study. By signing this consent form, you are agreeing to take part in this study. If you decide to participate in this study, you will be asked to attend 4 sessions of osteoporosis education and exercise classes that will last approximately one hour each over a 4-week period at East Hills Athletic Club. In addition, you will be asked to complete study-related surveys that will provide us with information about your health beliefs, knowledge level, prevention behavior, and confidence level for carrying out prevention behaviors or actions that could reduce your chances of developing osteoporosis.

Participation in this research study is entirely voluntary, and you may withdraw from the study at any time you wish. If you decide to discontinue participation in this research study, your membership to the East Hills Athletic Club will not change.

All information you provide in the surveys will be kept confidential. The research study and its results will be reported in the Doctor of Nursing Practice dissertation document completed by Joanne Finazzi, at Grand Valley State University (GVSU).

3. Length of Your Participation

If you agree to participate in the research study, you will be asked to attend 4 sessions of educational and exercise intervention classes lasting approximately one hour each at East Hills Athletic Club over the course of 4 weeks.

You will be required to participate in 15 minutes of instruction and 45 minutes of low-impact exercise for one night each week during the study period.

4. Where the Study is being Done and Number of People Participating

The research study is being done at East Hills Athletic Club. We anticipate enrolling 8 participants for this study.

MERCY HEALTH

5. Study Procedures

The design of the research study will involve a one-group research study. A pretest (beginning of the study survey) and posttest (end of the study survey) approach will be used with survey questionnaires given to participants about osteoporosis knowledge, self-efficacy, and health beliefs. The surveys will add 10 minutes to the first and last classes. You will be asked to avoid placing your name, address, or other personal identification information on the surveys. You will be assigned a research identification number to place on each survey so that we can compare your answers before and after the program. We will provide confidential, unmarked envelopes with no identifying information for you to place your surveys in, so that we will not be able to link the answers to you, specifically.

Each class will involve approximately 15 minutes of instruction and 45 minutes of low-impact exercise, except the first and last class. The first and last class will involve an extra 10 minutes to complete the pretest (beginning of the study survey) and posttest (end of the study survey). When participants complete the study, they are no longer contacted.

The research study and the surveys are designed to help us understand your health beliefs, knowledge, prevention behaviors and confidence in your ability to do actions to prevent osteoporosis.

6. What Will Happen When You Complete the Study

When your participation in the study ends, you will no longer have access to the study specific osteoporosis education and exercise intervention classes at East Hills Athletic Club. In March 2014, results of the research study will be provided to you. The primary investigator will meet with you privately at East Hills Athletic Club to share the final research study results. In the event that East Hills Athletic Club is closed, the meeting with take place at the Kirkhof College of Nursing office at Grand Valley State University in Grand Rapids, Michigan.

7. Possible Risks or Side Effects of Taking Part in this Study

In the activities you will do for this research study, there will be no more risk than in your regular exercise classes guided by your trainer. The risks from participating in the prescribed exercises may include muscle soreness and stiffness for a day or two following the exercises. We will assist you to perform the exercises correctly, but not beyond what you can do safely. Participation may involve unforeseeable risks, such as muscle soreness and muscle stiffness.

8. Costs for Taking Part in this Study

There is no cost to you for participation in this research study. If you are injured as a result of your participation in this research study, Mercy Health Saint Mary's will assist you in obtaining emergency care, if necessary, for your research related injuries. If you have insurance for medical care, your insurance carrier will be billed in the ordinary manner. As with any medical insurance, any costs that are not covered or are in excess of what are paid by your insurance, including deductibles, will be your responsibility. Mercy Health Saint Mary's policy is not to

provide financial compensation for lost wages, disability, pain or discomfort, unless required by law to do so. This does not mean that you are giving up any legal rights you may have. You may contact the Principal Investigator Joanne Finazzi at Grand Valley State University at 616-331-3558 with any questions or to report an injury.

9. Payment Taking Part in this Study

Participants will not be paid for taking part in the research study.

10. Possible Benefits to You for Taking Part in the Study

Potential benefits to the participant that may be reasonably expected for taking part in this research study may include increased osteoporosis knowledge, increased self-efficacy, and a positive change in health beliefs.

In the educational classes that are a part of the project, benefits may include more knowledge of the causes, diagnosis, prevention, and treatment of osteoporosis (a bone disease), greater confidence in your ability to do activities to decrease risk of osteoporosis, and understanding of benefits and barriers to actions you can take to decrease your risk of this disease.

11. About Participating in this Study

Your participation in this study is voluntary. You may stop participating in this study at any time. Your decision not to take part in this study or to stop your participation, will not affect your medical care or any benefits to which you are entitled. If you decide to stop taking part in this study, you should tell the investigator.

Your doctor, the investigator and/or the Sponsor may stop your participation in the study at any time if they decide that it is in your best interest. They may also do this if you do not follow instructions. If you have other medical problems or side effects, the doctor and/or nurse will decide if you may continue in the research study.

