

Health Belief Model

Theory Essence Sentence

Personal beliefs influence health behavior.

STUDENT LEARNING OUTCOMES

After reading this chapter the student will be able to:

1. Explain the original concept of the Health Belief Model.
 2. Discuss how the constructs of perceived seriousness, susceptibility, benefits, and barriers might predict health behavior.
 3. Analyze the impact of the modifying variables on health behavior.
 4. Identify cues to action and how they motivate behavior.
 5. Use the theory to explain at least one behavior.
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THEORETICAL CONCEPT

The Health Belief Model (HBM) is by far the most commonly used theory in health education and health promotion (Glanz, Rimer, & Lewis, 2002; National Cancer Institute [NCI], 2003). It was developed in the 1950s as a way to explain why medical screening programs offered by the U.S. Public Health Service, particularly for tuberculosis, were not very successful (Hochbaum, 1958).

The underlying concept of the original HBM is that health behavior is determined by personal beliefs or percep-

tions about a disease and the strategies available to decrease its occurrence (Hochbaum, 1958). Personal perception is influenced by the whole range of intrapersonal factors affecting health behavior, as discussed in Chapter 1.

THEORETICAL CONSTRUCTS

The following four perceptions serve as the main constructs of the model: perceived seriousness, perceived susceptibility, perceived benefits, and perceived barriers. Each of these perceptions, individually or in combination, can be used to explain health behavior. More recently, other constructs have been added to the HBM; thus, the model has been expanded to include cues to action, motivating factors, and self-efficacy.

Perceived Seriousness

The construct of perceived seriousness speaks to an individual's belief about the seriousness or severity of a disease. While the perception of seriousness is often based on medical information or knowledge, it may also come from beliefs a person has about the difficulties a disease would create or the effects it would have on his or her life in general (McCormick-Brown, 1999). For example, most of us view the flu as a relatively minor ailment. We get it, stay home a few days, and get better. However, if you have asthma, contracting the flu could land you in the hospital. In this case, your perception of the flu might be that it is a serious disease. Or, if you are self-employed, having the flu might mean a week or more of lost wages. Again, this would influence your perception of the seriousness of this illness.

Perceived Susceptibility

Personal risk or susceptibility is one of the more powerful perceptions in prompting people to adopt healthier behaviors. The greater the perceived risk, the greater the likelihood of engaging in behaviors to decrease the risk. This is what prompts men who have sex with men to be vaccinated against hepatitis B (de Wit et al., 2005) and to use condoms in an effort to decrease susceptibility to HIV infection (Belcher et al., 2005). Perceived susceptibility motivates people to be vaccinated for influenza (Chen et al., 2007), to use sunscreen to prevent skin cancer, and to floss their teeth to prevent gum disease and tooth loss.

It is only logical that when people believe they are at risk for a disease, they will be more likely to do something to prevent it from happening. Unfortunately, the opposite also occurs. When people believe they are not at risk or have a low risk of susceptibility, unhealthy behaviors tend to result. This is exactly what has been found with older adults and HIV prevention behavior. Because older adults generally do not perceive themselves to be at risk for HIV infection, many do not practice safer sex (Rose, 1995; Maes & Louis, 2003). This same scenario was found with Asian American college students. They tended to view the HIV/AIDS epidemic as a non-Asian problem; thus, their perception of susceptibility to HIV infection was low and not associated with practicing safer sex behaviors (Yep, 1993).

What we have seen so far is that a perception of increased susceptibility or risk is linked to healthier behaviors, and decreased susceptibility to unhealthy behaviors. However, this is not always the case. In college students, perception of susceptibility is rarely linked to the adoption of healthier behaviors (Courtenay, 1998), even when the perception of risk is high. For example, although college students consider themselves at risk for HIV because of their unsafe sex behaviors, they still do not practice safer sex (Lewis & Malow, 1997), nor do they stop tanning even though they perceive themselves to be at increased risk for skin cancer (Lamanna, 2004). Perception of susceptibility explains behavior in some situations, but not all.

