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Effects of an Osteoporosis Educational Intervention: Knowledge and Self-Efficacy of Prevention in Young Adult Collegiate Females

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EFFECTS OF AN OSTEOPOROSIS EDUCATIONAL INTERVENTION: KNOWLEDGE AND SELF-EFFICACY OF PREVENTION IN YOUNG ADULT COLLEGIATE FEMALES

by

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DEDICATION

This project is dedicated to my family. Thank you for always encouraging me to strive for more in life and having confidence in my abilities to do so. I would not have made it this far in life without your unconditional love and support. Thank you also to my best friend, Marcus, who has been there for the ups and downs of this achievement and has continued to stand firmly by my side. Your ongoing encouragement and love has kept me on track throughout this adventure.

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ABSTRACT

Osteoporosis is a silent and potentially debilitating chronic illness. In 2012, the CDC reported that 4.5 million women over the age of 50 were diagnosed with osteoporosis in the United States. Within the next 20 years, 41 million women worldwide are projected to have osteoporosis. The annual financial burden of osteoporosis is estimated to be 19 billion dollars. The objective of this evidence-based practice project was to answer the clinical question: In young adult collegiate females, how does an osteoporosis educational intervention compared to current education effect osteoporosis knowledge and self-efficacy of osteoporosis prevention over a one-month time period? The ACE Star Model and the health belief model were used as frameworks for the project, which was implemented at a university in northwest Indiana. Freshman female kinesiology students (N = 60) were followed to assess the impact of an in-service osteoporosis educational intervention. The intervention consisted of a slide show presentation guided by the National Osteoporosis Foundation (NOF), group discussion, and NOF take-home materials. Demographic data was collected at baseline. Osteoporosis Knowledge Test (OKT) and Osteoporosis Self-Efficacy Scale (OSES) were collected pre-intervention, immediately post-intervention, and 3-weeks post-intervention. Results were assessed with repeated measures analysis of variance with significance determined as $p < 0.05$. The OKT total results were significant (F (2, 56) = 89.234, p = 0.000) as well as all subclasses of risk factors (F (2, 56) = 46.063, p = 0.000), nutrition (F (2, 56) = 64.745, p = 0.000), and exercise (F (2, 56) = 70.068, p = 0.000). The OSES total results were significant (F (2, 44) = 3.986, p = 0.026); however, the subclasses of calcium (F (2, 44) = 2.370, p = 0.105) and exercise (F (2, 44) = 2.584, p = 0.087) were not significant. Future projects with similar objectives could provide promising results with young adults to improve knowledge and self-efficacy of prevention of chronic illnesses like osteoporosis.

Keywords: osteoporosis, young adults, females, prevention, educational intervention

CHAPTER 1

INTRODUCTION

Evidence-based practice (EBP) is practice that has been well-researched and the evidence has been analyzed, synthesized, and condensed into specific practice guidelines. The focus of this specific EBP project was to unveil the best practice for encouraging osteoporosis preventative behaviors through increased self-efficacy of prevention and knowledge of osteoporosis within the young adult collegiate female population. To make practice changes with EBP, the project manager aimed to cultivate an environment that welcomed change as well as encouraged comprehension of the necessity for change. To determine whether the EBP project was needed, analysis of the clinical problem and current research as well as an assessment of the specific population of choice took place. Once the clinical problem had been reviewed, the project manager conducted a thorough literature review to determine literature appropriate to educational interventions for osteoporosis prevention among the population of interest. An outline for the EBP project needed to be well-established prior to the project manager determining which nursing theory and EBP model would guide and strengthen the project. This chapter will provide brief discussion of the background, statement of the problem, and definition of the purpose and significance of the EBP project.

Background

The prevalence of osteoporosis and low bone mass continues to grow with half of the United States' population over the age of 50 known to have low bone mass or osteopenia (Looker, Borrud, Dawson-Hughes, Shepherd, & Wright, 2012). According to the Centers for Disease Control and Prevention (CDC) (2012), 4.5 million (10%) women over the age of 50 have been diagnosed with osteoporosis. Hospitalizations as a result

of osteoporotic fractures have reached 279,000 with an average length of stay of 6.3 days (CDC, 2012). By 2025, the National Osteoporosis Foundation (NOF; 2012) estimates that osteoporosis will be the cause of 3 million fractures with an approximated healthcare expenditure of 25.3 billion dollars each year. If current trends continue, it is estimated that within 20 years there will be 41 million women affected by osteoporosis worldwide (Kass-Wolff, 2004). After assessment of the clinical problem, it is evident that EBP guidelines need to be established to increase prevention and decrease rates of osteoporosis and reduce healthcare expenditures.

National initiatives. Many different national programs have determined a need for osteoporosis prevention. According to Healthy People 2020, a nutrition and weight status objective calls for increased consumption of calcium among individuals older than 2 years of age. Recommended intake for college-aged females is 1,300mg, and on average, only 1,064mg are being consumed (Healthy People 2020, 2012). United States Preventive Services Task Force (USPSTF; 2012) discussed the need for screening for osteoporosis among 65 and older women, but there are no current recommendations to screen young adults to identify those at risk. Lastly, the NOF (2012) has called for a national effort to educate youth about osteoporosis so that they have an opportunity to achieve and maintain optimal peak bone mass and reduce the risk of osteoporosis later life. The NOF health initiative is the driving force for this EBP project to educate young adult collegiate females about osteoporosis to provide the opportunity to achieve a more optimal peak bone mass.

Statement of Problem Specific to Young Adult Females

To further comprehend the clinical problem, an assessment of collegiate females' bone health prior to attainment of peak bone mass needed to be addressed. Specific risk factors that predispose young adult females to osteoporosis must be defined and assessed through current literature. The female population is of interest because post-

menopausal women report the majority of the osteoporosis cases reported (Reginster & Burlet, 2006). Some non-modifiable risk factors specific to females are gender and frame size, as women tend to have smaller frames than men (Mayo Clinic, 2012). To delay and/or prevent post-menopausal osteoporosis, women must reach an optimal peak bone mass which occurs around the age of 20 to 30. Young women attain approximately 92% of bone mineral content by 18 years and 99% by 26 years (Harel et al., 2007). Although longitudinal or physiological growth is most rapid during early pubertal stages, bone accrual is greatest around menarche and continues in similar intensity several years after the physiological growth spurt. Osteoporotic prevention behaviors are lacking among young adult females for many reasons, but the most prominent reason is the lack of knowledge pertaining to preventative activities (Larkey, Day, Houtkooper, & Renger, 2003). The literature and clinical agency support of the EBP project will be discussed throughout this section.

Literature supporting the need for EBP project. Prior to the development of the EBP project, it was imperative to understand the reasons for poor bone health specific to young adult females. Young adult females are lacking in the recommended calcium and Vitamin D intake. They also have decreasing rates of bone mineral density for various reasons, such as hormonal contraception use and lack of exercise (Anderson, Chad, & Spink, 2005; Cromer et al., 2008). Health history of specific chronic diseases and medication usage can also lead to predisposition for development of osteoporosis. Some of the more prevalent reasons for poor bone health will be discussed in greater detail in this section.

Dietary. Calcium and vitamin D consumption is vital for bone mineral deposition. The main reason for lack of calcium intake is suspected to be directly related to body image disturbances and perception that prevention is not worthwhile (Chang, 2006). There is also a preconception that dairy products, which are the number one sources of

calcium, cause weight gain. Also Whitling et al. (2004) reported that females consume more soft drinks and juice compared to milk consumption. During the transition to young adulthood, mean daily calcium intakes of females is decreased by an average of 153 mg (Larson et al., 2009).Vitamin D, similar to calcium, is lacking within the diet. Many dairy products are fortified with vitamin D, and with decreased dairy consumption decreased vitamin D follows. While vitamin D intake is encouraged among young children because vitamin D deficiency results in Ricketts, the push for vitamin D intake subsides after childhood because there are no significant clinical symptoms as a result of vitamin D insufficiency (Harkness & Cromer, 2005). Poor eating habits and clinical eating disorders are also prevalent among young adult females (Ali & Siktberg, 2001). Skipping meals and eating disorders depletes the body of all nutrients including calcium and vitamin D. Lastly, another reason for poor intake of calcium and vitamin D can be seen among the lactose intolerant and/or vegetarian/vegan populations. The lack the knowledge of how to attain calcium and vitamin D other than within dairy or animal products is a main cause for poor nutrition (Kass-Wolff, 2004). Education on nutritional benefits of calcium and Vitamin D as well as adequate intake and sources of nutrients would be beneficial in addressing this risk factor.

Exercise. Lack of exercise and over-exercise can both increase risk of osteoporosis by decreasing bone mineral deposition. With the increased sedentary lifestyle of Americans, bone mineral densities have continued to decrease (Ali & Siktberg, 2001). Mechanic stress through weight-bearing exercises is known to strengthen bone density (Mayo Clinic, 2012). Unfortunately, high-impact weight-bearing activities, such as weight-lifting, are more commonly seen among males as compared to females. On the other end of the spectrum, over-exercise is evident in the female-athlete-triad (Ducher et al., 2011). The female-athlete-triad consists of a combination of low energy availability, menstrual disturbances, and low bone mineral density commonly

seen in collegiate athletes that strive for low bodyweight to enhance performance and body image. This health concern is very common among distance runners. Generally, the low bone mineral density goes undetected until the female seeks treatment for stress fractures. Education on the necessity for moderate exercise with balanced diets can improve this risk factor.

Hormonal. Decreased estrogen levels are known to decrease bone mineral deposition, evidenced by rapidly increasing incidence of osteoporosis among post-menopausal women. Within the young adult female population, there is evidence that lowered estrogen levels affect the bone mineral deposition as well. The female-athlete-triad menstrual disturbances result in depleted estrogen levels (Ducher et al. 2011). Similarly, use of hormonal contraception is very common among young adult females (Cromer et al., 2008). Research conducted by Cromer et al. (2008) found significant bone loss with progesterone only injection such as Depo-Provera. Bone loss was also evident in low-dose estrogen combined oral contraceptives. The push for lower estrogen contraceptives to protect against cancers, such as breast cancer, may be the increasing risk of osteoporosis. Education regarding the need for increased bone health promotion during the duration of usage of hormonal contraception can help improve this risk factor.

Concomitant factors. There are many other reasons to describe why young adult females have poor bone health, but only a few more will be discussed. First, teen pregnancy in the United States continues to increase and can greatly decrease bone mineral density. Bone loss is more significant in teen mothers because the fetus' demands for calcium compete with the ongoing needs of the adolescent and young adult for bone mineral accrual (Harel et al., 2007). Lactation further decreases mineral accrual; the loss of bone mineral accrual is thought to be irreversible in adolescents. Second, vitamin D deficiency is also a result of decreased sun exposure. Indoor sports are more common with fewer children playing outside, and the increased use of

sunscreen to prevent skin cancer inevitably decreases Vitamin D exposure increasing risk of osteoporosis (Harkness & Cromer, 2005). Third, excessive alcohol intake and smoking are two activities that decrease the absorption of calcium and vitamin D. Young adulthood is commonly a time to experiment, and alcohol intake and smoking increase during this time period (Larkey et al. 2003). After review of all reasons for poor bone health in adolescent and young adult females, it is evident that EBP is needed to increase osteoporosis knowledge and prevention behaviors to attain of optimal peak bone mass to decrease risk of development of osteoporosis later in life.

College location. A thorough analysis of literature unveiled research articles assessing the need for EBP within the college population for osteoporosis prevention. Ford, Bass, and Keathley (2007) studied osteoporosis knowledge and attitudes of college-aged females and males. The authors found that there was a lack in knowledge of calcium-rich foods as well as the need for increased consumption of calcium-rich foods. Ford et al. (2007) concluded that there needs to be guidelines developed and implemented in the form of educational programs designed to increase awareness of calcium-rich foods and other risk factors of osteoporosis. Similar to Ford et al. (2007), a study conducted by Kasper, Garber, and Walsdorf (2007) analyzed osteoporosis knowledge and health beliefs among college women more specifically. The results of the study provided evidence that there were gaps in young women's ability to identify risk factors for osteoporosis and lack of knowledge of susceptibility of disease. Kasper et al. (2007) also concluded that the results suggested that young women would benefit from educational programs concerning osteoporosis prevention.

Clinical agency supporting the need for EBP project. The project manager implemented the project within a college freshmen kinesiology course that focused on healthy lifestyles. The physical education class was the ideal clinical agency as the population within the class included young adult collegiate females with a majority of the

participants aged 18 years old. The physical education course had 12 separate class times with an average of 35 students enrolled in each class. Although classes included both genders, female data was the only pertinent information analyzed for the project. Maximum participation was projected to be around 210 females. It was suspected that the population would be consistent with the literature findings and lack knowledge of osteoporosis as well as osteoporosis prevention self-efficacy. To create a baseline assessment of knowledge, the participants completed the Osteoporosis Knowledge Test (OKT). Pre-intervention, they averaged a total score of 52.69%, which provided evidence that the participants were lacking knowledge about the risk factors of osteoporosis (52.71%), the nutrition aspects for prevention of osteoporosis (52.52%), and the exercises needed for prevention of osteoporosis (52.93%). Assessment of self-efficacy of prevention was accomplished with the Osteoporosis Self-Efficacy Scale (OSES). Baseline OSES results revealed higher than expected confidence levels with the total average score of 71.23%. With implementation of an educational intervention, it was hoped that knowledge and self-efficacy would be improved.

Purpose of the EBP Project

The purpose of the EBP project was to increase osteoporosis knowledge and improve self-efficacy of prevention by implementing an educational intervention with young adult collegiate females. Increased preventative behaviors with improved self-efficacy focused on increased calcium intake as well as increased frequency of weight-bearing exercises. To better comprehend the purpose of the EBP project, the compelling clinical question was assessed and broken down into the PICOT format.

Identifying the compelling clinical question. The project manager assessed the purpose of the EBP by identifying the clinical question as follows: In young adult collegiate females, how does an osteoporosis educational intervention compared to current education effect osteoporosis knowledge and self-efficacy of osteoporosis

prevention over a one-month time period? Assessment of literature focused on the need for bone health education within the young adult population for osteoporosis prevention.

PICOT format. To better comprehend the compelling clinical question, the project manager used the PICOT format to ensure all key components were addressed. The PICOT format was developed as an abbreviation for the following categories: the population of interest (P), the intervention of interest (I), the comparison of interest (C), the outcome to be assessed (O), and timeline for intervention (T) (Fineout-Overholt & Stillwell, 2011). Each of the key components was addressed to guide the EBP project:

P – The population of interest defined by the EBP project was young adult collegiate females, age 18 to 24 years. For the convenience sample, the project manager used a freshman kinesiology course which focused on healthy lifestyles. It was projected that there would be a potential maximum of 210 female participants. With the educational intervention being provided as extra credit, participants were limited to 84 females in attendance with 60 participants whom provided data. The freshmen course included students with the majority age being 18 years of age which would be prior to peak bone mass attainment (Harel et al., 2007).

I – Intervention of interest was an in-service osteoporosis educational intervention. The project manager implemented a formal educational intervention within the 50-minute allotted class time. The intervention consisted of a slide show guided by NOF recommendations, group discussion, and provision of NOF take home materials.

C – The comparison of interest was current osteoporosis education and/or knowledge. This was assessed through pre-test/post-test evaluation for osteoporosis knowledge and self-efficacy of prevention.

O – The measured outcomes were osteoporosis knowledge and self-efficacy of osteoporosis prevention. The measurement tools that were utilized were the OKT and OSES (Horan, Kim, Gendler, Froman, & Patel, 1998; Kim, Horan, Gendler, & Patel, 1991). The project manager received copyright permission for the OKT and OSES prior to implementation and publication of tools.

T – The EBP took one month for completion including implementation and completion of data collection. One-week prior to intervention, the project manager asked the potential participants to complete demographic data and pre-test data. The intervention took place over a two week span to meet with all 12 classes. Post-test data was collected immediately after the intervention, within 48 hours, and then again three weeks post-intervention to assess recall of information.