If you wish to take part in this study, we expect that you will attend all study classes. If you cannot attend a class, you should contact the investigator as soon as you know that you will miss the class. Tell the investigator or research study staff about any side effects, doctor visits, or hospitalization that you may have whether or not you think they are related to the study intervention.

If you decide to leave the research study, contact the Primary Investigator Joanne Finazzi at Grand Valley State University at 616-331-3558 so that the investigator can assist you with terminating your participation in the research study.

12. Compensation for Injury

If you are injured as a result of your participation in this research study, medical care and/or hospitalization will be provided, if necessary. If you have health insurance, your insurance carrier will be billed in the ordinary manner. As with any health insurance, any costs that are

not covered or are in excess of what is paid by your insurance, including deductibles, will be your responsibility. No funds have been set aside to pay you in the event of a study related injury.

By signing this consent form, you will not waive any of your legal rights or release the parties involved in this study from liability for negligence.

13. Confidentiality of Study Records

Data for this project is being collected anonymously and neither researchers nor anyone else can link the data to the participant. Information collected for this study is confidential.

The anonymous survey data is be stored according to Grand Valley State University security guidelines. Only the primary investigator has access to the data. Data is kept for 3-years.

14. Release of Personal Information

We will do our best to ensure that your personal information is kept confidential and private to the maximum extent required by law. We cannot guarantee absolute confidentiality and privacy. Your personal information may be disclosed if required by law. If information from this study is published or presented at scientific meetings, your name and other personal information will not be used.

15. Financial Conflict of Interest

There is no conflict of interest related to the primary or secondary investigator or study sponsor.

16. Names of Contacts for Questions About the Study

If you have any questions about taking part in this study, or in the event of a research related illness or injury, contact Primary Investigator Joanne Finazzi at Grand Valley State University at 616-331-3558. If you have any questions about your rights as a research participant, you may contact:

Brenda Hoffman, Mercy Health Saint Mary's Institutional Review Board (IRB) Chairperson
200 Jefferson Ave. SE – Grand Rapids, MI 49503
Telephone: 616-685-6198

This research protocol has been approved by the Human Research Review Committee at Grand Valley State University. File No. 14-037-H: Expiration: September 13, 2014.

MERCY HEALTH

If you have questions about your rights as a project participant, you can contact the committee chair at email address hrrc@gvsu.edu or phone number 616-331-3197.
The project has also been reviewed by the Institutional Review Board of Mercy Health Saint Mary's.

MERCY HEALTH

DOCUMENTATION OF INFORMED CONSENT

By signing this consent form and by initialing each page, you certify you have read this form, you have had the opportunity to ask questions about this research study and this form, and you have received answers that fully satisfy those questions. You are voluntarily signing this consent form as evidence of your decision to participate in this research study.

You are aware you may withdraw your consent in writing at any time without harming my future medical care or losing any benefits to which you might be otherwise entitled. You have been advised that the investigator in charge of this study may discontinue your participation in this study if it is felt to be in your best interest, if you do not follow the study requirements or if the study is stopped.

You will receive a signed copy of this Research Informed Consent Form.

By signing this consent form, you have not waived any of your legal rights or released the parties involved in this study from liability for negligence.

Signature of Study Participant	Date
Printed Name of Study Participant	Date
Signature of Person Obtaining Consent	Date
Signature of Principal Investigator	Date

APPENDIX G

NOTICE OF IRB EXPEDITED NEW APPROVAL

To: Joanne Finazzi, MSN, RN, DNP4
3090 Buckhaven Dr. SE
Ada, MI 49301

Re: IRB# 13-1014-01-OT
An Evidence-Based Approach For The Implementation Of An Osteoporosis Educational And Exercise Intervention Among Perimenopausal Women

Date: November 5, 2013

This is to inform you the Mercy Health Institutional Review Board (IRB) has renewed its approval of the above research study by expedited review. This includes approval for:

Research Protocol, Version 3: November 1, 2013
Research Informed Consent Form, Version 3 Date 11/1/2013
Osteoporosis Knowledge Test (Revised 2011) and Psychometric Analysis of the Osteoporosis Knowledge Test
Osteoporosis Health Belief Scale
Refinement of the Osteoporosis Health Belief Scale
Osteoporosis Self-Efficacy Scale and Instructions
Osteoporosis Research Study Checklist

The approval period is from **November 4, 2013 to November 3, 2014**. Your study number is **13-1014-01-OT**. Please be sure to reference this number and/or the study title in any correspondence with the IRB.

Your responsibilities to the IRB do not end with this approval. You will be required to submit a continuing review report by the date indicated below or a notification of study closure form with a report of the study's findings upon completion of the study.

All conditions for continued approval during the prior approval period remain in effect. These include, but are not necessarily limited to the following requirements:

- A copy of the **Informed Consent Form(s)**, approved as of **November 4, 2013**, is enclosed. No other consent form(s) should be used. The consent form(s) must be signed by each subject prior to initiation of any protocol procedures. In addition, each subject must be given a copy of the signed consent form(s).

- All protocol modifications to approved research must be submitted to the IRB and not be implemented until approved by the IRB except where necessary to eliminate apparent immediate hazards to the study subjects.