When the perception of susceptibility is combined with seriousness, it results in perceived threat (Stretcher & Rosenstock, 1997). If the perception of threat is to a serious disease for which there is a real risk, behavior often changes. This is what happened in Germany in 2001 after an outbreak of bovine spongiform encephalitis (BSE), better known as mad cow disease. Although mad cow disease does not occur in people, research suggests that eating cattle with the disease can result in variant Creutzfeldt-Jakob disease (CJD). Vari-

ant CJD, like BSE, affects the brain, causing tiny holes that make it appear spongelike. Both diseases are untreatable and fatal (National Institute of Neurological Disorders and Stroke, 2007). The perception of threat of contracting this disease through eating beef was one factor related to declining meat consumption in Germany (Weitkunat et al., 2003). People changed their behavior based on the perception of threat of a fatal disease.

Another example in which perception of threat is linked to behavior change is found in colon cancer survivors. Colorectal cancer is a very serious disease with a high risk of recurrence. It is the perception of the threat of recurrence that increases the likelihood of behavior change in people previously treated for this disease. In particular, changes occur in their diets, exercise, and weight (Mullens et al., 2003).

We see the same thing when people perceive a threat of developing non-insulin-dependent diabetes mellitus (NIDDM). Among people whose parents had or have the disease, the perception of threat of developing it themselves is predictive of more health-enhancing, risk-reducing behaviors. Most important, they are more likely than others to engage in behaviors to control their weight (Forsyth, 1997), given that obesity is a known risk factor for NIDDM.

Just as perception of increased susceptibility does not always lead to behavior change, as we saw earlier in the chapter with college students, neither does a perception of increased threat. This is the scenario with older adults and safe food-handling behaviors. Older adults are among the groups most vulnerable to foodborne illness (Gerba, Row, & Haas, 1996) and are among those for whom it can be particularly serious. Even though they perceive a threat of illness from foodborne sources, they still do not use safe food-handling practices (Hanson & Benedict, 2002) all of the time.

Perceived Benefits

The construct of perceived benefits is a person's opinion of the value or usefulness of a new behavior in decreasing the risk of developing a disease. People tend to adopt healthier behaviors when they believe the new behavior will decrease their chances of developing a disease. Would people strive to eat five servings of fruits and vegetables a day if they didn't believe it was beneficial? Would people quit smoking if they didn't believe it was better for their health? Would people use sunscreen if they didn't believe it worked? Probably not.

Perceived benefits play an important role in the adoption of secondary prevention behaviors, such as screenings. A good example of this is screening for colon cancer. One of the screening tests for colon cancer is a colonoscopy. It requires a few days of preparation prior to the procedure to completely

cleanse the colon: a diet restricted to clear liquids followed by cathartics. The procedure involves the insertion of a very long, flexible tube instrument with a camera on the end into the rectum to view the length of the colon. The procedure itself is done under anesthesia, so it is not uncomfortable, but it does take time afterward to recover, and the preparation is time consuming. Regardless of the inconvenience, this is presently the best method for early detection of colon cancer, the third leading cause of cancer deaths in the United States. When colon cancer is found early, it has a 90% cure rate. However, only 36% of people over age 50 (who are most at risk) have this screening done (New York-Presbyterian Hospital, 2006). What makes some people undergo screening and others not? Among women, those who perceive a benefit from colonoscopy (early detection) are more likely to undergo screening than those who do not see the screening as having a benefit (Frank & Swedmark, 2004).

The same holds true for breast cancer. We know that the earlier breast cancer is found, the greater the chance of survival. We also know that a breast self exam (BSE), when done regularly, can be an effective means of early detection. But not all women do BSE regularly. They have to believe there is a benefit in adopting this behavior, which is exactly what was found to be true among black women: those who believed breast self exams were beneficial did them more frequently (Graham, 2002).

Perceived Barriers

Since change is not something that comes easily to most people, the last construct of the HBM addresses the issue of perceived barriers to change. This is an individual's own evaluation of the obstacles in the way of him or her adopting a new behavior. Of all the constructs, perceived barriers are the most significant in determining behavior change (Janz & Becker, 1984).

In order for a new behavior to be adopted, a person needs to believe the benefits of the new behavior outweigh the consequences of continuing the old behavior (Centers for Disease Control and Prevention, 2004). This enables barriers to be overcome and the new behavior to be adopted.