Significance of Project

The EBP project aimed to improve osteoporosis knowledge and self-efficacy of prevention. The project manager hoped that the participants who completed the educational intervention would have increased knowledge and self-efficacy not only immediately but long-term. The significance of the project long-term would be to delay onset of osteopenia and osteoporosis as well as decreased incidence of osteoporosis. Successful implementation of the intervention has the potential to make a lasting change on the curriculum for the health promotion kinesiology course. The project manager hoped that the educational intervention would continue to be implemented indefinitely to educate college students of osteoporosis and ways to decrease risk for osteoporosis later in life. Although the focus of the project was on the collegiate female population, the male students were also subjected to the educational intervention but data was not measured or analyzed. Although data was not measured for males, it was still projected

that both genders improved osteoporosis knowledge and gained self-efficacy of prevention after attendance at the intervention.

CHAPTER 2

FRAMEWORKS AND REVIEW OF LITERATURE

Frameworks are essential for the basis of research and EBP. A thorough review of the frameworks, health belief model (HBM) and the ACE Star model, chosen to guide the EBP project was provided throughout this chapter. The details of the review of literature that was conducted to support the EBP project will also be provided within this chapter.

Theoretical Framework: Health Belief Model

Description of HBM. The HBM was utilized as a guide for the EBP project. The HBM originated in the 1950s and 1960s with the works of Hochbaum and Rosenstock who both were social psychologists. Initially, the HBM was established to better understand why people failed to participate in behaviors that promoted health and prevented illness, essentially those people who failed health promotion. The HBM is considered a value-expectancy based theory that relies on the personal perceptions of individuals; whereas, the value is the desire to prevent illness or get well, and the expectancy is belief that a certain action will prevent illness or improve health (Champion & Skinner, 2008). For this reason, the HBM was chosen to promote osteoporosis prevention by improving knowledge and self-efficacy of prevention. The components of the HBM were assessed to predict whether or not participants would take action to prevent osteoporosis. Throughout the evidence, many authors have chosen to implement the HBM as a guide for research in osteoporosis prevention (Chan, Kwong, Zang, & Wan, 2007; Nieto-Vazquez, Tejeda, Colin, & Matos, 2009; Sedlak, Doheny, & Jones, 1998; Sedlak, Doheny, & Jones, 2000; Werner, 2005).

To thoroughly grasp the ideas of HBM, comprehension of the basic components is a necessity: a) perceived susceptibility, b) perceived severity, c) perceived benefits, d)

perceived barriers, e) cues to action, and f) self-efficacy (Champion & Skinner, 2008). Perceived susceptibility is the individual perception of risk for developing a certain health condition. Perceived severity refers to the perception of the seriousness of the disease and whether or not it would be necessary to prevent or treat. Perceived benefits are the individual's beliefs that the proposed action(s) will effectively and efficiently reduce the risk of developing a disease or lessen the seriousness of a disease. Perceived barriers are the determined costs both tangible and psychological of accepting the proposed action(s). Champion and Skinner (2011) offer the definition for cues to action as "strategies to activate readiness" (p.48). Lastly, self-efficacy is defined as "confidence in one's ability to take action" (Champion & Skinner, 2011, p.48). Self-efficacy was not originally specified as a separate construct of the HBM. In 1988, Rosenstock, Strecher, and Becker determined the need for self-efficacy as a construct to better assess complex behaviors of humans regarding their health choices.

Application of the HBM. Each of the constructs will be applied within the EBP project: a) perceived susceptibility, b) perceived severity, c) perceived benefits, d) perceived barriers, e) cues to action, and f) self-efficacy. Within this EBP project, the perceived susceptibility was addressed by discussing the college females' belief in risk for developing osteoporosis later in life. Within discussion, the participants were educated on the consequences of osteoporosis including physical, social, and emotional factors to highlight severity of the chronic disease. Some osteoporotic consequences that were addressed were slumped frame, shortened stature, fractures, morbidity, and mortality. The EBP project manager assessed the participants' current knowledge of osteoporosis and osteoporosis prevention to further prepare education about the risk factors to address within the intervention. Education of risk factors and prevention activities aimed to increase the participants' knowledge of benefits to improve perception of benefits. Assessment of self-efficacy of prevention also allowed the project manager

to evaluate participants' beliefs in benefits of action. The participants were asked to change lifestyle behaviors within the EBP project to further prevent osteoporosis, such as increase calcium and Vitamin D intake, encourage weight-bearing exercises, decrease alcohol and tobacco usage, and enhance awareness of risk factors. During college years, it is commonly a time to experiment with tobacco products and alcohol. Participants reported their resistance to change the following behaviors: consuming alcohol, using tobacco products, and lacking exercise regimens, as a barrier for osteoporosis prevention. Self-efficacy within the EBP was defined as the confidence one has to carry out osteoporosis prevention such as increase calcium intake and weight-bearing exercises. Within the EBP project, the project manager encouraged participation in preventative behaviors by providing brochures on how to calculate calcium intake along with other take home educational material from the NOF. The take home material served as a reminder and a cue to action for the participants.

Strengths and limitations of the HBM. The HBM adequately served as a framework of the proposed EBP project because the aim of the presentation is focused on increasing knowledge and self-efficacy for prevention of osteoporosis. The project manager hoped to increase knowledge and self-efficacy of osteoporosis prevention, which would translate to increased health promotion. As discussed in Chapter 1, young adult females are lacking good bone health promotion. It was found that young adults have an invincibility preconception that may create a barrier to accepting change to improve bone health for later life, but throughout the literature, it was found that the HBM implemented along with education has helped breakdown such a barrier. The constructs of the HBM allowed the project manager to address individual perceptions within the educational intervention to more specifically encourage lifestyle changes. The HBM has been used throughout the literature as a way to predict behavior, but limited research is available for the use of the model specifically within the intervention. However, those

studies that included the HBM within the prevention intervention provided promising results (Chan et al., 2007; Sedlak et al., 1998; Sedlak et al., 2000). Osteoporosis is much more common in persons over the age of 50; therefore, the severity of the disease was difficult for the young adults to grasp because they have many years prior to turning 50. The perceived severity was a weak construct for the majority of the participants.

Evidence-Based Framework: The ACE Star Model

Description of ACE Star model. After thorough assessment of potential frameworks for the EBP project, the ACE Star model was chosen to guide the development of EBP with the project. The acronym for the premise of ACE is *A*cademic *C*enter for *E*vidence-Based Practice. The ACE Star model was established in 2000 at the University of Texas, San Antonio, with the aim to understand the cycles, nature, and characteristics of knowledge that is used in various aspects of EBP. The goals of ACE are improving patient outcomes, care, and patient safety (Stevens, 2004). The ACE Star model is depicted as a star with five points; whereas, each point indicates one of the five phases in the development of EBP. The five phases are as follows: a) discovery of research, b) evidence summary, c) translation to guidelines, d) practice integration, and e) evaluation. The project manager plans to progress through the phases of the ACE Star model to develop EBP. Once all five phases are complete the final outcome would be the development of evidence-based quality improvement of health care. Each phase is discussed below.

Discovery of research – Within the initial phase of the ACE Star model, discovery of research is defined as the assessment of knowledge through generalized searching methods (Stevens, 2004). The generalized search is aimed to determine a need for EBP. Conducting a pilot study is also encouraged.

Evidence summary – Within the evidence summary phase, the literature retrieved from the discovery of research phase is narrowed and synthesized into

a usable amount. Along with the discovery of research, the evidence summary phase is also deemed to be a knowledge generating phase (Stevens, 2004). Assessment of literature can highlight limitations and guide needed alterations to the EBP development. The evidence summary phase also determines whether or not the findings within the literature can be reproduced. The aims of the evidence summary phase are as follows: a) reduce extensive literature to manageable form, b) establish generalizability, c) determine consistencies and explain inconsistencies, d) promote cause and effect relationship, e) reduce bias, f) support clinical care decision-making, g) increase time of implementation, and h) provides basis for new knowledge integration.

Translation to guideline – The translation to guideline phase is established to further utilize the synthesize data into a meaningful statement to create appropriate guidelines. The guideline must provide a useful and relevant synthesis of evidence that suits time, cost, and standard of care (Stevens, 2004).

Practice integration – The practice integration phase is considered the most familiar stage in healthcare because the requirements of practice to be based on current literature (Stevens, 2004). Within this phase of EBP development, the innovation is implemented, which requires practice changes through formal and informal channels. The rate of adoption is assessed within the phase as well as factors that affect the integration of change. Within this phase, the feasibility of integration is also assessed to determine whether or not it could be implemented into standard practice.

Outcome evaluation – Lastly, the integration of the osteoporosis educational program was evaluated to determine outcomes as well as any changes that would benefit the program (Stevens, 2004). Areas commonly addressed within

this phase include patient health outcomes, provider and patient satisfaction, efficacy, efficiency, economic analysis, and health status impact.

Application of the ACE Star model. Congruent with the goal of the ACE Star model, the project manager planned to increase patient outcomes and patient safety with the acceptance of osteoporosis prevention by healthy lifestyle changes.

***Discovery of research*.** Initially, the project manager generated knowledge through a generalized literature search. Once the generalized need for EBP was determined, the project manager continued the literature search to identify a more specific need. The project manager focused attention on college freshman females with the need for an educational intervention to promote osteoporosis knowledge and self-efficacy of prevention. With utilization of multiple databases, the project manager ensured saturation of evidence to strengthen osteoporosis EBP project. Within the first phase, the project manager conducted broad searching to determine whether or not the need exists for EBP of osteoporosis education in college freshmen females. A pilot study was not conducted due to time constraints of the project.

Evidence summary. The project manager narrowed and synthesized the literature into one meaningful statement (Stevens, 2004). Throughout the summarization and analysis of findings as well as comprehension of limitations, the project manager determined needed alterations for the proposed EBP project. All parts of this evidence summary phase worked together to appropriately synthesize data to create evidence for osteoporosis education interventions with freshman college females. Inclusion and exclusion criteria were established to finalize the narrowing of literature.

Translation to guideline. After a thorough literature search had been conducted and literature had been synthesized into one meaningful statement, the project manager utilized the evidence to develop the following guideline: an educational intervention for college freshman females. The project manager assessed the literature to determine

recurring themes for educational interventions to establish the most appropriate educational intervention to reproduce the wanted results. The common themes encountered were interventions conducted in-person with the use of a slide show presentation that included NOF recommended guidelines as well as group discussion and provision of take home materials. The recurring themes will be discussed in greater detail in chapter 3.

***Practice Integration*.** Once the educational program was constructed, it was implemented to measure whether or not the desired outcomes of increased osteoporosis knowledge and improved self-efficacy of prevention was reached. Although there was evidence that promotes the benefits of an educational intervention, the project manager implemented and assessed the innovation to determine the most current evidence. The project manager integrated the project within a collegiate freshman kinesiology course that focused on healthy lifestyles and physical activity. Therefore, the project was congruent with the course curriculum and could be incorporated for years to come.

Outcome Evaluation. Within the outcome evaluation phase, the project manager assessed the impact of the EBP on the following: a) patient health outcomes, b) provider and patient satisfaction, c) efficacy, d) efficiency, e) economic analysis, and f) health status impact. For efficacy and efficiency, the project manager implemented the project within the normal allotted course time. To ensure adequate time, participants were asked to complete demographic forms and pre-tests a week prior to educational intervention. The patient health outcomes were measured by assessing the increased knowledge of osteoporosis through the Osteoporosis Knowledge Test (OKT). Self-efficacy was assessed with the Osteoporosis Self-Efficacy Scale (OSES). The post-tests addressed immediate recall of information within 24 to 48 hours after intervention as well as three weeks after for recall of information. The quality improvement that was proposed was for decreased incidence of osteoporosis.

Strengths and limitation of the ACE Star model. There were strengths and limitations of the ACE Star model for the project. The ACE Star model was an appropriate model for the osteoporosis educational intervention with collegiate freshmen females. The five phases allowed for the project manager to move from one phase to the next, ensuring that the appropriate process of EBP development was being conducted. Stevens (2004) summarized each phase which assisted the project manager to incorporate the osteoporosis EBP project within each phase. However, within phase 1, discovery of research was detailed as an assessment of results from a single study, but instead within the project discovery of research was accomplished with the assessment of relevant literature found within databases. Initially, the need for EBP for osteoporosis prevention was discovered during retrieval of literature assessing osteoporosis health promotion among young adults. Therefore, a limitation of the ACE Star model is the lack of pilot study. Another limitation that was noted can be found in completion of phase five because assessment of participant satisfaction was not conducted. Overall, the model fits the EBP project, but it was not without limitations.

Literature Search

Generalized literature searches were conducted to determine the most appropriate existing current literature, which is part of the initial phase of the ACE Star model with discovery research. Once the need for EBP was established, the project manager was able to develop the PICOT question which structured the literature search: In young adult collegiate females, how does an osteoporosis educational intervention compared to current education affect osteoporosis knowledge and self-efficacy of osteoporosis prevention over a one-month time period? The project manager will discuss the literature search process including search engines and keywords, identification of inclusion and exclusion criteria, classification evidence into levels

depending of strength of literature, and appraisal of selected literature in the sections to follow.

Search engines and keywords. A review of literature was conducted by use of a university's online databases and citation chasing as well as with the assistance of a university librarian. Initial search was to determine whether or not best practice already existed in the area of interest of an educational intervention to promote osteoporosis knowledge and self-efficacy of prevention with young adult females. Neither search within Cochrane Collaboration and Library or Joanna Briggs Institute Clinical Online Network of Evidence for Care and Therapeutics (JBI ConNect) resulted in current EBP guidelines or systematic reviews. Literature search was extended to Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline via EBSCO, and ProQuest Nursing and Allied Health Source. Interlibrary loan provided by the university was also utilized to retrieve unavailable literature. Keywords used within the literature search were osteoporosis; educat* intervention and program* separated by the Boolean operator OR; and knowledge, prevent*, and self-efficacy all three separated by the Boolean operator OR. Keywords were searched within the entirety of peer-reviewed journal articles within CINAHL, Cochrane, and Medline; whereas, in ProQuest osteoporosis and educat* intervention OR program* was narrowed within the abstract of the peer-reviewed journal articles. Due to limited results, JBI was assessed with the sole keyword of osteoporosis. The project manager expanded the literature search with GoogleScholar to retrieve dissertations or theses, which rendered two graduate works. Citation chasing was also employed to retrieve one study.

Inclusion and exclusion criteria. The search results were narrowed to further assess the literature for pertinence with the proposed PICOT question. Inclusion criteria requirements were determined to ensure appropriate material could be found within the literature. Literature results must be compromised of the following: a) peer-reviewed, b)

published in English-language from 2000 to 2013, c) involving in-service educational intervention, d) research, e) population including young adult participants (18 to 24 years), and f) measured outcomes of osteoporosis knowledge and/or self-efficacy of prevention. One article written in 1998 was included after citation chasing as it was mentioned throughout the current literature as the initial testing of osteoporosis prevention among college students.

After review of abstracts, exclusion criteria limitations were set. References were chosen for elimination for the following factors: a) focused on school-age children, b) focused on post-menopausal population, c) focused on high-risk populations, d) focused on pharmaceutical interventions for prevention, and/or e) focused solely on male population. After inclusion and exclusion criteria were established, references were narrowed and abstracts were reviewed for pertinence within the proposed osteoporosis EBP project. Relevant articles were assessed for appropriate citations for citation chasing.

Literature search began with a board review within the databases which resulted in 374 potential relevant results. After skimming through the article titles, the number of articles up for review was greatly decreased to 60 potential articles. Initial results narrowed by abstract review resulted in 24 articles. After second reading of the abstract and first full-text review, articles were narrowed to 14 for relevancy. After multiple full-text appraisals as well as assessment for inclusion criteria and exclusion criteria, the project manager was able to narrow literature to 10 relevant articles for the osteoporosis EBP project. Six of the 14 discarded articles did not include an assessment of either osteoporosis knowledge or self-efficacy of osteoporosis prevention. Due to focus on older adults primarily, high-risk adult populations, or male populations six articles were removed. Lastly, two of the initially retrieved articles focused attention on theoretical and model testing and lacked testing for knowledge and/or self-efficacy. The respective

databases for included literature are as follows: three from Cochrane trials, three from CINAHL, one from ProQuest, one from Medline, and two theses from GoogleScholar. Of the 10 articles, there was one graduate systematic review thesis, three randomized control trials (RCTs), four quasi-experimental studies, one graduate quasi-experimental thesis, and one literature review.