- All forms of advertising (including but not limited to: television, radio, internet, flyers, brochures, posters) must be submitted to the IRB and must not be implemented until approved by the IRB

- Significant changes to the study site and significant deviations from the research protocol must be reported.

- Unanticipated problems/events and all adverse events, *whether related to the study article or not,* must be reported to the IRB.

- Please complete and submit reports to the IRB as follows:

  Renewal of the study - complete and return the Continuing Review Report/Request for Renewal by **10/01/2014**. The study cannot continue after **November 3, 2014** until re-approved by the IRB.

  Study completion, termination, or if not renewing the project – complete and send the Notification of Study Closure form.

Please call me if you have any questions about the terms of this approval.

Brenda Hoffman
IRB Chairperson

Copy: File

APPENDIX H

GRAND VALLEY STATE UNIVERSITY
www.gvsu.edu

DATE:	September 13, 2013
TO:	Joanne Finazzi, MSN, RN, - Doctor of Nursing Practice Student
FROM:	Grand Valley State University Human Research Review Committee
STUDY TITLE:	[495853-2] An Evidence-Based Approach For The Implementation Of An Osteoporosis Educational And Exercise Intervention Among Perimenopausal Women
REFERENCE #:	14-037-H
SUBMISSION TYPE:	Revision
ACTION:	APPROVED
APPROVAL DATE:	September 13, 2013
EXPIRATION DATE:	September 13, 2014
REVIEW TYPE:	Expedited Review

Thank you for your submission of revised and clarified materials for this research study. The Human Research Review Committee has approved your research plan application as compliant with all applicable sections of the federal regulations, Michigan law, GVSU policies and HRRC procedures. All research must be conducted in accordance with this approved submission.

Advisory notes not affecting approvability: The consent document should state that subjects will be required to participate in 15 minutes of instruction and 45 minutes of low-impact exercise for one night each week. Secondly, some participants might not remember whose birthdate they put on the first form. A simpler and more personal prompt may have higher levels of memory retention.

This approval is based on no greater than minimal risk to research participants. This study has received expedited review, category 2-7 based on the Office of Human Research Protections 1998 Guidance on Expedited Review Categories.

Please insert the following sentence into your information/consent documents as appropriate. All project materials produced for participants or the public must contain this information.

> ***This research protocol has been approved by the Human Research Review Committee at Grand Valley State University. File No. 14-037-H Expiration: September 13, 2014.***

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note the following in order to comply with federal regulations and HRRC policy:

1. Any revision to previously approved materials must be approved by this office prior to initiation. Please use the *Change in Protocol* forms for this procedure. This includes, but is not limited to, changes in key personnel, study location, participant selection process, etc.
2. All UNEXPECTED PROBLEMS and SERIOUS ADVERSE EVENTS to participants or other parties affected by the research must be reported to this office within two days of the event occurrence. Please use the UP/SAE Report form.
   All instances of non-compliance or complaints regarding this study must be reported to this office in a timely manner. There are no specific forms for this report type.
3. All required research records must be securely retained in either paper or electronic format for a minimum of three years following the closure of the approved study. This includes signed consent documents from all participants.
4. This project requires continuing review by our office on an annual basis. Please use the appropriate *Continuing Review* forms when applying for approval extension.
   - Protocols that are active and open for enrollment require both the Primary Investigator and Authorizing Official to electronically sign the Continuing Review submission in IRBNet.
   - Protocols that are open for data analysis ONLY, require the Primary Investigator's signature.

If you have any questions, please contact the HRRC Office, Monday through Thursday, at (616) 331-3197 or hrrc@gvsu.edu. The office observes all university holidays, and does not process applications during exam week or between academic terms. Please include your study title and reference number in all correspondence with this office.

cc:

APPENDIX I

GRAND VALLEY STATE UNIVERSITY
www.gvsu.edu

DATE:	November 14, 2013
TO:	Joanne Finazzi, MSN, RN, - Doctor of Nursing Practice Student
FROM:	Grand Valley State University Human Research Review Committee
STUDY TITLE:	[495853-3] An Evidence-Based Approach For The Implementation Of An Osteoporosis Educational And Exercise Intervention Among Perimenopausal Women
REFERENCE #:	14-037-H
SUBMISSION TYPE:	Amendment/Modification
ACTION:	APPROVED
EFFECTIVE DATE:	November 14, 2013
REVIEW TYPE:	CHANGE IN PROTOCOL

Thank you for your submission of revised materials for this research study. **Your request to make the changes required by the IRB from Trinity/St. Mary's are acceptable to the HRRC and reasonable as described on the materials submitted. The HRRC has been APPROVED. You may implement the changes to your study as proposed and described.**

Your project retains its original expiration date of September 13, 2014. Please include a brief summary of these approved modifications in your continuing review application, which should be submitted at least 60 days prior to approval expiration.

If you have any questions, please contact the Research Protections Program, Monday through Thursday, at (616) 331-3197 or rpp@gvsu.edu. The office observes all university holidays, and does not process applications during exam week or between academic terms. Please include your study title and reference number in all correspondence with our office.

References

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