In trying to increase breast self examination practices in women, it would seem obvious that the threat of breast cancer would motivate adoption of this early detection practice. Certainly breast cancer is a very serious disease, one for which women are at risk and for which the perception of threat is high. Even with all of this, the barriers to performing BSE exert a greater influence over the behavior than does the threat of cancer itself (Champion, 1993; Champion & Menon, 1997; Ellingson & Yarber, 1997; Umeh & Rogan-Gibson, 2001).

Some of these barriers include difficulty with starting a new behavior or developing a new habit, fear of not being able to perform BSE correctly, having to give up things in order to do BSE, and embarrassment (Umeh & Rogan-Gibson, 2001).

Barriers also stand in the way of Hispanic women seeking Pap tests, even though they perceive cervical cancer as being serious and believe there are benefits to having a Pap test. The barriers—fear that the test is painful and not knowing where to go for testing—are not outweighed by the benefits of the test or minimized by the seriousness of the disease (Byrd et al., 2004). Among college women, fear of pain and embarrassment are the barriers to Pap tests. It is interesting that these barrier beliefs are greatest among women who have never had a Pap test (Burak & Meyer, 1997).

Modifying Variables

The four major constructs of perception are modified by other variables, such as culture, education level, past experiences, skill, and motivation, to name a few. These are individual characteristics that influence personal perceptions. For example, if someone is diagnosed with basal cell skin cancer and successfully treated, he or she may have a heightened perception of susceptibility because of this past experience and be more conscious of sun exposure because of past experience. Conversely, this past experience could diminish the person's perception of seriousness because the cancer was easily treated and cured.

In personal health classes on many campuses, students are required to complete a behavior change project. They choose an unhealthy behavior and develop a plan to change it and adopt a more healthy behavior. The modifying variable behind this is motivation. The motivation is a grade.

Cues to Action

In addition to the four beliefs or perceptions and modifying variables, the HBM suggests that behavior is also influenced by cues to action. Cues to action are events, people, or things that move people to change their behavior. Examples include illness of a family member, media reports (Graham, 2002), mass media campaigns (Figure 4.1), advice from others, reminder postcards from a health care provider (Ali, 2002), or health warning labels on a product.

Knowing a fellow church member with prostate cancer is a significant cue to action for African American men to attend prostate cancer education programs (Weinrich et al., 1998). Hearing TV or radio news stories about foodborne illness and reading the safe handling instructions on packages of raw meat and poultry are cues to action associated with safer food-handling behaviors (Hanson & Benedict, 2002). Having

ing they do not believe they can exercise, and perceive there to be significant barriers to exercise (Wallace, 2002). As a result, these women do not exercise.

In summary, according to the Health Belief Model, modifying variables, cues to action, and self-efficacy affect our perception of susceptibility, seriousness, benefits, and barriers and, therefore, our behavior (Figure 4.2).

Health Belief Model Constructs Chart

Perceived susceptibility	An individual's assessment of his or her chances of getting the disease
Perceived benefits	An individual's conclusion as to whether the new behavior is better than what he or she is already doing
Perceived barriers	An individual's opinion as to what will stop him or her from adopting the new behavior
Perceived seriousness	An individual's judgment as to the severity of the disease
Modifying variables	An individual's personal factors that affect whether the new behavior is adopted
Cues to action	Those factors that will start a person on the way to changing behavior
Self-efficacy	Personal belief in one's own ability to do something



Perception of benefits and barriers is a powerful determinate of health behavior.

THEORY IN ACTION: CLASS ACTIVITY

Using the HBM, brainstorm to identify possible perceptions of seriousness, susceptibility, benefits, and barriers that might explain why some women do not engage in behav-

iors to prevent osteoporosis, and possible cues to action and modifying variables that might change this behavior.

Now read the following article, and then answer the discussion questions that follow it.