Levels of evidence. To ensure saturation of evidence, the project manager used Melnyk and Fineout-Overholt's (2011) to assess and rate the selected articles. The hierarchy of evidence has seven separate levels. Of the seven levels, level I, II, III, and V are represented within the qualified articles for the EBP project. Level I evidence represents evidence that is the form of a systematic review or meta-analysis of quantitative research. Evidence within well-designed RCTs is placed within the level II evidence category. Level III evidence signifies well-controlled trials without randomization, which would embody the quasi-experimental studies within the literature search. Level V evidence consists of reviews of descriptive studies. Of the 10 articles selected from the literature search, one qualified for level I evidence, three for level II evidence, five for level III, and one for level V.

Appraisal of relevant evidence. Much research has been conducted upon osteoporosis educational programs; however, the general focus in the past has been with adolescence and older adults. There has been a recent push to better understand and educate the young adult population. The similarities among the different educational programs throughout the literature were vast; however, unfortunately no one program was exactly the same. The most common theme noted is the use of a slide show presentation with group discussion as a major aspect of the educational program among a convenience sample of college students. The 10 chosen articles were assessed according to Melnyk and Fineout-Overholt (2011) within the following section. Summary grid of relevant evidence is provided (See Appendix A).

Level I evidence. Level I evidence is categorized as a systematic review or meta-analysis of experimental studies. Of the 10 articles, there was one that qualified for level I. Franzen (2011) conducted a systematic review as part of a bachelor degree thesis. The purpose of the systematic review was to collect evidence-based research, analyze, and evaluate the effectiveness of an osteoporosis education intervention for young women. A literature search was conducted with the electronic databases of CINAHL, ScienceDirect, PubMed, and GoogleScholar with the timeline for publication 2000 to 2010 in the English language. Key terms were identified: a) osteoporosis education, b) intervention, c) adolescence, d) young adult women, and e) young women. The inclusion criteria requirement was determined to be studies with experimental pre-test/post-test designs within the adolescent or young adult population. Exclusion criteria limitations were defined as pharmacological intervention or participants with chronic diseases, taking weight loss medication, having hearing or vision difficulties, or pregnant. After appraisal with inclusion criteria, exclusion criteria, and full-text reading, Franzen (2011) narrowed the literature to seven chosen studies.

Of the seven selected studies, three were RCTs, and four were quasi-experimental. The total population among the seven studies was 1,292 women with the age range of 14 to 48 years. The main focus of all seven studies was the measurement of osteoporosis knowledge and prevention behaviors. As part of the inclusion criteria, all studies were pre-test/post-test format. Franzen (2011) identified that the studies were all short-term with assessment of post-tests ranging from eight weeks, four weeks, three weeks, two weeks, and same day after intervention. The educators across the studies were identified with differing professions such as nurses, physicians, physical therapists, and social workers.

Interventional content presented these common themes: osteoporosis diagnosis, risk factors, prevention, and treatment. However, Franzen (2011) also identified another

common theme of presenting information specific to the effects of osteoporosis on a woman's body. Group lecture, seminar, and slide show presentation were included within the intervention method of all included studies. Take home materials such as brochures, booklets, and pamphlets were also provided within a majority of the studies. Many different tools were identified throughout the literature review: a) OKT, b) osteoporosis behaviors survey (OBS), c) OSES, and d) osteoporosis health belief scale (OHBS). A few of the studies developed their own instruments to measure knowledge and health belief. Overall, Franzen (2011) stated that all of the studies provided significant results with the improvement of knowledge. Five or the seven studies provided evidence of improved health-related osteoporosis behaviors. The results of the intervention were not calculated to determine the treatment effect or the precision of the intervention. Although there was only one systematic review, the inclusion of such literature strengthens the evidence. The project manager discussed level II evidence within the next section.

Level II evidence. Level II evidence consists of single RCTs, which represented three of the 10 studies included in the literature review. The first RCT to be discussed was Nieto-Vazquez et al. (2009), whom conducted a RCT with a two-group pre-test/post-test format. The purpose of the RCT was to determine the effects of an osteoporosis educational program on knowledge, health beliefs, and self-efficacy among college-aged Puerto Rican women. The theoretical framework for the study was based on the HBM and the Purnell model of cultural competency. The study took place in a public university in the eastern Caribbean. Power analysis was conducted to ensure adequate amount of participants. It was determined that 105 participants would be needed. With a convenience sampling method, 118 participants were attained and randomly assigned to either the treatment group or the control group. Of the 118 participants, 13 were removed due to missing data on either the pre-test or post-test,

which resulted in 51 subjects in the treatment group and 54 in the control group. Completion rate was 89%. Age of participants ranged from 18 to 25 years. Approval from Barry University Institutional Board Review (IRB) as well as local IRB was obtained prior to conduction of research. Informed consent was obtained from all participants.

Participants in the treatment group initially completed the following pre-tests: a) OKT, b) OHBS, and c) OSES. Same tools were used as the post-tests four weeks following the educational intervention. Cronbach's alpha scores were assessed for pre-test and post-test of each tool (OKT: 0.51-0.60; OHBS: 0.74-0.80; OSES: 0.92-0.94). Nieto-Vazquez et al. (2009) did not explicitly discuss the method or the duration of the educational intervention. However, they provided an outline of the in-service presentation based on the NOF guidelines: a) define bone mass density, b) identify osteoporosis risk factors, c) distinguish the importance of maintaining bone health, and d) identify strategies and the importance for prevention of osteoporosis.

Nieto-Vazquez et al. (2009) set three outcome hypotheses for the study. Women who attend an osteoporosis educational intervention compared to women who do not attend will have significantly higher knowledge measured by the OKT, significantly more positive health beliefs measured by the OHBS, and significantly higher level of self-efficacy measure by the OSES. Statistical analysis was conducted with an ANOVA with statistically significant results having a *p* value of less than 0.05. With regard to the pre-test and post-test of OKT and OHBS within the treatment group, there was significant improvement ($p = 0.38$; $p = 0.49$). The OSES did show slight improvement in the treatment group; however, it was not significant ($p = 0.32$). Analysis of pre-test to post-test of the control group did not show any significant improvement.

The second RCT was conducted by Piaseu, Belza, and Mitchell (2001). The RCT was completed to test the effectiveness of an osteoporosis educational program within the young women population. The experiment was set-up as a two group pre-test/post-

test design. Post-test was assessed two weeks following the intervention. Convenience sampling was used to attain participants from a pool of first-year nursing students in a university in Thailand. Population was all women with ages ranging from 17 to 21 years. One hundred participants were collected and randomly assigned using a table of random numbers to either the treatment group (n = 50) or the control group (n = 50). IRB approval was obtained from University of Washington. All participants signed informed consent voluntarily.

Pre-tests and post-tests both consisted of OKT, OHBS, and OSES. Cronbach's alpha was conducted for all tools including pre-test and post-test (OKT: 0.40-0.86; OHBS: 0.82-0.95; OSES: 0.94-0.96). Initially within the treatment group, demographic data and pre-test were obtained. The educational intervention lasted three hours and consisted of instructional material, slide show presentation, calcium-rich foods served, and demonstration of weight-bearing activities. Outline of presentation included: a) osteoporosis risk factors, b) potential consequences of osteoporosis, and c) strategies for osteoporosis prevention.

Outcomes were assessed to determine significant improvements between pre-test and post-test of the treatment group compared to that of the control group. Within the knowledge test, there are three categories: risk factors, exercise, and calcium. The overall score for the OKT as well as subsets for pre-test to post-test within the treatment group was significantly increased with a *p* value less than 0.001. Overall score and subsets, perceived susceptibility, seriousness, benefits of exercise, barriers of exercise, barriers of calcium, and health motivation of the OHBS were also assessed. With comparison of pre-test to post-test within the treatment group, results were significant ($p < 0.001$ for all categories). Lastly, the OSES as well as specific components of the OSES, confidence in exercise and confidence in calcium intake, were found to be significantly improved ($p < 0.001$ for all categories). All outcomes with comparison of pre-

test to post-test within the treatment group were significant with a *p* value less than 0.001. Piaseu et al. (2001) did not display raw data of results. Analysis of pre-test to post-test within the control group was not found to be significant across all three tools.

The final RCT to be discussed was conducted by Sedlak et al. (1998) to assess whether young women who have participated in an osteoporosis prevention program would have higher levels of osteoporosis knowledge compared to those that did not attend. The design for the research was a RCT with a two group pre-test/post-test format with post-tests being collected three weeks after the intervention. The HBM and Bandura's self-efficacy models were the frameworks on which Sedlak et al. (1998) based the research and the intervention. The study took place at a large Midwestern state university where a convenience sample of college-aged women enrolled in a freshman pre-nursing course was obtained. Initially 63 participants were obtained; however, due to attrition a total of 31 completed the study. Scheduling conflicts, lack of follow-up, and inability to contact regarding follow-up contributed to the attrition rate. The participation rate was 49%. All 63 of the initial participants were randomly assigned to either the control group or the treatment group. Of the 31 remaining, they accounted for 13 of the control group and 18 of the treatment group. Majority of the participants were 8 to 19 years of age and were in either their freshman or sophomore year in school. There is no mention of IRB approval or informed consent.

Participants who were randomly assigned to the treatment group were subject to the educational intervention. The educational intervention consisted of three separate meetings with the researcher for pre-test, intervention, and post-test. Pre-tests and post-tests were the OKT, OHBS, and OSES. The educational intervention was based on a NOF prevention program. Duration of intervention was not noted. Sedlak et al. (1998) presented a slide show presentation as well as provided the participants with

instructional materials. Calcium-rich foods and weight-bearing exercise demonstrations were also offered to participants during the interventional meeting.

Outcomes were assessed according to the measurement tools as well as the purpose of the study. With regard to the OKT, it was reported that on average the treatment group scored five points higher from pre-test to post-test than those in the control group who scored approximately one point higher. Although raw data was not provided for the reader, the authors stated that the participants in the treatment group had significantly higher knowledge of osteoporosis compared to those in the control group ($p < 0.001$). Same held true for the OHBS, those who attended the educational intervention had significantly higher health beliefs ($p < 0.001$). The OSES results were considered not significant. Analysis of pre-test to post-test among the control group found no significant results. That concludes the discussion of the included RCTs, within the next section the project manager appraised the level III evidence.

Level III evidence. Level III are studies in which interventions are employed but lack randomization of sample. The project manager reported five of the ten chosen articles within this category. The first level III evidence was published by Bohaty, Rocole, Wehling, and Waltman (2008). The researchers utilized a quasi-experimental design with a one-group pre-test/post-test format. The purpose of the research was to test the effectiveness of an educational program to increase dietary intake of calcium and vitamin D. The framework for which the research was based was Bandura's self-efficacy model. The recruitment of the sample was obtained from a fitness center in Nebraska, a hairdressing school in Nebraska, and a daycare in Iowa. Convenience sampling provided the authors with 80 women who met the inclusion criteria requirements: a) 19 to 30 years old, b) not pregnant or breastfeeding, and c) English literate. IRB approval was obtained from the University of Nebraska Medical Center. All participants provided written informed consent for study.

The instruments used for pre-test and post-test for the intervention measurement was a knowledge test constructed by Bohaty et al. (2008). The tool was a 20-item true/false design titled *Facts on Osteoporosis.* The Cronbach's alpha was calculated as a 0.7043. For measurement of dietary intake of calcium and vitamin D, the authors used a 3-day dietary recall and calculated intake with the Nutritionist Five software. During the intervention, participants met for a 45 minute slide show presentation. Outline of slide presentation is as follows: a) importance of calcium and vitamin D in prevention of osteoporosis, b) risk of osteoporosis for young women, c) strategies for increasing daily calcium and vitamin D intake, and e) calcium and vitamin D food choices for the lactose intolerant and vegetarian. After the slide show presentation, group discussion ensued. Participants were provided with a packet of take home materials including a handout from the NOF. Two weeks following the intervention, participants received a follow-up phone call. Post-test were obtained eight weeks following the initial intervention.

Outcomes were assessed according to the aims that were set prior to the conduction of research. The first aim was to determine changes in women's osteoporosis knowledge from pre-test to post-test. Women had significantly higher osteoporosis knowledge scores post-intervention ($p < 0.01$). The second aim of the study was to compare intake of calcium from pre-test to post-test. There was no significant change from pre-intervention to post-intervention ($p = 0.38$). Comparison of vitamin D intake from pre-test to post-test was the third aim. Once again, there was no significant change from pre-intervention to post-intervention ($p = 0.72$). Lastly, Bohaty et al. (2008) assessed the intake of dairy products from pre-test to post-test. No significant change was noted ($p = 0.14$).

The second level III appraised evidence was performed by Chan et al. (2007). The researchers conducted a quasi-experimental study with a two-group pre-test/post-test format. The purpose of the study was to examine the effectiveness of an

osteoporosis education program within young adults. The HBM was used as a guide for the research. The recruitment of participants was conducted with the use of an announcement and notice board. Participants' ages ranged from 18 to 23 years. Seventy-one percent of the participants were females. A power analysis was conducted to determine an adequate number of participants. It was determined that a total of 46 participants were needed with 23 in both the control and the treatment group. Convenience sampling used to retrieve the exact number of 46 participants. One participant was lost due to refusal to partake in educational intervention, which left 23 in the control group and 22 in the treatment group. IRB approval and informed consent were not mentioned.

Pre-tests were initially completed by all participants. The pre-tests and post-test were the same tools: OKT, OHBS, and OSES. The intervention consisted of three sessions of approximately two hours in length. The content validity of the program was determined by a panel of experts as 0.83. The outline of the presentation focused on osteoporosis facts, prevention of osteoporosis, diagnosis of osteoporosis, and treatment of osteoporosis. The presentation style was not explicitly mentioned. After completion of all three sessions, the post-tests were collected three and six weeks after initial meeting.

Outcomes were assessed for each subscale within the three tools. There was significant improvement across all three tools as well as subscales from pre-test to post-test of the treatment group ($p < 0.001$). The subscales for the OKT were risk factor, exercise, and calcium. With regard of the OHBS, susceptibility, seriousness, benefits of exercise, benefits of calcium intake, barriers to exercise, barrier to calcium intake, and health motivation are the subscales. OSES has two subscales of self-efficacy of exercise and self-efficacy of calcium intake. No significant change was seen within the control group from pre-test to post-test.

Rodzik (2008) conducted the third level III evidence with completion of a quasi-experimental study as part of graduate work for a master's thesis. The purpose of the study was to assess the effectiveness of an osteoporosis educational program on knowledge of osteoporosis prevention and level of self-efficacy. The framework chosen to guide the study was Bandura's social cognitive theory (SCT). The study was set-up as a two-group pre-test/post-test design. Post-test data was collected on the same day of the intervention. IRB approval was obtained from Eastern Michigan University's College of Health and Human Services. Convenience sampling at a Midwestern community college was used to obtain 149 participants. All 149 signed the informed consent, but only 138 completed the study with a participation rate of 92.6%. Participants were college females ranging in age from 18 to 48 years. Older than 18 years of age and can speak English were the inclusion criteria set for the participants. Exclusion criteria requirements did not allow those who had already participated in an osteoporosis education program or currently diagnosed with osteopenia or osteoporosis.

Prior to the intervention, all participants completed the pre-tests. Pre-tests and post-tests both utilized the OKT and OSES. The intervention consisted of slide show presentation that focused on identification of osteoporosis risk factors, consequences of osteoporosis, and strategies of osteoporosis prevention. The complete study was conducted in approximately 30 minutes time. Rodzik (2008) allowed 15 minutes for the participants to complete both pre- and post-tests, which left 15 minutes for the presentation.

The measurement of outcomes was based on a p value of 0.05 for significance. Measurement of knowledge was assessed with the OKT, and significant improvement was seen from pre-test to post-test ($p < 0.05$). Rodzik (2008) assessed ethnic differences as well as age ranges and found that the results from pre-test to post-test were all significant independent of demographical data ($p < 0.05$). The OSES provided

significant improvement in both subscales of calcium intake ($p < 0.05$) and exercise ($p < 0 .05$). Demographical data was also analyzed with the OSES, and the results remained significant from pre-test to post-test ($p < 0.05$).

The next article to be discussed was conducted by Sedlak et al. (2000). A quasi-experimental study with a three-group design in which all three groups received a slightly different osteoporosis educational intervention was conducted. Pre-tests and post-test were collected in all three groups. The purpose of the research was to increase knowledge of osteoporosis, increase health beliefs, and increase osteoporosis prevention activities. The research was guided by the HBM. The three separate groups were determined by the participants' readiness to learn. The three groups were intense, intermediate, and brief. The intense group ($n = 31$) consisted of young college women with the average age under 25 years. A community sample with the age range of 22 to 83 years were placed in the intermediate sample ($n = 35$). Lastly, the brief group ($n = 18$) contained nurses with an average age range of 35 to 45 years. Sedlak et al. (2000) do not mention IRB approval or informed consent.

Prior to participation in one of the three interventions, all subjects completed the pre-tests, which were the OKT, OHBS, and Osteoporosis Preventing Behaviors scale (OPBS). Same tools were used 3 weeks post-intervention to assess change. The premise of all three programs was basically the same, but the intensity and duration of meetings differed according to the participants' readiness to learn. The intense group met for three sessions over a three week period and had assignments to complete in between sessions. The intermediate group met one time for approximately three hours. Lastly, the brief group met one time for a 45 minute session. The content within the three programs all contained NOF instructional materials and slide show presentation. The outline of the intervention content included osteoporosis risk factors, diagnosis of osteoporosis, osteoporosis prevention strategies, and treatment of osteoporosis. The

presentation was focused on parts of the HBM to such as barriers to prevention and susceptibility of osteoporosis.

Outcomes were compared from pre- to post-intervention within all three groups. The impact of knowledge was measured with the OKT. Within all three groups, osteoporosis knowledge was significantly improved (intense $p < 0.001$; intermediate $p < 0.01$; brief $p < 0.001$). The OHBS was used to measure the impact of the intervention on health beliefs. The measurements were assessed within each of the subscales of susceptibility, seriousness, benefits of exercise, benefits of calcium intake, barriers to exercise, barrier to calcium intake, and health motivation. The only significant improvement was seen within the intermediate group with regard to belief of benefits of calcium intake ($p < 0.05$). Lastly, the OPBS was used to analyze a change in osteoporosis prevention behaviors, specifically caffeine consumption, calcium intake, and weight bearing exercise. Once again there was only one significant finding seen within the intense group with a decrease in caffeine consumption ($p < 0.05$).

Lastly, Zhang, Li, Wang, Guo, and Guo (2012) analyzed the effectiveness of a targeted continuing osteoporosis educational intervention and assessed the awareness of osteoporosis in college-age females. The study design was quasi-experimental with a one-group pre-test/post-test format. No theoretical framework was discussed. The study took place in a city in northwest China. Recruitment of sample was accomplished through convenience sampling Chinese technical/professional pre-internship nursing students. A total of 256 females with the average age of 18.8 years were obtained for the study. IRB was obtained from the Ethics Committees of Xi'an Jiaotong University. Written consent was obtained from all participants prior to conduction of research.

Prior to the intervention, subjects completed pre-test data. The pre-test and post-tests were the Osteoporosis Knowledge Assessment tool (OKAT), OHBS, and OSES. The Cronbach's alpha for the OKAT is 0.70. The intervention was based on the

guidelines provided for the NOF. The outline of the slide show presentation consisted of the definition of osteoporosis, risk factors of osteoporosis, physical consequences, preventive measures, diagnostic measures, and treatment. The intervention presentation's duration was two and a half hours followed by a half hour of discussion and 20 minutes for questions for a total of three hours and 20 minutes. Post-test data was collected two weeks following the intervention.

Outcomes were assessed according to the determined significance of level of *p* less than 0.05. To examine the effect of the continuing education on osteoporosis knowledge, one would review the results of the OKAT. Knowledge was significantly increased post-intervention ($p < 0.001$). Measurement for the effect of osteoporosis continuing education on health belief and self-efficacy were assessed with the OHBS and the OSES. Overall, appraisal of the OHBS found significant increase in health belief ($p < 0.001$). Of the seven subscales of the OHBS, five were significantly increased. The subscales that were not significantly increased were the perceived barriers to exercise and calcium intake. Significant improvement was seen with the overall review of the OSES from pre- to post-test ($p < 0.001$). The subscales of the OSES, self-efficacy of exercising and consuming calcium-rich food, were both significantly improved ($p < 0.001$). Although level III evidence lacks randomization, the project manager was able to determine significance of improvement from baseline with the use of pre-intervention and post-intervention data collection throughout all of the articles. Next, the last article from the literature with level V evidence was discussed.

Level V evidence. Level V evidence is described as reviews including descriptive studies, which consisted of only one article from the literature search. Werner (2005) reviewed the status of research on knowledge about osteoporosis as it pertains to assessment of knowledge, factors associated with knowledge, relationship with knowledge and osteoporosis behaviors, and proposed future directions. Specifics of the

literature search were not discussed except the publication date of current research was defined as years 1998 to 2004. Studies within the review were categorized into two separate groups: instruments to assess knowledge and relationships identified between knowledge and osteoporosis health-related behaviors. Within the assessment of knowledge, Werner (2005) appraised current tools being used both structured and unstructured to comprehend knowledge as well as common correlations with knowledge and demographic data. There were 17 separate studies included to assess the different tools. Majority of the knowledge instruments assessed awareness of osteoporosis, knowledge about risk factors, and knowledge about preventive actions. Multiple choice and true/false questions were the most common format for the knowledge assessment. Although, Werner found that multiple choice formats may be more difficult to construct, they are less susceptible to guessing by the participants. After appraisal of knowledge tools and correlations with demographical data, the following populations were identified to have higher knowledge: a) females, b) higher level of education, c) persons with relative or someone they know affected by osteoporosis, and d) persons who have received osteoporosis information in the past.

With regard to the relationships between knowledge and health-related behaviors, Werner (2005) assessed another 15 studies. Of the 15, there were four experimental RCTs, six quasi-experimental studies, and five cross-sectional studies. According to Melnyk and Fineout-Overholt (2011), the use of studies other than RCTs weakens a review which placed the review at the fifth level. Werner (2005) argued that cross-sectional, correlation studies were needed to assess the current association between knowledge and participation in health-related behaviors. Of the five cross-sectional studies, results were statistically significant with a direct relationship between the more knowledge one has about osteoporosis the higher likelihood for adoption of lifestyle changes with health-related behaviors. The intervention studies, both

experimental and quasi-experimental, were used to examine the effects of educational programs on knowledge and participation of health-related changes. This portion of the systematic review is consistent with the proposed EBP project. Five of the quasi-experimental studies employed a one-group pre-test/post-test design. All of the experimental studies used a two-group pre-test/post-test design. Werner (2005) failed to provide statistical evaluation of the studies; however, synthesized literature was available. The majority of the studies' interventions lasted from 30 minutes to an hour. Longer interventions did not provide for extensively better results, and they proved to be more expensive and required greater effort to conduct. Didactic instruction with focus on prevention, diagnosis, and treatment was the most common aspect of the educational interventions. Of all the intervention studies assessed, all but one study provided significant increase in osteoporosis knowledge. When changing lifestyle behaviors, the educational interventions that had interactive portions were most effective. Level V is considered weak evidence, but the project manager was able to assess different tools to appropriately assess the osteoporosis educational intervention.

Construct Evidence-Based Practice

To construct evidence-based practice, the project manager thoroughly appraised the literature review. With appraisal of literature, the project manager was able to find commonalities within current evidence to build the best evidence for practice. The synthesis of literature provided for the most appropriate educational intervention for young adult females to increase osteoporosis knowledge and self-efficacy of prevention. After best practice was determined, the project manager implemented the practice to assess and analyze the PICOT question.

Synthesis of appraised literature. After appraisal of literature, it was apparent that the most common method for educating young adults is by slide show presentation followed by group discussion to answer questions. Convenience sampling of young

adults was accomplished with a university setting most often. Bohaty et al. (2008) stated, “Osteoporosis is a major health problem of older adult women; however, lifestyle behaviors to prevent osteoporosis should begin earlier in life when women are adolescents or young adults” (p.93). Nieto-Vazquez et al. (2009) stated, “Evidence has found that osteoporosis prevention is dependent on education, perception, attitude, and gained knowledge” (p.172). As incidence rates of osteoporosis continue to rise and the lifespan of women increases, it is imperative to achieve optimal peak bone mass to prolong bone health. Osteoporosis prevention education EBP provided the guidelines to educate young adult women to reduce osteoporosis rates.

Health belief model. Throughout the review of literature, it was evident that the HBM is a common framework utilized to promote health education within young adults. Of the 10 appraised studies, four studies identified the HBM as the guide for the research as well as the construct for the intervention (Chan et al., 2007; Nieto-Vazquez et al., 2009; Sedlak et al., 1998; Sedlak et al., 2000). Also, Franzen (2011) systematically reviewed literature and found that much of the current literature used HBM as a framework as well as an assessment tool. Nieto-Vazquez et al. (2009) discussed the relevancy of using the HBM as a framework and construct for the intervention:

> The model is comprised of six descriptive concepts (e. g., perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy) that help the individual to take action for early detection of the disease. These components are needed to understand to seriousness and severity of the disease, and self-efficacy represents the willingness to take action to avoid disease (p. 173).

Using the framework to guide the educational intervention, Nieto-Vazquez found significant improvement of osteoporosis knowledge and health beliefs (OKT – $p < 0.05$;

OHBS – $p < 0.05$). Chan et al. (2007) also assessed the effectiveness of an osteoporosis educational program with young adults using the HBM as a framework. Chan et al. (2007) followed the belief that individuals will take action to avoid, to screen for, or to control health if they perceived themselves as vulnerable. Getting young adults to disregard to preconception of invincibility can be difficult, but Chan and colleagues (2007) were able to improve perceptions of participants within their study. Participants in the study significantly improved knowledge, health beliefs, and self-efficacy of prevention ($p < 0.001$ across all three categories).

University. The continuing education setting is the optimal setting to obtain young adult females and implement an educational intervention. During young adulthood, visits to family practice become scarce and inconsistent. Of the 10 studies chosen from the literature review, eight were conducted in a structured continuing education setting (Bohaty et al., 2008; Franzen, 2011; Nieto-Vazquez et al., 2009; Piaseu et al., 2001; Rodzik, 2008; Sedlak et al., 1998; Sedlak et al., 2000; Zhan et al., 2012). Piaseu et al. (2001) assessed the implementation of an osteoporosis educational program for young women within a university in Thailand. The prevention program held at the university provided evidence that osteoporosis knowledge, health beliefs, and self-efficacy were all improved after attendance of the osteoporosis prevention educational program ($p < 0.01$ for all three categories). Zhang et al. (2012) conducted similar research within a university in China. Results were significant for increased osteoporosis knowledge, health belief, and self-efficacy ($p < 0.001$ for all three categories). According to Nieto-Vazquez and colleagues (2009), “Universities should include education about osteoporosis in their health promotion and prevention programs” (p. 176).The use of a kinesiology course required of all freshmen was an ideal sample pool. The class focused on healthy physical activity as well as nutrition. The osteoporosis prevention program followed along with the current curriculum objectives.

Education. "Health education can decrease the overall costs of healthcare by preventing expensive complications of chronic illnesses" (Chan et al., 2007, p. 271). During young adulthood, the idea of invincibility decreases health promotion activities. Within osteoporosis education, the participants become more aware of osteoporosis risk factors and preventative behaviors that should be occurring at the present state (Franzen, 2011). Of the 10 appraised studies, eight utilized a slide show presentation as part of the educational intervention (Bohaty et al,. 2008; Chan et al., 2007; Franzen, 2011; Piaseu et al., 2001; Rodzik, 2008; Sedlak et al., 1998; Sedlak et al., 2000; Zhang et al., 2012). Also, of the included studies, five of them used NOF guidelines and educational material throughout the intervention (Bohaty et al., 2008; Nieto-Vazquez et al., 2009; Sedlak et al., 1998; Sedlak et al., 2000; Zhang et al., 2012). The common outline of presentation was as follows: a) define osteoporosis, b) identify risk factors, c) provide strategies for prevention, d) inform about diagnostic studies, and e) discuss treatment. Bohaty et al. (2008) used NOF material within a slide show format and reported significant improvement in knowledge which was assessed post-intervention (OKT- $p < 0.01$). Sedlak et al. (1998) and Sedlak et al. (2000) both used slide show presentations provided by the NOF to improve osteoporosis knowledge and health beliefs. Both studies resulted in improved knowledge and health belief measured by the OKT ($p \leq 0.001$; $p < 0.01$) and OHBS ($p \leq 0.001$; $p < 0.05$).

Best practice recommendation. Synthesis and appraisal of relevant literature led the project manager to determine that best practice for promoting osteoporosis knowledge and self-efficacy of prevention among young adults was the recommendation of a college- or university-based osteoporosis educational program. The aim of this EBP project was to increase osteoporosis knowledge and self-efficacy of prevention among young adult females. The educational interventions slightly differed among all the included studies; however, the basic outlines were quite similar and generally based on

NOF guidelines and structured by the HBM. The osteoporosis educational program included a slide show presentation with NOF guidelines that focused on identification of osteoporosis, risk factors, prevention, diagnosis, and treatment and open discussion after the intervention for questions. Within each of the outline points, the project manager discussed aspects of the HBM such as perceived seriousness and perceived susceptibly. The educational program was incorporated into a freshman kinesiology course that focused on health promotion. The presentation lasted 40 minutes and 10 minutes for questions to fit within the allotted time slot for class. NOF educational brochures were also offered to participants to provide for cues to action after the intervention.

Answering the clinical question. The osteoporosis education intervention aimed to answer the clinical question of: “In young adult collegiate females, how does an osteoporosis educational program compared to current osteoporosis education affect osteoporosis knowledge and self-efficacy of prevention within one month?” By incorporating an educational program that is supported in the literature, the project manager was able to assess the clinical question after implementation of the program within a freshman college course with the use of pre- and post-test evaluation. The OKT and OSES were used to assess knowledge and self-efficacy of prevention. The OKT and OSES are greatly supported by literature to accurately assess osteoporosis knowledge and self-efficacy. The project manager was also able to analyze the data to determine positive changes from the intervention. After assessment of the literature, the project manager hypothesized college-aged females who attend the osteoporosis educational intervention would have higher osteoporosis knowledge and higher self-efficacy of prevention.

CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

Throughout this chapter, the project manager discussed the implementation of the established guideline for the osteoporosis education intervention. The method for assessment of the intervention was a pre-test/post-test quasi-experimental design with convenience sampling. Discussion of the overall method including sample, outcomes, intervention, planning, data collection, and assessment tools are provided below.

Method

The EBP project was implemented as a quasi-experimental one-group pre-test/post-test design. Baseline data, collected prior to the intervention, was utilized as the control data. Post-intervention testing was collected on the same participants to assess for changes in knowledge and self-efficacy of prevention. The participants in the project were followed for one month post-intervention. The following information within the chapter provides detail of the methodological approach for implementation of the EBP project.

Participants and setting. The EBP project was implemented into a college undergraduate kinesiology course focused on healthy lifestyles in fall 2013. The course was required for all incoming freshman students at a university in Northwest Indiana. There were approximately 420 students, of which 50% or 210 students were females, enrolled in the kinesiology course. Therefore, there was a potential sample pool of 210 students to become participants within the EBP project. The kinesiology course was split up into 12 separate classes all of which were presented with the educational intervention at their respective class times (B. Tyree, personal communication, August 17, 2013). The chosen location provided for convenience sampling consistent with the population of

interest. The educational course was offered for extra credit for all students enrolled in the class, males and females.