Design and Implementation of an Osteoporosis Prevention Program Using the Health Belief Model

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ABSTRACT

Osteoporosis is a crippling condition that often results in premature mortality and significant morbidity that is manifested in the form of fractures, bone deformity, and pain. Osteoporosis is a serious public health problem that affects 25 million people in the United States, 80% of whom are women. National health objectives indicate an urgent need to reduce deaths due to falls, reduce the incidence of hip fractures, and increase the number of women educated about osteoporosis. Strategies for preventing osteoporosis include maximizing peak bone mass and minimizing bone losses through health education and health promotion programs. This study describes the design and implementation of an Osteoporosis Prevention Program for middle-aged women using the Health Belief Model.

Osteoporosis is a crippling condition that often results in premature mortality and significant morbidity that is manifested in the form of fractures, bone deformity, and pain (Krall & Dawson-Hughes, 1999). It is a serious public health problem that affects 25 million people in the United States, 80% of whom are women (McBean, Forgac & Finn, 1994). Osteoporosis is responsible for more than 1.5 million fractures annually including hip fracture, a life-threatening outcome (Krall & Dawson-Hughes, 1999). Hip fracture results in severe dis-

ability and even death: 20% of persons who experience a hip fracture die within a year (McBean, Forgac & Finn, 1994).

National expenditures related to this disease are estimated at \$17 billion annually; this cost is estimated to triple by the year 2040 (Melton, Thamer & Ray, 1997). National health objectives indicate an urgent need to reduce deaths due to falls, reduce the incidence of hip fractures, and increase the number of women educated about osteoporosis (U.S.D.H.H.S., 2000).

People who enter adulthood with low peak bone mass are at greatest risk of developing osteoporosis and associated fractures (Hansen, Overgaard, Riis, Christiansen, 1991). Lifestyle factors, including calcium intake and physical activity, account for approximately 20% of the variance in peak bone mass (Rubin, Hawker, Peltekova, Fielding, Ridout, Cole, 1999). Therefore facilitating healthy behaviors may maximize peak bone mass and slow bone loss. Medical treatment interventions are unable to completely reverse the effects of osteoporosis; therefore strategies designed to maximize peak bone mass and reduce bone loss later in life include prevention through health education and health promotion (Mark & Link, 1999).

Studies examining the design and implementation of osteoporosis prevention education are limited. Sedlak, Doheny

and Jones (2000) implemented three osteoporosis prevention education programs and reported significant improvements in osteoporosis knowledge after completing the programs. Blalock and colleagues (2000) examined the effects of brief written education materials and reported changes in osteoporosis knowledge and beliefs. Jamal and colleagues (1999) provided an intervention that included osteoporosis education and bone mineral density testing. They examined changes in lifestyle behaviors one year following the intervention and reported significant improvements in self-reported lifestyle behaviors. The purpose of this article is to describe the design and implementation of an Osteoporosis Prevention Program for middle-aged women using the Health Belief Model.

HEALTH BELIEF MODEL FRAMEWORK

The Health Belief Model (HBM) is a conceptual framework used to understand health behavior and possible reasons for non-compliance with recommended health action (Becker & Rosenstock, 1984). It can provide guidelines for program development allowing planners to understand and address reasons for non-compliance. The HBM addresses four major components for compliance with recommended health action: perceived barriers of recommended health action, perceived benefits of recommended health action, perceived susceptibility of the disease, and perceived severity of the disease. In addition, there are modifying factors that can affect behavior compliance. Modifying factors would include media, health professionals, personal relationships, incentives, and self-efficacy of recommended health action. The Osteoporosis Prevention Program (OPP) addressed several of the components in order to address major reasons for non-compliance concerning recommendations for osteoporosis prevention.

Articulation of OPP to HBM Framework

Several perceived barriers deter participant participation in health promotion programs for women. These include inconvenient program days and time, inaccessible location, lack of childcare, lack of time and cost. This program was designed to address these common barriers. To make the class times convenient, eight sessions of each class were offered each month at a variety of times (morning, afternoon and evening) to accommodate the various scheduling needs of participants. Classes were held at a centrally located state-of-the-art community center that provided free childcare services. To address the barrier of lack of time, each of the four classes lasted one hour and the screening and individual consultation required approximately an hour and a half, therefore the total contact time commitment for the entire program was five and a half

hours. To overcome another common barrier, cost, the program was offered free to participants.