Outcomes. The goal of the implemented osteoporosis educational intervention was to increase osteoporosis knowledge as well as improve self-efficacy of osteoporosis prevention among college-aged females. The long-term goal was for the educational intervention to become part of the course curriculum indefinitely to ultimately decrease incidence and/or delay the onset of osteoporosis later in life. Two separate tools were chosen to assess the desired outcomes by way of a pre-test/post-test format. The OKT (revised) assessed knowledge, and the OSES measured self-efficacy. Consistent with the reviewed literature, the OKT was most accurate in assessing osteoporosis knowledge as well as detecting improvement after implementation of an educational intervention (Chan et al., 2007; Franzen, 2011; Nieto-Vazquez et al., 2009; Piaseu et al., 2001; Rodzik, 2008; Sedlak et al. 1998; & Sedlak et al., 2000). Similar to that of the OKT, the OSES has been well-established in the literature to measure confidence in participating in osteoporosis prevention activities (Chan et al., 2007; Franzen, 2011; Nieto-Vazquez et al., 2009; Piaseu et al., 2001; Rodzik, 2008; Sedlak et al., 1998; Sedlak et al., 2000; & Zhang et al., 2012).

Intervention. Within the EBP project, an osteoporosis in-service educational intervention was implemented to increase osteoporosis knowledge and improve self-efficacy of prevention. The project manager was the sole presenter of the evidence-based educational intervention among the college freshmen enrolled in the kinesiology course focusing on healthy lifestyles. Although the educational intervention was offered to the entire enrollment of the freshman kinesiology course, those students that were female, over the age of 18, and non-pregnant were the population of interest. Data was collected from all students; however, analysis of data was only conducted for those students within the population of interest. No informed consent was necessary as the

project was declared an exempt review. Instead, students were asked to volunteer their data for analysis.

A review of literature did not reveal a specific educational intervention to follow; however, by compiling similarities of different interventions in the literature, guidelines for the intervention were established. The project manager provided the intervention to all students enrolled in the kinesiology course that participated in the intervention. The intervention consisted of an NOF educational slide show presentation, followed by group discussion, and completed with the provision of take home NOF osteoporosis materials. The intervention was provided during one class period of 50 minutes with the slide show presentation lasting 40 minutes leaving 10 minutes for discussion and questions.

The slide show presentation focused on the guidelines provided from the NOF. The NOF provided the project manager with their specific patient educational slide show. Some portions of the NOF patient education slide show was omitted due to relevancy of content, such as material focused on elderly patients and detailed treatment of existing osteoporosis. A slide show presentation based on NOF guidelines was consistent with the literature. Of the ten studies included in the literature review, five utilized material based on NOF guidelines for patient education and rendered promising results (Bohaty et al., 2008; Nieto-Vazquez et al., 2009; Sedlak et al., 1998; Sedlak et al., 2000; Zhang et al., 2012). Consistent with the OKT as the measurement tool for increased knowledge, both Sedlak et al. (1998) and Sedlak et al. (2000) provided statistically significant improvement with NOF guided education ($p \leq 0.001$ and $p < 0.01$, respectively).

For the second outcome of interest, it was found in the literature that simply providing education can improve self-efficacy. However, the educational interventions that stressed the main concepts of the HBM throughout the presentation and included group discussion as well as provided take home material were most successful. Many of

the studies provided evidence for self-efficacy improvement with four of the ten appraised studies providing statistically significant results (Chan et al., 2007; Piaseu et al., 2001; Rodzik, 2008; Zhang et al., 2012). Therefore, group discussion, HBM concepts, and take home materials were integrated into the educational intervention. The take home materials were brochures purchased from the NOF by the project manager, which educated the participants about the need for weight-bearing exercises, need for calcium and Vitamin D intake, sources of calcium and Vitamin D, and miscellaneous facts about osteoporosis and how to maintain good bone health.

One week prior to implementation of the educational intervention, the students within the kinesiology course were encouraged to complete the demographic form (See Appendix B), OKT (revised), and OSES. As previously mentioned, this data was used as baseline measurements. All data was submitted electronically by the participants via a university database. Students were familiar with the database as other coursework for the kinesiology class was required to be electronically submitted. After implementation of the intervention, all participants were asked to complete the OKT (revised) and OSES within the next 24 to 48 hours to assess immediate results of the intervention. Three weeks post-intervention, the participants were asked again to complete the OKT (revised) and OSES to measure retention of knowledge and maintained improvement of self-efficacy and the confidence in preventing osteoporosis.

Planning. Consistent with the ACE Star model, the first phase is to discover research (Stevens, 2004). To begin with, a broad literature search was conducted to identify an area of need. The initial area of need determined was osteoporosis prevention, and by further narrowing the literature search a more specific need was identified. A guideline for educating young adult females about osteoporosis to improve osteoporosis knowledge and self-efficacy of prevention was the identified as the area of need. Literature search was continued to retrieve more relevant evidence to support the

EBP project. With the use of inclusion and exclusion criteria, the literature search was narrowed down to a workable number, and the second phase of the EBP model was entered. Within the second phase of the ACE Star model, the project manager critically appraised the literature for relevancy, which further narrowed the amount of evidence (Stevens, 2004).

Translating the retrieved literature into a workable guideline was the next challenge within the EBP model (Stevens, 2004). Similarities throughout the literature were compiled to create an optimal osteoporosis educational intervention with the hope of improving osteoporosis knowledge and self-efficacy of prevention. Within this phase, the project manager assessed whether or not there was an accessible population with congruent needs. Once the university kinesiology course was identified as the target population, the project manager was able to begin brainstorming details of the intervention. Adjustments to the intervention were expected to allow for best fit within the clinical setting. Once the details of the intervention were finalized, the project manger began the integration phase.

Within the integration phase, the project manager implemented the intervention (Stevens, 2004). Within the planning for this phase, permission for implementation was attained from the Institutional Review Board (IRB) from the university. After the exempt review was approved, collaboration with the kinesiology department chair ensued to coordinate date and time for educational intervention. The department chair was of assistance to schedule the intervention for the students and provide the measurement tools to the students electronically. Implementation during a 50 minute class period was considered as the best fit for the intervention. Also within this phase, the project manager assessed whether or not the intervention was practical for standard practice. With the class focusing on healthy lifestyles, it was established that the EBP practice

was congruent with the current curriculum and would have the potential to be implemented indefinitely.

Lastly, outcome evaluation was needed within the last phase of the ACE Star model (Stevens, 2004). Within this phase, the project manager determined the tools appropriate for assessing the desired outcomes. The results were evaluated to determine the impact of the intervention as well as determine whether or not outcomes were readily met. Statistical analysis was used to assess outcomes. Along with outcomes of the measurement tools, the project manager also appraised the entire implementation process to determine alterations needed to perfect the EBP guideline.

Participant recruitment. Students were recruited prior to the intervention by word of mouth from their individual kinesiology professors. The project facilitator, the department chair of kinesiology, informed the professors of the EBP project and encouraged them to promote the project to their students. The professors also informed the students, who were willing to participate, of the demographic form as well as the OKT (revised) and OSES measurement tools needing to be completed prior to the intervention. Minimal extra credit was offered for attendance to the intervention but not for completion of the measurement tools to decrease coercion. Due to ease of implementation within the regular scheduled class period, no extensive recruitment tactics were utilized as the project facilitator was confident of attendance.

Data. Demographical data was collected prior to the intervention. Remaining data was collected from the pre-test/post-test design using the OKT (revised) and OSES as measurement tools. The measurement tools were assessed for reliability and validity. Collection of data will be discussed within this section along with the management and analysis of collected data.

Reliability and validity of measures. The project manager used two tools to measure the desired outcomes for the EBP project: the OKT (revised) and the OSES.

The reliability of the OKT was well-established in the literature. Initially the OKT was developed in 1991 by Katherine Kim, Mary Horan, and Phyllis Gendler with 24-items and was later revised in 2010 by Phyllis Gendler, Cynthia Coviak, Jean Martin, and Katherine Kim with 32-items. Question 27 was developed by Pamela von Hurst. The original OKT was a 24-item tool that consisted of multiple-choice questions related to osteoporosis. A perfect score was a 24. The OKT could be divided into two separate categories for calcium related-questions and exercise-related questions. Much of the research for reliability of the OKT was assessed separately for each category. According to Chan et al. (2007), the internal consistency measured by a Cronbach alpha was 0.66 for calcium and 0.67 for exercise. However, there was a consistent lack of validity measurements. The OKT was revised in 2010 to include 32 items including the original 24 items remaining. The expanded version was created to more accurately assess osteoporosis knowledge. According to the developers of the tool, the OKT (revised) is sub-categorized with risk factors, nutrition, and exercise. The developers provided the project manager with recent psychometric testing of the OKT (revised). The reliability coefficients for internal consistency for OKT (revised) were as follows: 0.849 for the total scale, 0.83 for the Nutrition subscale, and 0.81 for the Exercise subscale. The developers also employed a test-retest analysis with a Pearson Correlation of 0.872. Content validity was used to assess the validity of the OKT (revised).

The OSES can be separated into two separate focus areas for the prevention of osteoporosis, which are self-efficacy of exercise and calcium intake. The tool is a 21-item visual analogue scale ranging from 0 to 100, not at all confident to very confident, respectively. Similar to that of the OKT, the OSES' reliability and validity is assessed according to the separate categories. According to Chan et al. (2007), the internal consistency for OSES exercise was 0.92 and OSES calcium was 0.96. According to Rodzik (2008), reliability coefficients for the OSES subscales for internal consistency

were 0.94 for exercise and 0.93 calcium intake. According to the developers, validity of the OSES was assessed by factor analysis and hierarchical regression (Horan et al., 1998).

Collection. The demographic form, OKT (revised), and the OSES were uploaded onto Blackboard for electronic submission of data. There was a time limit of 30 minutes was given for submission, start to finish, of the OKT (revised) to prevent students from locating answers without using their own knowledge. Prior to the intervention, students that were willing to participate logged into their personal Blackboard accounts and completed the demographic form, OKT (revised), and OSES for pre-test results. Post-test measurement of the OKT (revised) and OSES were collected at two separate time intervals using Blackboard for electronic submission. The first collection was encouraged immediately following the intervention; however, for those unable to complete tests immediately following the intervention, the tests were available for up to 48 hours following the intervention. The second post-test was available 3-weeks after intervention for one week duration to assess retention.

Management and analysis. The impact of the educational intervention on both osteoporosis knowledge and self-efficacy of prevention were measured with a pre-test/ post-test format. The pre-test/post-test format allowed for comparison of baseline data before the intervention with data immediately and 3-weeks post-intervention. Changes or improvements in knowledge and self-efficacy were apparent with improvements in the post-tests. Retention of knowledge and self-efficacy were further assessed with the 3-week post-test. Descriptive statistics about the participants were derived from the completed demographic forms. Additional analysis of the outcomes was assessed with repeated-measures analysis of variance (ANOVA) results determined with the use of SPSS 18.0 statistical software.

Protection of human subjects. The initial phase for protection of the study participants consisted of the project manager completing training from the National Institutes of Health, which specifically focused on protection of human subjects. This training was followed by the approval from the department chair of kinesiology to incorporate the educational intervention within the current curriculum for fall 2013. Once the department chair approved the curriculum changes, the project manger prepared for IRB application. The initial phase for IRB application was to determine the type of review being conducted. The educational intervention was determined to be an exempt review. Application was sent to the IRB chairperson and was approved a week and a half later. As previously mentioned, an exempt review does not require for an informed consent. However, professors were encouraged to have the students contact the project manager with any questions or concerns about participation in the EBP project.

CHAPTER 4

FINDINGS

The purpose of the EBP project was to assess change in the knowledge and self-efficacy of preventative behaviors for osteoporosis among young adult collegiate females post an educational intervention. The project manager was hoping for significantly improved outcomes. In addition to the increased knowledge and self-efficacy, it was hoped that prevention activities would be more readily accepted and conducted by the participants now and continue into the future. The intervention assessed the current knowledge and self-efficacy of prevention for osteoporosis as well as assessed changes in knowledge and self-efficacy post-educational intervention. The results and data analysis for patient characteristics and measured outcomes will be presented throughout the chapter.

Participant Characteristics

The following section provides details of the sample: size, demographics, and exercise habits. Students were also categorized and analyzed according to attendance to the intervention and degree of material completed.

Size. In total, there were 84 females that attended the intervention. There was a projected potential for 210 female participants; therefore there was a 40% attendance rate. Of the 84 that attended the lecture, 60 completed the minimum of the demographic data and pre-test data (71.4%). Of the 60 that attended and completed data, 27 participants completed almost all portions of the demographic form, pre-tests, immediate post-tests, and recall post-tests (45.0%). Twelve of the 60 only completed the demographics and pre-test data (20.0%). Eleven of the 60 completed demographics, pre-tests, and immediate post-tests but omitted the 3-week recall post-tests (18.3%). Two participants completed everything except the immediate post-test data (3.3%).

Three were missing the OSES immediate post-test portion and all of the 3-week recall data (5.0%). Five of the 60 had multiple miscellaneous pieces missing in data collection process (8.3%). In Figure 4.1, a graph reveals the categories of data completion.

Characteristics. Participant characteristics were assessed with the completion of the demographic form. The demographic form addressed age, ethnicity, marital status, college of study, exercise frequency, type of exercise, and income (See Table 4.1). The demographic form can be found in Appendix B.

Student characteristics. With analysis of the age, it was found that the age range was 18 to 23 years of age. The mode of the students was 18 years of age with 75.0% accounting for 45 of the 60 participants. The second most recurring age was 19 with 16.7%. The mean age was 18.38 years. Ethnicity was predominantly Caucasian race with 90.0%. Data was also skewed in one direction with analysis of marital status with 98.3% reported single, never married. College of study was spread out among the different majors with the College of Arts and Sciences being the most common with 43.3% of the participants. Assessment of income also provided an array of results spread from less than $10,000 annually to more than $150,000 annually.

Exercise habits. Frequency and type of exercise were also assessed within the demographic form (See Table 4.2). The analysis of exercise frequency found that the majority of the participants ranked themselves right in the middle with two to three times per week for exercise at 43.3% accounting for 26 of the 60 participants. Consistent with the literature, the majority of the participants conducted cardiovascular exercises (60.0%) compared to muscle strengthening (1.7%).