A common reason for non-compliance to osteoporosis prevention is the erroneous belief that osteoporosis is not serious. According to the Health Belief Model, people are most likely to make health behavior changes when they perceive that the disease is serious and are less likely to practice healthy behaviors if they believe that the disease is not severe (Maddux & Rogers, 1998; Rosenstock, 1974). To demonstrate the severity of this disease, negative outcomes associated with the disease were presented including death, crippling and fractures. Osteoporosis results in reduced quality of life, avoidance of social interaction due to low self-esteem and physical pain of daily activities. Emotional suffering and anxiety regarding fear of fracture and depression about being dependent on others are other negative outcomes associated with osteoporosis.

Program Administration

Recruitment efforts utilized a variety of avenues to reach women and encourage participation. A flyer was developed that included a list of dangers of osteoporosis, a graphic image of a spine, a photo of a disfigured woman with the disease, and contact information about the Osteoporosis Prevention Program. Targeted settings included the local university, the school systems, libraries, community centers, hair and beauty salons, shopping centers, the mall, and grocery stores. Flyers were also distributed to health department offices, hospitals, clinics and doctors' offices. Recruitment efforts were conducted by way of the local university daily e-mail announcements, newspapers, television and radio networks. These efforts generated interest from approximately 100 potential participants.

Recruitment announcements instructed interested potential participants to call to reserve a place in an Orientation Class. Eight sections of the Orientation Class were held at a centrally located, state-of-the-art community center. Class size was limited to 50 participants per class. The Orientation Class defined osteoporosis and described the disease outcomes, risk factors, general strategies for prevention, and information regarding the Osteoporosis Prevention Program. Attendees were instructed to tell their friends about the program and, as a result, 292 additional potential participants registered for a subsequent section of the Orientation Class. A total of 392 women attended the Orientation Classes and a total of 342 women completed the entire program.

The Osteoporosis Prevention Program was comprised of three components: educational classes, bone mineral density testing, and individual consultation. The educational classes component included four classes designed to educate and provide skill acquisition information to assist women in making

lifestyle modifications to improve bone health. The four class topics were: general information about osteoporosis and orientation to the program, improving calcium intake through low fat food selections, selecting and utilizing calcium supplements, and initiating and adhering to a weight bearing exercise program. Several barriers deter participant participation in health promotion programs for women. These include inconvenient program days and time, inaccessible location, lack of childcare, lack of time and cost. This program was designed to address these common barriers. To make the class times convenient, eight sessions of each class were offered each month at a variety of times (morning, afternoon and evening) to accommodate the various scheduling needs of participants. Classes were held at a centrally located state-of-the-art community center that provided free childcare services. To address the barrier of lack of time, each of the four classes lasted one hour and the screening and individual consultation required approximately an hour and a half, therefore the total contact time commitment for the entire program was five and a half hours. To overcome another common barrier, cost, the program was offered free to participants. Funding was obtained from a local private organization.

To efficiently manage time, at the end of the orientation class, participants signed up for the nutrition class; upon completion of the nutrition class, participants signed up for the supplements class; and at the end of the supplements class, participants signed up for the exercise class. These cues to action encouraged participants to continue in the program. Classes started and ended on time; forty-five minutes were scheduled for lecture and fifteen minutes were provided for paperwork and to respond to questions.

The orientation class was prepared by the Principal Investigator and utilized information obtained from the National Osteoporosis Foundation. When participants arrived, they were greeted by the instructor and an assistant and asked to find a seat at a table. A handout packet was provided for each participant that included a flyer about the program and a power point handout that followed the presentation.

To demonstrate the severity of the health threat of osteoporosis, a picture of a woman with a severe stooped posture and a protruding abdomen was included in the educational materials. According to Klohn and Rogers (1991), motivation to prevent osteoporosis remained high among women in their study if they believed it was highly visible or disfiguring. Osteoporosis results in avoidance of social interaction due to low self-esteem and physical pain of daily activities. Emotional suffering and anxiety regarding fear of fracture and depression about being dependent on others are other negative outcomes associated with osteoporosis.