Figure 4.1

Data Completion Characteristics

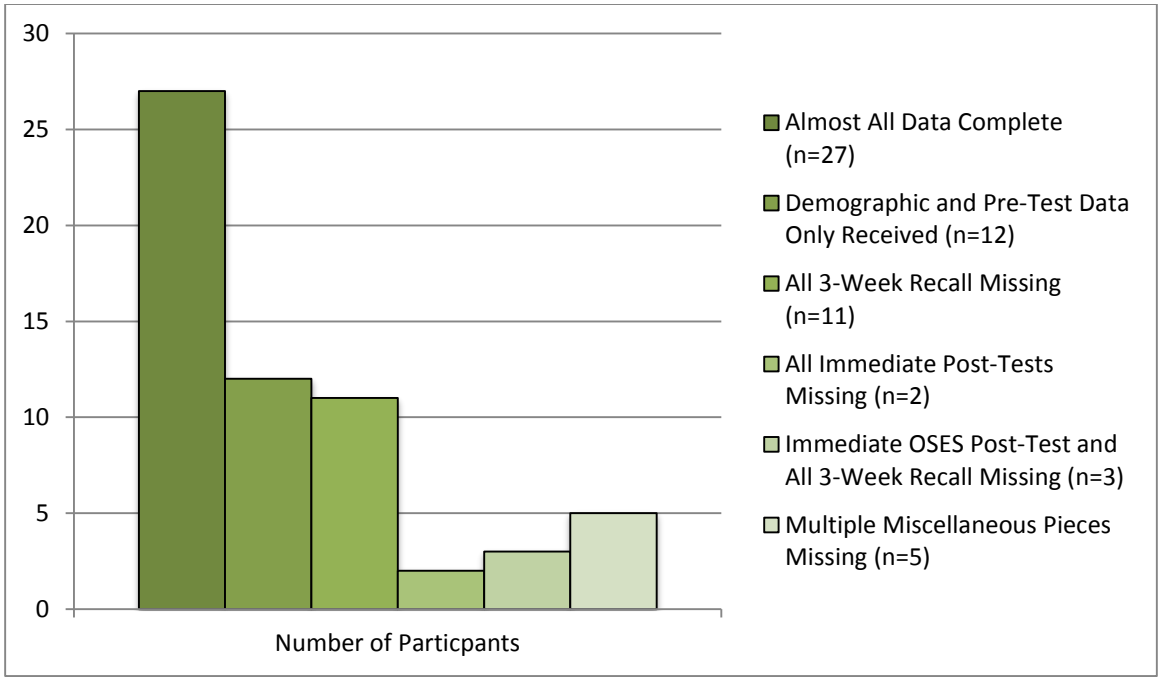

Table 4.1

Student Characteristics

Characteristic	Frequency (n) Results
Age	75.0% (n = 45) 18 years old
	16.7% (n = 10) 19 years old
	8.3% (n = 5) 20-23 years old
Ethnicity	90.0% (n = 54) White
	5.0% (n = 3) Hispanic
	3.3% (n = 2) Asian/Pacific-Islander
	1.7% (n = 1) Other
Marital Status	98.3% (n = 59) Single, never married
	1.7% (n = 1) Separated or Married
College of Study	43.3% (n = 26) Arts and Sciences
	11.7% (n = 7) Business
	3.3% (n = 2) Christ College
	13.3% (n = 8) Engineering
	21.7% (n = 13) Nursing
	6.7% (n = 4) Undecided
Income	5.2% (n = 3) Below $10,000
	6.9% (n = 4) $10,000 - $24,999
	6.9% (n = 4) $25,000 - $39,999
	15.5% (n = 9) $40,000 - $54,999
	3.4% (n = 2) $55,000 - $69,999
	17.2% (n = 10) $70,000 - $84,999
	6.9% (n = 4) $85,000 - $99,999
	17.2% (n = 10) $100,000 - $114,999
	8.6% (n = 5) $115,000 - $150,000
	12.1% (n = 7) Above $150,000

Table 4.2

Student Exercise Habits

Exercise Habits	Frequency (n) Results
Exercise Frequency	18.3% (n = 11) None to Seldom
	43.3% (n = 26) 2 to 3 times per week
	28.3% (n = 17) 4 to 6 times per week
	10.0% (n = 6) 6+ times per week
Exercise Type	60.0% (n = 36) Cardio
	30.0% (n = 18) Combination: Cardio and Muscle-Strengthening
	5.0% (n = 3) Flexibility Training
	5.0% (n = 3) Muscle-Strengthening or None

Changes in Outcomes

The primary outcomes for the EBP project were knowledge of osteoporosis and self-efficacy of osteoporosis preventative behaviors. At baseline, the project manager collected data to assess current knowledge of osteoporosis and self-efficacy as well as demographic data. Within the demographic form, the students' current exercise behaviors were also assessed. Data was initially stored on Blackboard, then participants were deindentified, and data was organized into a Microsoft Word document. After completion of the osteoporosis educational intervention, the students completed the immediate post-tests, OKT and OSES, within 48 hours of the intervention. Recall data was also collected 3-weeks post-intervention. Post-test data collection was completed with Blackboard and further organized on the Microsoft Word document. After organization of data, all data was compiled in SPSS 18.0 software for statistical analysis.

Statistical testing. Repeated measures ANOVA and post-hoc paired t-test were chosen to compare differences from baseline to immediate post-test to recall post-test with the use of SPSS 18.0 software. Tools were compared as a total along with analysis of subclasses. The OKT was broken down into total, risk factors, nutrition, and exercise results. The OSES was categorized as total, calcium intake, and exercise scores. Statistical significance for all categories was determined to be a value of $p < 0.05$ for ANOVA analysis and $p < 0.017$ for post-hoc paired *t*-test analysis. A *p* value of 0.017 for post-hoc testing was chosen because 0.05 divided by 3-time intervals is 0.017.

Significance. Descriptive means were assessed with each measurement tool total and subclass scores (See Table 4.3 and Figure 4.2). A one-way repeated-measures ANOVA was calculated comparing the measurement tool total scores and subclass scores at three different times: pre-intervention, immediately post-intervention within 48-hours, and 3-weeks post-intervention (See Table 4.4). Once significance with

Table 4.3

Measurement Tools - Mean Results

Test	Subclass	Time	Total Possible	Mean Score	Percent
OKT	Total	Pre-Test	32.00	16.8621	52.69%
OKT	Total	Immediate Post-Test	32.00	25.7931	80.60%
OKT	Total	3-Week Recall	32.00	23.3103	72.84%
OKT	Risk Factors	Pre-Test	14.00	7.3793	52.71%
OKT	Risk Factors	Immediate Post-Test	14.00	10.9310	78.08%
OKT	Risk Factors	3-Week Recall	14.00	10.8621	77.59%
OKT	Nutrition	Pre-Test	26.00	13.6552	52.52%
OKT	Nutrition	Immediate Post-Test	26.00	20.4483	78.65%
OKT	Nutrition	3-Week Recall	26.00	18.6207	71.62%
OKT	Exercise	Pre-Test	20.00	10.5862	52.93%
OKT	Exercise	Immediate Post-Test	20.00	16.2759	81.38%
OKT	Exercise	3-Week Recall	20.00	15.5517	77.76%
OSES	Total	Pre-Test	2,100.00	1,495.8696	71.23%
OSES	Total	Immediate Post-Test	2,100.00	1,625.4783	77.40%
OSES	Total	3-Week Recall	2,100.00	1,609.2609	76.63%
OSES	Calcium	Pre-Test	1,100.00	745.5217	67.77%
OSES	Calcium	Immediate Post-Test	1,100.00	791.7826	71.98%
OSES	Calcium	3-Week Recall	1,100.00	791.2174	71.93%
OSES	Exercise	Pre-Test	1,000.00	750.3478	75.03%
OSES	Exercise	Immediate Post-Test	1,000.00	833.6522	83.37%
OSES	Exercise	3-Week Recall	1,000.00	799.5652	79.96%

Figure 4.2

Mean Results

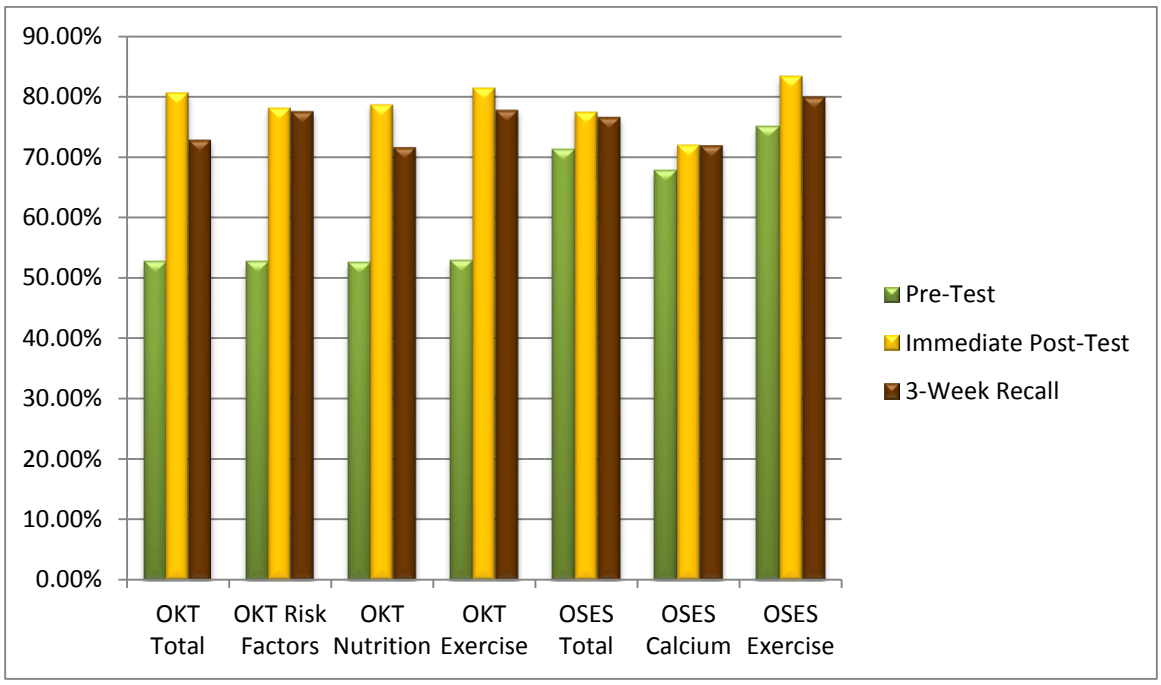

Table 4.4

Repeated Measures ANOVA – Sphericity Assumed Results

Test	Subclass	*F*-value	Degrees of Freedom	Significance $p < 0.05$	Significant?
OKT	Total	89.234	2; 56	p = 0.000	Yes
OKT	Risk Factors	46.063	2; 56	p = 0.000	Yes
OKT	Nutrition	64.745	2; 56	p = 0.000	Yes
OKT	Exercise	70.068	2; 56	p = 0.000	Yes
OSES	Total	3.986	2; 44	p = 0.026	Yes
OSES	Calcium	2.370	2; 44	p = 0.105	No
OSES	Exercise	2.584	2; 44	p = 0.087	No

the repeated-measures ANOVA was determined, post-hoc testing with paired t-tests was completed to ensure results were truly significant (See Table 4.5). Results were assessed for significance from pre-intervention to immediate post-intervention and pre-intervention to recall post-intervention. The project aimed to sustain knowledge gained from the intervention, and it was not expected for scores to improve significantly from immediate post-intervention to 3-week re-call intervention. Therefore, significant improvements from pre-test to immediate post-test as well as pre-test to 3-week recall were of interest, and results from immediate post-test to 3-week recall were not addressed. The following section details the results of both the OKT and the OSES.

OKT results. With analysis of knowledge, it was found that total as well as all subclasses of the OKT were found to be initially statistically significant with ANOVA testing. The OKT maximum score is 32 for total, 14 for risk factors, 26 for nutrition, and 20 for exercise. A significant effect was found with the OKT total (F (2, 56) = 89.234, p = 0.000). Follow-up with protected t revealed that scores increased significantly from pre-test (m =16.79, sd = 4.11) to immediate post-intervention (m = 55.67, sd = 5.03) as well as pre-test (m = 16.47, sd = 4.46) to 3-week recall (m = 22.72, sd = 3.56). The OKT risk factor subclass was found to be significant (F (2, 56) = 46.063, p = 0.000). Follow-up with protected t revealed that scores increased significantly from pre-test (m =7.42, sd = 2.36) to immediate post-intervention (m = 11.12, sd = 2.05) as well as pre-test (m = 7.28, sd = 2.40) to 3-week recall (m = 10.56, sd = 1.68). Significance was found with the OKT nutrition subclass (F (2, 56) = 64.745, p = 0.000) and was justified with significant improvement from pre-intervention (m = 13.79, sd = 3.66) to immediately post-intervention (m = 20.42, sd = 2.57) as well as pre-intervention (m = 13.28, sd = 3.96) to recall post-intervention (m = 18.16, sd = 3.00). Lastly, the subclass for exercise was also found to be significant (F (2, 56) = 70.068, p = 0.000), which was confirmed with t-test results from pre-intervention (m = 10.37, sd = 2.67) to immediately post-intervention (m =

Table 4.5

Protected Dependent t-Tests

Test/Subclass	Mean	Standard Deviation	Significance? $p < 0.017$
OKT Total			
Pre – Immediate Post	16.79; 25.67	4.11; 3.05	yes; p = 0.000
Immediate Post – Recall	25.60; 23.17	3.53; 3.22	yes; p = 0.000
Pre – Recall	16.47; 22.72	4.46; 3.56	yes; p = 0.000
OKT Risk Factors			
Pre – Immediate Post	7.42; 11.12	2.36; 2.05	yes; p = 0.000
Immediate Post – Recall	10.80; 10.77	2.34; 1.52	no; p = 0.937
Pre – Recall	7.28; 10.56	2.40; 1.68	yes; p = 0.000
OKT Nutrition			
Pre – Immediate Post	13.79; 20.42	3.66; 2.57	yes; p = 0.000
Immediate Post – Recall	20.27; 18.50	3.03; 2.78	yes; p = 0.006
Pre – Recall	13.28; 18.16	3.96; 3.00	yes; p = 0.000
OKT Exercise			
Pre – Immediate Post	10.37; 16.37	2.67; 2.35	yes; p = 0.000
Immediate Post – Recall	16.13; 15.43	2.69; 2.40	no; p = 0.171
Pre – Recall	10.47; 15.13	2.75; 2.62	yes; p = 0.000
OSES Total			
Pre – Immediate Post	1,519.45; 1,699.53	294.31; 278.29	yes; p = 0.000
Immediate Post – Recall	1,625.48; 1,609.26	298.56; 331.68	no; p = 0.688
Pre – Recall	1,493.68; 1,605.92	307.17; 318.20	no; p = 0.093
OSES Calcium			
Pre – Immediate Post	756.50; 828.11	181.51; 142.30	yes; p = 0.000
Immediate Post – Recall	791.78; 791.22	147.26; 155.77	no; p = 0.978
Pre – Recall	736.60; 782.52	175.44; 152.90	no; p = 0.165
OSES Exercise			
Pre – Immediate Post	762.95; 871.39	161.91; 164.67	yes; p = 0.000
Immediate Post – Recall	833.65; 799.57	176.74; 249.19	no; p = 0.284
Pre – Recall	757.08; 806.40	170.27; 239.76	no; p = 0.287

16.37, *sd* = 2.35) and pre-intervention (*m* = 10.47, *sd* = 2.75) to recall post-intervention (*m* = 15.13, *sd* = 2.62).

OSES results. OSES results were not as strong. Maximum scores were 2,100 for total, 1,100 for calcium subclass, and 1,000 for exercise subclass. Analysis of the total scores for OSES was significant (F (2, 44) = 3.986, p = 0.026). After post-hoc analysis, significant improvement was only noted from pre-intervention (*m* = 1,1519.45, *sd* = 294.31) to immediately post-intervention (*m* = 1,699.53, *sd* = 278.29) with a *p*-value of 0.000. Improvement was noted from pre-intervention to post-intervention but was not significant (p = 0.093). Unfortunately for each subclass, the one-way repeated measures ANOVA did not reveal significant results. Calcium subclass revealed a *p*-value of 0.105, and the exercise subclass results in a *p*-value of 0.087. However, with paired *t*-test analysis significant results (p = 0.000) were found in both the calcium and the exercise subclasses when comparing pre-intervention (*m* = 756.50, *sd* = 181.51; *m* =762.95, *sd* = 161.91) results to immediate post-intervention (*m* = 828.11, *sd* = 142.30; *m* = 871.39, *sd* = 164.67).

CHAPTER 5

DISCUSSION

The purpose of the EBP project was to provide an educational intervention that increased osteoporosis knowledge and self-efficacy of prevention among young adult females. This chapter first aimed to explain the findings of the project that were presented in chapter four as well as provide explanations and applicability of the theoretical framework and the EBP model. Then, the chapter concludes with strengths and weaknesses of the overall EBP project as well as discussion of future implications.

Explanation of Findings

Data was collected at three different time intervals: prior to the intervention, immediately following the intervention within 48 hours, and 3-weeks after the intervention. The OKT and OSES were implemented in the same manner via Blackboard during each time interval. Prior to the intervention, the participants were also asked to provide demographic data using the demographic form found in Appendix B which was also implemented via Blackboard. Analysis of this data was conducted with the use of SPSS software. Differences in scores from pre-intervention to post-intervention were of interest. The 3-week post-intervention assessment was intended to evaluate recall data and maintenance of knowledge gained from the intervention. Descriptive statistics were also examined.

Of the potential 210 females to attend the in-service educational intervention, only 84 (40%) attended. As mentioned in a previous chapter, the original plan was to have the in-service educational intervention implemented as part of the class curriculum with completion of the measurements tools as extra credit. The Department Chair of Kinesiology determined that it would be better to implement the entire educational intervention as voluntary attendance with 10 points of extra credit regardless of

measurement tool completion. The voluntary status of the intervention and limited extra credit led to a lower attendance rate. Of the 84 females that attended the intervention, 60 (71.4%) completed the demographic data as well as some portion of the OKT and OSES during the three time intervals. As discussed in the previous chapter, there was a lack of consistency on the portions of the tools that were in fact completed. This inconsistency could be attributed to the attainment of extra credit for attendance instead of completion of tools.