Another common barrier to osteoporosis education is low perceived susceptibility reflected in the false belief that osteoporosis only happens to old women. According to the Health Belief Model (Becker & Rosenstock, 1984) people who perceive that they are not susceptible to a disease are not likely to take positive prevention actions. In a study by Anderson, Auld & Schiltz (1996), women were aware about osteoporosis but they were unconcerned about the harm to them specifically as individuals. Kasper, Peterson, Allegrante, Galsworthy, & Gutin (1994) reported that most women in their study believed they would not develop osteoporosis and practiced behaviors that were detrimental to bone health.

To increase perceived susceptibility, a slide of normal healthy bone (from a 75 year old woman) and a slide of weak osteoporotic bone (from a 47 year old woman) were included as part of the class materials along with visuals of the three common sites for osteoporotic fracture (spine, hip and wrist). To further increase perceived susceptibility, incidences of osteopenia, osteoporosis, and osteoporotic fractures among U.S. women of all ages were included. The concept of osteoporosis as the silent thief was discussed to illustrate that this disease progresses without outward symptoms until the disease progress is severe, often resulting in fracture.

To maximize the probability that a participant will make a positive health behavior change, effective coping responses must be presented and participants must perceive they have the ability to perform these coping responses (Maddux & Rogers, 1998). Therefore, controllable risk factors for osteoporosis were presented. To enhance skill building, self-efficacy, and perceived ability to perform effective coping responses, strategies for osteoporosis prevention were also presented.

Slides were displayed of women receiving bone mineral density testing and this procedure was well described. Finally, the Osteoporosis Prevention Program was described and women were instructed to sign up for a nutrition class.

Adequate calcium is required for maintaining optimal bone density throughout life (National Osteoporosis Foundation, 2000). The National Institutes of Health (2000) report that fifty to sixty percent of women consume less than half of the recommended amount of calcium. Increasing calcium intake is an important part of osteoporosis prevention (NOF, 2000).

A Registered Dietitian prepared the nutrition class, titled "Increasing Calcium Consumption Through Foods." Information was obtained from nutrition textbooks, the National Osteoporosis Foundation, the American Dietetic Association, and National Institutes of Health. Each participant received a power point handout that included the slides presented in the class, a glossy handout of the Food Guide Pyramid, a list

of calcium and fat contents of common foods, and a glossy recipe pamphlet of low-fat high calcium recipes with photos.

Dietary Reference Intakes state that 1000 milligrams of calcium are required for women ages 19 to 50 years and 1200 milligrams are required for women over age 50 (Institute of Medicine, 1997). This class addressed improving overall diet quality and emphasized ways to meet calcium requirements through food choices. The nutrition class provided information regarding specific ways to select low-fat dairy products. Detailed information was disseminated regarding calorie and fat contents of specific dairy products. A comparison of nutrients in milk and soda were displayed. Portions of a variety of dairy products to provide one serving or 300 milligrams of calcium were displayed and food models were circulated to demonstrate portion sizes. Ways to incorporate dairy products in recipes were presented such as substituting non-fat milk for water in soups, cereals, oatmeal, mashed potatoes and pancakes.

Information was distributed regarding how to obtain calcium from non-dairy food sources including red beans, pinto beans, cooked collards or turnips, broccoli, almonds, canned salmon and sardines with edible bones, calcium-enriched tofu, and calcium-enriched soy milk. Calcium fortified food products such as orange juice were also presented. Calcium-rich low-fat recipes were disseminated as well as sample grocery lists. Several women reported that the grocery lists were excellent reminders (or cues to action) to help make positive behavior changes. Women who expressed concerns about weight control and heart disease were given strategies for improving their calcium intake while reducing their risk of other chronic diseases.

The importance of avoiding fad diets was discussed and calcium contents of some popular fad diets were displayed. The ineffectiveness of fad diets for weight control was discussed along with the inadequate levels of calcium delivered by fad diets. Overcoming lactose intolerance was covered and handouts were available for women who had this condition.

At the end of the nutrition class, participants were instructed to sign up for the calcium supplements class. Women were instructed to bring calcium and other supplements they were using to the supplements class.

The class devoted to the selection of calcium supplements was designed to assist women who were lactose intolerant or who were otherwise unable to obtain sufficient calcium from their diets. This class was prepared by a Registered Dietitian and utilized a thorough literature review of 44 current articles in peer-reviewed journals regarding calcium supplementation.