After completion of data collection and organization, the project manager utilized repeated-measures ANOVA to examine the total scores and subclass scores for the OSES and OKT. Initial analysis provided statistics that were significant for the total and all subclasses of the OKT as well as significant for the total of the OSES (OKT total $p = 0.000$; OKT risk factor $p = 0.000$; OKT nutrition $p = 0.000$, OKT exercise $p = 0.000$; OSES total $p = 0.026$). Post-hoc testing with paired *t*-testing was necessary to ensure accuracy of significance. As expected, improvements or significant differences were examined from pre-intervention to post-intervention either immediately or with recall examination for all initial significant subclasses; however, the total for the OSES was only significant from pre-intervention to immediately post-intervention. For many of the subclasses, significant differences were not apparent from immediate post-intervention to recall assessment, which was expected because there was no further education provided to the students. The 3-week assessment was to ensure maintenance of knowledge and self-efficacy. Consistent with the literature findings, an incidental finding was discovered that the females did partake less in muscle-strengthening exercises with only 2.8% of participants conducting sole-focused muscle-strengthening exercises. In comparison, 29.2% of participants conducted a combination of muscle-strengthening and cardiovascular training, and 58.3 % of participants conducted sole-focused cardiovascular exercises to cut weight (Ali & Siktberg, 2001; Ducher et al., 2011).

The EBP project answered the following PICOT question: In young adult collegiate females, how does an osteoporosis educational intervention compared to current education affect osteoporosis knowledge and self-efficacy of osteoporosis prevention over a one-month time period. Fortunately, the answer that the project manager was hoping for, which was increased knowledge and improved self-efficacy of osteoporosis, was received. Although self-efficacy was not as impacted as the knowledge improvement, the initial pre-test scores for self-efficacy were higher than expected (71.23%). Therefore, there was not as much room for improvement to assess as much of a significant change. Increased knowledge and improved self-efficacy results were consistent with the evidence analyzed in the review of literature (Chan et al., 2007; Piaseu et al., 2001; Rodzik, 2008).

Applicability of the Theoretical Framework

The HBM was the chosen theoretical framework for the EBP project. The HBM has been utilized to understand and improve health promotion from the beginning of its existence (Champion & Skinner, 2008). The purpose of the EBP project was to improve health promotion to reduce risk for development of osteoporosis later in life, which allowed the HBM to be very applicable to the project. The increased knowledge allowed for the participants to make better informed decisions about bone health. The assessment of self-efficacy provided the project manager with reassurance that the participants were confident in partaking in health promotion for osteoporosis prevention. The fit of the HBM to the project will be discussed in regards to the key constructs, which are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Champion & Skinner, 2008).

Fit of the theoretical framework. Overall, the action of interest was for increased bone health among the participants through increased knowledge and self-efficacy. The theoretical framework was assessed with the confidence in making

changes as measured with the OSES. Also, during group discussion each of the key constructs were discussed. The construct for perceived susceptibility was enhanced by the provision statistics of developing osteoporosis, such as 50% of women over the age of 50 have low bone mass (Looker et al., 2012). Also, the NOF (2012) presentation included that a woman's risk for breaking a hip due to osteoporosis was equal to the risk of developing breast, ovarian, and uterine cancer combined. As for perceived severity, group discussion consisted of the analysis of potential pain from broken bones as well as hospitalizations and co-morbid complications from fractures, specifically hip fractures. Perceived benefits were assessed by discussion of benefits to current health status with improved bone health as well as potential benefits in the future. Students agreed that they could benefit from more exercise currently as well as in the future. Perceived barriers were discussed with respect to current barriers as well as potential barriers in the future. Current barriers consisted of time restraints with schoolwork to start exercise regimen and not wanting to change behaviors such as smoking and consuming alcohol. In the future, students discussed the potential barriers of work, family, and other health complications. Cues to action were provided with take home materials purchased from the NOF. Lastly, self-efficacy was promoted throughout the lecture as well as the group discussion. We discussed the students' confidence levels in increasing their bone health promotion. A better understanding of individual participant's perceptions could have been assessed through individual meetings with the students. Perhaps the project can be expanded upon in the future to include a qualitative portion.

Strengths and limitations of the theoretical framework. One of the major strengths of utilizing the HBM as a guide for the EBP project is the amount of evidence within the literature review that utilized the HBM as a guide for osteoporosis health promotion among young adults (Chan et al., 2007; Nieto-Vazquez et al., 2007; Sedlak et al., 1998; Sedlak et al., 2000). Project manager was able to assess the fit of the

theoretical framework in similar projects prior to deciding to utilize the model within this project. The HBM aided in the construction of the dialogue within the slide show presentation as well as guided the questions during the group discussion. An example of a question asked to the classes was: “What do you perceive your risks are for getting osteoporosis?”

Naidoo and Wills (2009) discussed the component of the HBM that addressed the likelihood that an action will be taken. The participants need to have incentive to change, feel threatened by current behavior, feel the benefits of the change, and feel confident in the change. During discussion, the participants discussed the benefits of good bone health, and many stated that they would feel confident in making changes. The main limitation of the HBM among young adults with regard to chronic health complications is the inability to get the participants to feel threatened for the illness. Many of the students voiced that it was difficult to perceive the susceptibility and severity of osteoporosis because they were presumably healthy young adults. The OHBS may have been a more beneficial tool to utilize to fully grasp the impact of the framework of the HBM. The OHBS attempts to quantitatively assess the participants’ health beliefs with likert assessment. Subclasses of the OHBS include: a) susceptibility of osteoporosis, b) seriousness of osteoporosis, c) benefits of exercise, d) benefits of calcium intake, e) barriers of exercise, f) barriers of calcium intake, g) health motivation. The analyzed literature that utilized the HBM as a framework subsequently used the OHBS (Chan et al., 2007; Nieto-Vazquez et al., 2009; Sedlak et al., 1998; Sedlak et al., 2000). Within the EBP project, these subclasses were discussed but not quantitatively measured. In future projects, the OHBS may be beneficial to incorporate along with the OKT and OSES.

Although the HBM was a great fit for the EBP project, it was not without its flaws. Understanding the flaws and making preparations to combat the flaws allowed for the

project manager to successfully implement the HBM as a framework. Analysis of the evidence within the literature review that utilized the HBM allowed for the project manager to be aware of the potential flaws. As noted in the literature, the young adult participants commonly lacked the ability to comprehend the susceptibility and severity of osteoporosis (Chan et al., 2007; Piaseu et al., 2001). Therefore, the project manager spent more time discussing the susceptibility statistics and the severity of the illness. The participants' behaviors were not completely predictable, but with the use of the HBM as a guide in future health promotion educational interventions among young adults, it may lead to a better understanding of health beliefs among young adults.

Applicability of the EBP Model

The ACE Star model was the chosen EBP model for guidance throughout the project. The ACE Star model "serves as an organizer for examining and applying EBP" (Stevens, 2004). The ACE Star Model is a framework for methodically putting EBP processes into operation. The five phases of the model include: a) discovery of research, b) evidence summary, c) translation to guidelines, d) practice integration, and e) evaluation (Stevens, 2004).

Fit of the EBP model. The five phases of the ACE Star model provided a guide for the project manager to transition from development to implementation and to evaluation of the EBP project. During phase one, the model guided the project manager to assess generalized literature to determine the need for EBP. When assessing osteoporosis health promotion, it was evident that a consensus for standard of practice was lacking with respect to osteoporosis health promotion among young adults. After a more refined search, it was determined the young adult collegiate females were in need of EBP with regard to bone health education to prevent osteoporosis. During this phase, it was also recommended to conduct a pilot study to determine the need. This is a limitation with the project because a pilot study was not conducted.

Phase two of the ACE Star model addressed the summarization of retrieved literature as well as limiting material according to relevancy of EBP need. According to Stevens (2004), at completion of phase two the project manager should be able to summarize the evidence into one meaningful statement. Critical appraisal of the literature is conducted within this phase to take large amounts of literature retrieved and to narrow the evidence into a manageable amount. Also, with the use of critical appraisal, the evidence increased in generalizability for future implementation of the determined EBP. During this phase, the project manager was also able to discern similarities among many studies as well as determine inconsistencies. The consistencies and inconsistencies were utilized to determine inclusion and exclusion criteria as well as allowed for the project manager to begin compiling the evidence for development of the EBP guideline.

Once literature was summarized into a manageable state and was critically appraised, the development and implementation of the EBP project was established in phases three and four. The evidence was translated into practice recommendations as well as integrated into practice. During the third phase, the project manager assessed the literature and developed an osteoporosis educational in-service for young adults. Discovering common themes throughout the literature led to the development of the intervention including a) in-service presentation, b) population of college-aged females, c) NOF slide show presentation, d) group discussion, e) NOF take home materials, f) HBM for guidance. Once the intervention was determined, the project manager progressed to the fourth phase of practice integration. During this phase, the project manager presented the idea of the project to the Department Chair of Kinesiology at a university in northwest Indiana. The course of interest for implementation was a healthy lifestyle course for freshman students. Communication with the department chair was conducted via emails as well as face to face contact. The department chair allowed for

the project to be implemented within the students' coursework. There were 12 separate class sections within the course, all 12 classes were offered the osteoporosis educational in-service for extra credit. During an allotted 50-minute class time, the intervention was presented to each of the 12 classes.

During the final phase of the ACE Star Model, the project manager evaluated the outcomes. The evaluation phase addressed: a) patient health outcomes, b) provider and patient satisfaction, c) efficacy, d) efficiency, e) economic analysis, and f) health status impact. As the intervention was based on increased health education, specific health outcomes were difficult to address. However, improved self-efficacy and increased knowledge for bone health promotion could be assessed as improved health outcomes. Patient satisfaction was not assessed. The EBP project provided promising results with significantly increased osteoporosis knowledge and improved self-efficacy with a one-time in-class implementation; therefore, the project would be determined efficient and efficacious. The take home materials as well as the rights to use the OKT and OSES measurement tools were the only items purchased for implementation of the intervention costing less than $100. Longitudinal studies would be needed to address health status impacts of the EBP project. These studies could be determined with bone mineral indexes and rates of osteoporosis among the participants later in life.

Strengths and limitations of the EBP model. The ACE Star model was very useful in guiding the EBP project. The model provided phases that allowed for the project manager to maintain organization throughout the project. Also, the phases were understandable and easy to follow. However, the model lacks in-depth detailing within each of the phases. Also, the model is newer and examples of the framework utilized in practice integration are limited. The ACE Star Model is being utilized as a framework for incorporating curriculums that are evidence-based within the healthcare profession classroom setting (Fineout-Overholt, Stillwell, Williamson, Cox, & Robbins, 2011). The

osteoporosis education that was provided to the participants was evidence-based. As aforementioned in the above section, some of the portions of the ACE Star model were not applicable to the project which provided for further limitations of the model. The pilot study within phase one was not conducted due to limited time of the project. The evaluation process was also not thoroughly completed. The project was completed in a short period of time and long-term health impacts and outcomes were not able to be addressed. Another weakness is that students and kinesiology faculty were not asked to complete satisfactory surveys to evaluate the implementation of the intervention. However, the Department Chair of Kinesiology stated that she enjoyed that the project manager took interest in educating young adult students. Also, the department chair would be willing to incorporate similar projects within the freshman course in the future.

Strengths and Limitations of the EBP Project

Overall evaluation of the EBP project allows for the project manager to reflect on the strengths and limitations encountered throughout the process from planning to implementation and to evaluation. Thorough analysis of the entire project is imperative to further improve the project for future projects with similar objectives. The incidence of chronic illnesses including osteoporosis is rapidly increasing, and it is crucial that educational programs promoting health promotion are presented efficaciously.

Strengths. The convenience and ease of administration were considered strengths of the project. The project was declared as an exempt review by the university's IRB board; therefore, the participants were not asked to complete informed consent, which further increased the ease of administration. The project was implemented into a college course that was focused on healthy lifestyles; therefore, the project followed the objectives within the course curriculum. The course was a requirement of all incoming freshman students, which provided a large population pool within the age range of interest. Majority of the freshman students were 18 to 19 years of

age, which is under the average age for peak bone mass accrual. This age range allowed for the participants to increase their bone health in time to increase their peak bone mass accrual. The intervention was presented during one class session and required little extra coursework with completion of the measurement tools. Measurement tools were administered via Blackboard for ease of completion for the students. Data was also available to the project manager via Blackboard at all times throughout the project which allowed for constant monitoring.

The enthusiasm of the students to learn about osteoporosis was considered a strength. Many were unaware that their actions as young adults could have such an impact on their health later in life. The department chair was also very accepting of the project implementation. Also, many of the kinesiology professors attended the osteoporosis educational intervention and concluded that they too had learned some new facts. The group discussion was quite energetic with appropriate chatter relating to the osteoporosis discussion prompts. Many of the students approached the project manager after the class to ask further questions that were more personal dealing with health concerns relating to the issue of bone health for their personal futures.

The amount of evidence supporting the need for osteoporosis education and prevention among young adults as well as the national initiatives for bone health were strengths of the EBP project. As mentioned within the first chapter, many different national programs have determined a need for osteoporosis prevention. Healthy People 2020, within a nutrition and weight status objective, a need for increased consumption of calcium among individuals older than 2 years of age was addressed. The NOF (2012) has called for a national effort to educate youth about osteoporosis so that they have an opportunity to achieve and maintain optimal peak bone mass and reduce the risk of osteoporosis later life. In conjunction with the NOF initiative, the project was

strengthened by the use of the NOF sponsored patient education slide show presentation as well as the purchase of NOF handouts for the participants.

Limitations. The greatest weakness of the EBP project was the inconsistency of data completion by the participants. Elements of the data were missing from many of the participants' data. There were only 27 of the 60 participants (45.0%) that completed almost all of the data requests. Although the administration of the tools via Blackboard made completion easier for the students, lack of direct observation of data completion could be the culprit for the sporadic submissions. Another weakness can be determined with the voluntary status change for the educational intervention. This limitation could be reflected as a difference of opinion for innovation between the department chair and project manager. More students may have completed the forms if the forms were the source of the extra credit instead of attendance sufficing for the requirements to earn extra credit. Although professors were enthusiastic for the educational intervention, they could have provided stronger encouragement to their respective students for attendance.

Another limitation was that initially the measurement tools were entered into Blackboard incorrectly. This oversight caused much more work for the project manager to reformat the tools and to retrieve data from the first class. Each of the students' measurement tools had to be assessed separately and scored on an individual basis because of the manner in which the tools needed to be implemented on Blackboard to not affect the student's grades to result in zero points possible. In the future, a different electronic tool would be considered for collection of data. Also, consult with an information technological specialist would be beneficial.

Implications for the Future

With assessment of the project, it is vital to consider future implications. It is necessary to discuss future implications because it will strengthen the execution of

future projects with similar objectives. Implications of the project will be discussed within this section with respect to practice, theory, research, and education.

Practice. The project has implications for practice with professors as well as health care providers that provide care to college students or young adult patients. Physical education, health education, or kinesiology professors who teach classes focused on health lifestyles should incorporate health promotion which aims to decrease the risks for potential chronic health issues including osteoporosis. University-based or college-based health centers should provide education to their young adult patients about the need for good bone health as well as how to conduct good bone health with adequate calcium and vitamin D intake and moderate exercise with weight-bearing activities. General practitioners who care for young adults should also take time to provide health promotion in respect to osteoporosis and other similar chronic health issues. As presented in this EBP project, the college classroom setting is an ideal setting for reaching young adult females, and it should be encouraged that the educational intervention becomes part of the kinesiology curriculum in the future. Many young adults seek care very sparingly, it is the practitioners' job to take the time to review healthy lifestyles and encourage health promotion whenever the chance presents itself.

Theory. The HBM was applicable to this EBP project, and it was used as a framework for the dialogue of the slide show presentation as well as the group discussion prompts. The HBM takes into account the factors that affect a person's choice to undergo a healthy lifestyle change. By understanding the preconceptions of the young adult as well as which preconceptions encourage young adults to partake in health promotion is important for future projects. It is understood that young adults struggle to fathom the seriousness and susceptibility of many chronic illnesses as many of them are presumably currently health individuals. Finding ways to communicate the

threats of the illness through the use of the HBM will provide for stronger projects in the future.

Research. The amount of literature retrieved within the literature search provided evidence that many practitioners are concerned with the need for osteoporosis education and prevention. However, the research has not been disseminated to the young adults in need of the education nor has it been presented to the health educators within the university whom could relay the research to their students. Additional research is needed to determine whether or not increased knowledge and self-efficacy will be sustained over time after the incorporation of an educational intervention with young adults. Also bone mineral indexes could be assessed with longitudinal studies to address whether or not young adult females aged 18 to 20 can impact their peak bone mineral densities and sustain a higher bone mineral density into menopause. Future research is also needed to assess the male gender responses to the educational intervention as they are not invincible to the development of osteoporosis.

Education. In the future, educators within the university setting and curricula developers for courses focused on healthy lifestyles should be encouraged to incorporate health promotion education for chronic illnesses, particularly osteoporosis. The Department Chair of Kinesiology and the professors for the healthy lifestyle courses should be educated about major chronic illnesses as well as what evidence-based actions their young adult students could perform now to help reduce the risk for the chronic illnesses in the future. If curriculums required of incoming college students incorporated health promotion education, young adults would be more equipped and prepared to make better educated lifestyle decisions and potentially decrease incidences of chronic illnesses especially chronic illnesses that are preventable.

Conclusion

An in-service osteoporosis educational intervention was implemented into a college freshman kinesiology course focused on healthy lifestyles in northwest Indiana. Participants completed OKT and OSES prior to the intervention and immediately post-intervention as well as 3-weeks post-intervention. The HBM and the ACE Star model were utilized as frameworks for the EBP project. Overall, students increased their knowledge of osteoporosis as well as improved their self-efficacy with confidence of partaking in health promotion activities to prevent osteoporosis. Statistically significant improvements were seen with the total assessment of the OKT scores as well as all subclasses of risk factors, nutrition, and exercise. The OSES scores were statistically significant for the total assessment, but were not significant for the subclasses of calcium and exercise. Future projects with similar objectives could provide promising results with young adults to improve knowledge and self-efficacy of prevention of chronic illnesses like osteoporosis.

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BIOGRAPHY

Valerie A. Bollenbacher

Ms. Bollenbacher graduated from Valparaiso University with a Bachelor of Science in Nursing (BSN) degree in 2010 with Cum Laude honors. She continued her educational pursuits at Valparaiso University where she will complete a Doctorate of Nursing Practice (DNP) with a clinical focus as a family nurse practitioner (FNP) with graduation in May of 2014. She has been the recipient of the Gerke honor scholarship throughout her DNP course work. Valerie was inducted into Sigma Theta Tau International, Zeta Epsilon chapter while completing her BSN and has remained an active member throughout her pursuit for DNP. During her undergraduate and first year of graduate studies, Valerie also competed at the Division I athletic level as a member of the Valparaiso University volleyball team.

Valerie's focus in healthcare is providing comprehensive care to the family unit as a whole and understands that family dynamics play an instrumental role in care provision. She has also taken a special interest in the education of young adults concerning health promotion. Her DNP evidence-based practice (EBP) project focused on educating young adult females about osteoporosis. She has been accepted to present her EBP project findings at the annual American College Health Association conference in May 2014. After achieving her Doctorate of Nursing Practice degree and becoming a board certified family nurse practitioner, Ms. Bollenbacher plans to establish a career within a family practice primary care or internal medicine setting.

ACRONYM LIST

ACE: Academic Center for Evidence-Based Practice

ANOVA: Analysis of Variance

CDC: Centers for Disease Control and Prevention

CINAHL: Cumulative Index to Nursing and Allied Health Literature

EBP: Evidence-Based Practice

HBM: Health Belief Model

IRB: Institutional Review Board

JBI ConNect: Joanna Briggs Institute

NOF: National Osteoporosis Foundation

OBS: Osteoporosis Behaviors Survey

OHBS: Osteoporosis Health Belief Scale

OKAT: Osteoporosis Knowledge Assessment tool

OKT: Osteoporosis Knowledge Test

OPBS: Osteoporosis Preventing Behaviors Scale

OSES: Osteoporosis Self-Efficacy Scale

RCT: Randomized Control Trial

SCT: Social Cognitive Theory

USPSTF: United States Preventive Services Task Force

Appendix A

Summary of Appraised Literature

Author; Purpose; Framework; Level	Population and Setting	Design and Intervention	Area of Interest and Measurement Tool	Outcomes
Bohaty et al. (2008) Purpose: -To test effectiveness of educational intervention to increase dietary intake of calcium and Vitamin D and knowledge of osteoporosis in young adult females. Framework: - Bandura's Theory of self-efficacy Level: -III	Population: - Convenience Sample - Young adult female - Age: 19 to 30 yrs - Total: 80 Settings: - Fitness Center - Hairdressing School - Daycare Center	Design: - Quasi-experimental - One-group - Pre-test/Post-test Post-test: - 8-weeks after Intervention: - Duration: 45 min. - Type: --- Slide show presentation and group discussion --- Take home packet from NOF and slide show handouts. --- 2-week phone follow-up	Interest: - Importance of Ca and Vit. D - Risk for Osteoporosis - Strategies to increase Ca and Vit. D - Ca-rich foods that are low in fat and calories - Lactose Intolerant and Vegetarian food choices Tools: - 3-day dietary recall with Nutritionist Five software - 20 item True/False	Increase knowledge scores from pre-test to post-test were significant ($p < 0.01$). Dietary intake of Ca and Vit. D was not improved, and no significant data was found ($p = 0.38$ and $p = 0.72$). Dairy intake was also not significantly improved ($p = 0.14$).
Chan et al. (2007) Purpose: - To explore the effectiveness of an osteoporosis prevention education program for young adults. Frameworks: - HBM - Bandura's Theory of self-efficacy Level: - III	Population: - Convenience Sample - Young adults - Age: 18 to 30 yrs - Total: 46 (23 Control and 23 Intervention) Setting: - Integrated services center for young people in the community	Design: - Quasi-experimental - Two-group - Pre-test/Post-test and follow-up Post-test: - 3-weeks and 6-weeks after Intervention: - Duration: 3 lessons each 2 hours - Type: --- Slide show presentation --- Take home slide show handouts	Interest: - Osteoporosis facts - Prevention of osteoporosis - Diagnosis of osteoporosis - Treatment of osteoporosis Tools: - OKT - OHBS - OSES	All three scales resulted in statistically significant improvements compared to treatment and control groups with post-tests. Each category of the tools were assessed to be significant ($p < 0.001$)
Franzen (2011) Purpose: - To explore effectiveness of an osteoporosis education intervention in young women.	Population: - Young women - Nursing students - Beauty clinic clients - Chemistry and medical class college students	Design: - Systematic Review - Graduate Project: Bachelor Thesis Seven studies examined - All Pre-test/ Post test format	Interest of common themes: - Osteoporosis diagnosis - Risk factors - General prevention and specific to women's health	Osteoporosis education is needed among young adults. Young adults are tough to educate. Persistent education is needed.

Framework: - Bandura's self-efficacy Level: - I	- Fitness Center - Hairdressing school students - Daycare Center - General female volunteers - School girls Setting: - Grade school - University hospital center - College and University - Nursing School - Two beauty clinics	Post-tests: - 8-weeks; 4-weeks; 3-weeks; 2-weeks; and 1 day post intervention Intervention: - Common Intervention Duration: Not specified - Common Intervention Types: --- Group lecture/ discussion --- Slide show presentations	- Treatment - Physical consequences to women's body Common Tools: - OKT - OPBS - OSES - OHBS	
Nieto-Vazquez et al. (2009) Purpose: - To determine the effects of an osteoporosis educational intervention in college-age Puerto Rican women. Framework: - HBM - Purnell model of cultural competency Level: - II	Population: - Convenience Sample - Undergraduate female students - Age: 18 to 25 yrs - Total: 105 (54 control group and 51 treatment group randomly assigned) Setting: - Medium-sized public university in the Eastern Caribbean	Design: - RCT - Two-group - Pre-test/Post-test Post-test: - 4-weeks after Intervention: - Duration: Not Specified - Type: --- In-service (presentation not specified)	Interest: - NOF guidelines - Define bone mass density - Identify risk factors - Importance of bone mass maintenance - Strategies for prevention Tools: - OKT - OHBS - OSES	Women who attended the osteoporosis educational intervention (treatment group) had statistically significant ($p = 0.038$) higher knowledge than those who did not attend (control group) ($p < 0.05$). Treatment group had statistically significant ($p = 0.049$) increase in positive health beliefs compared to control group ($p < 0.05$). Treatment group did not have significant increase in self-efficacy ($p = 0.32$).
Piaseu et al. (2001) Purpose: To test the effectiveness of an osteoporosis educational program for young women Framework: - Not Specified Level: - II	Population: - Convenience Sample - Thai undergraduate female nursing students - Age: 17 -21 yrs - Total: 100 (50 randomly assigned to each the control and treatment group) Setting: - First-year Thailand Nursing program	Design: - RCT - Two-group - Pre-test/Post-test Post-test: - 2-weeks after intervention Intervention: - Duration: 3-hour - Type: --- Slide show presentation --- Ca-rich foods served --- Demonstration of weight-bearing activities	Interest: - Risk factors - Consequences of Osteoporosis - Strategies to Prevent Tools: - OKT - OHBS - OSES	Across all three scales, the treatment group had statistically significant improvement from pre-test to post-test ($p < 0.01$). There are no significant results with comparison of pre-test to post-test with control group.

Rodzik (2008) Purpose: - To determine if an educational intervention would increase knowledge and influence women to change behaviors regarding osteoporosis prevention. Framework: - Bandura's Social cognitive theory Level: III	Population: - Convenience Sample - College females - Age: 18-48 yrs - Total: 149 Setting: - Midwestern community college	Design: - Master's Thesis - Quasi-Experimental - One-group - Pre-Test/Post-Test Post-Test: - Same day after intervention Intervention: - Duration: 15min. (Total time 30 min with pre-test, slide show, and post-test) - Type: --- Slide show presentation	Interest: - Risk Factors - Physical Consequences - Strategies for prevention Tools - OKT - OSES	Knowledge of osteoporosis and prevention behaviors such as calcium intake and exercise showed higher self-efficacy. OSES and OKT pre-test and post-test provided statistically significant results ($p < 0.05$).
Sedlak et al. (1998) Purpose: To assess whether young women participating in an osteoporosis prevention program based on HBM and Self-Efficacy Model will have higher levels of knowledge. Framework: - Bandura's Self - Efficacy model - HBM Level: - II	Population: - Convenience Sample - Young college women - Total 31 (Randomly assigned to 13 Control group and 18 Treatment Group) Setting: - Large Midwestern state university - Freshmen pre-nursing course	Design: - RCT - Two-group - Pre-Test/Post-Test Post-Test: - 3 weeks after intervention Intervention: - Duration: 3 sessions (1 pre-test, 1 intervention, and 1 post-test) - Type: --- Slide show presentation from NOF *Osteoporosis Across the Lifespan.* --- Take Home instructional material --- Group Discussion --- Ca-rich foods served	Interest: - NOF guidelines - Outline of presentation not provided Tools: - OKT - OHBS - OSES	Statistically significant improvement in knowledge (OKT) from pre-test to post-test of treatment group ($p \leq 0.001$). Statistically significant improvement in health belief (OHBS) from pre-test to post-test of treatment group ($p \leq 0.001$). No significant change with self-efficacy (OSES) with treatment or control group. Control group pre-test/post-test: no significant change in OKT, OHBS, or OSES.
Sedlak et al. (2000) Purpose: - To increase knowledge of osteoporosis preventing behaviors through education programs differing in intensity to	Population (3 programs): - Intense: Young women; Total-31 - Intermediate: Heterogeneous community sample of women; Total-35; Age-22 to 83 yrs. - Brief: Nurses; Total-18; Age- 35	Design: - Quasi-experimental - 3-group - Pre-Test/Post-Test Post-Test: - 3-weeks after Intervention: - Duration: --- Intense: 3 sessions over 3 weeks	Interest: - NOF guidelines - Definition of osteoporosis - Description of bone health - Risk factors - Diagnostic screening - Treatment - Barriers of prevention	Statistically significant improvement from pre-test to post-test was seen in OKT ($p < 0.01$ for intermediate group and $p < 0.001$ for intense and brief groups). With OHBS,

represent learning needs. Framework: - Adult Learning - HBM Level: - III	to 59 yrs Setting: - Local University	--- Intermediate: One 3-hour session --- Brief: One 45-min session - Type: --- Slide Show presentation from NOF *Osteoporosis: The Silent Disease* --- Brochure: NOF *Stand up to Osteoporosis*	- Susceptibility of osteoporosis Tools: - OKT - OHBS - OPBS	intermediate group was the only one to show significant improvement ($p < 0.05$). With OPBS, only one portion of the OPBS was significant with decreased caffeine intake in the intense group ($p < 0.05$).
Werner (2005) Purpose: - To examine the status of research on knowledge about osteoporosis by reviewing and analyzing the current literature. Framework: - Not specified Level: - V	Common themes Population: - Convenience samples - Majority peri- and post-menopausal healthy women Setting: - No common theme for setting of studies	Design: - Literature Review Instruments used to assess knowledge about osteoporosis - Structured - 10 studies/tools reviewed - Unstructured – 8 studies/tools reviewed Relationship between knowledge and osteoporosis health-related behaviors - Cross-sectional --- 5 studies - Experimental ---10 studies	Interest: - Assessment of knowledge about osteoporosis. - Correlates of knowledge about osteoporosis. - Relationships between knowledge about osteoporosis and participation in health-related behaviors. - Future directions in the field.	Correlates of osteoporosis knowledge: - Higher knowledge is seen in: females, higher education; relative with osteoporosis; and previous osteoporosis specific education. Relationship with knowledge and health-related behavior: - Majority increased knowledge w/ educational program - Less consistent in health behavior change
Zhang et al. (2012) Purpose: - To evaluate the effectiveness of a targeted continuing osteoporosis educational program and to explore awareness and prevention of osteoporosis in female pre-internship nurse students. Framework: - Not Specified Level: - III	Population: - Convenience Sample - Pre-internship nursing students - Female - Avg. Age 18.8 yrs - Total: 256 Setting: - Northwest China - Coin-toss one technical/ professional nursing school randomly chosen	Design: Quasi-Experimental One-group Pre-Test/Post-Test Post-Test: - 2-weeks after intervention Intervention: - Duration: 2.5 hour lecture with 30 min open discussion and 20 min questioning - Type: --- Lecture --- Slide show presentation based on NOF --- Group discussion	Interest: - NOF Guidelines - Definition of osteoporosis - Prevalence on osteoporosis - Etiology of osteoporosis - Risk factors - Physical consequences - Prevention - Diagnostic - Treatment Tools: - OKAT - OHBS - OSES	OKAT: Statistically significant improvement in knowledge from pre-test to post-test ($P < 0.001$). OHBS: Statistically significant improvement in health belief ($p < 0.001$). Not sig. portions: perceived seriousness ($p = 0.019$), barriers to exercise and Ca intake ($p = 0.544$; 0.287); and motivation $p = 0.001$) OSES: Statistically significant improvement of self-efficacy ($p < 0.001$)

Appendix B

Demographic Form

1. Gender:

A: Male
B: Female

2. Age: _____
(Please fill in the blank)

3. Ethnicity/Race:

A: White
B: African American
C. Hispanic
D. Asian / Pacific-Islander
E. Native American

4. Marital Status:

A: Single, never married
B: Married
C: Separated
D: Divorced
E: Widowed

5. College of Study:

A: College of Arts and Sciences
B: College of Business
C: Christ College
D: College of Engineering
E: College of Nursing
F: Undecided

6. Weekly Frequency of Exercise:

A: None
B: Seldom
C: 2 to 3 times
D: 4 to 6 times
E: More than 6 times

7. Majority of Exercise consists of:

A: Cardio
B: Muscle-Strengthening
C: Equal combination of both cardio and muscle-strengthening
D: Flexibility – Yoga, Pilates, etc…
E: None – Don't Exercise Regularly

8. Annual Household Income

A: Below $10,000
B: $10,000 to $24,999
C: $25,000 to $39,999
D: $40,000 to $54,999
E: $55,000 to $69,999
F: $70,000 to $84,999
G: $85,000 to $99,999
H: $100,000 to $114,999
I: $115,000 to $150,000
J: Above $150,000