Recommended daily calcium amounts were presented and participants were instructed to first calculate the amount of calcium they receive from foods, then to calculate the remaining amount needed from supplements. Guidelines for selecting a supplement were provided including the importance of selecting a dissolvable supplement. A dissolvability experiment was conducted and a variety of calcium supplements were put into clear cups with white vinegar and the amount of time required for supplements to dissolve was noted. (Supplements should fully dissolve in 45 minutes.) The benefit of liquid and chewable supplements was discussed because these dissolve in the mouth. The issue of absorbability was discussed and supplements with high absorbability ratings (calcium citrate and calcium carbonate) were recommended. Selecting products with selected other nutrients such as vitamin D and vitamin K was discussed.

The instructor discussed the issue of contaminants and presented products to avoid that may contain harmful substances. Dangers of toxicity, levels of intake that can lead to toxicity and conditions where supplementation is not recommended (such as kidney stones) were discussed. The issue of when to take a calcium supplement was covered and other dietary considerations that may impair calcium absorption were discussed. This class concluded with a list of strategies for maintaining bone health including not smoking and not consuming alcohol in excess. At the end of the supplements class, women were instructed to sign up for the exercise class.

Regular physical activity contributes to the prevention of osteoporosis by the bone's response to demands placed upon it (Greendale, Barrett-Connor, & Eldelstein, 1995). Physical activity promotes an increase in bone mineral density (Bassey & Ramsdale, 1994) and reduction in bone loss among women (Katz, Sherman, & DiNubile, 1998). Weight bearing exercises are especially beneficial for building and maintaining bone strength and density (Drinkwater & McCloy 1994).

The exercise class was prepared utilizing fitness textbooks and information from the National Osteoporosis Foundation and American College of Sports Medicine. Participants were provided with a power point handout and illustrations of safe stretches and exercises. Information presented in this class included benefits of exercise, exercise myths and facts, recommended types of exercises, developing components of fitness, guidelines for starting an exercise program, training principles, weight bearing exercises, resistive exercise with equipment, and utilization of common objects at home to provide resistance.

The instructor demonstrated exercises, and safety tips were provided. Several suggestions for improving adherence were discussed. The importance of selecting physical activities

that are enjoyed was emphasized. A national survey indicated that yard work was associated with higher bone density levels and was more popular than walking and other activities among women (Turner, Ting, Bass & Brown, 2000). Women were encouraged to find a friend to exercise with. Information regarding local facilities and programs were also distributed.

Prior to the physical activity classes, sign up sheets were developed for the bone mineral density testing schedule. Participants were instructed to sign up for the bone density testing component of the program before departing.

Each participant received bone mineral density testing of the left hip, spine and total body using dual energy X-ray absorptiometry (DEXA) technology. A full table Lunar Prodigy was used for testing. Bone mineral density testing is safe, fast, easy and comfortable. The participants expressed appreciation for being able to have their bone density tested without having to pay a fee. The computer software generated detailed printouts regarding bone density and body composition. These included color printouts of bone density levels, graphic images of the hip, spine and total body, t-score and z-scores, and graphs displaying their readings along with future projections based on normal rates of loss. The total body printout included bone density and body fat and provided a graph of chronic disease risk based on percent of body fat. For many participants, receiving a bone mineral density test increased perceived susceptibility as 28% of participants had readings below the normal range.

Immediately after the bone density exam, participants received a 45 to 60 minute individual consultation from the Principle Investigator who is a Registered Dietitian. The individual consultation was provided to explain the test results and to provide individualized advice, empowerment and encouragement. During the individual consultation, participants were provided with the color printouts of their bone density results with graphic images and graphs. Participants were also provided with pre-prepared packets that included literature from the National Osteoporosis Foundation regarding osteoporosis prevention and bone density testing.

Additional literature was provided for specific situations as appropriate. For example, women who had osteoporotic readings received handouts regarding coping with osteoporosis. Other handouts were disseminated as needed including information about diets for hypertension, how to cope with lactose intolerance, and corresponding handouts in Spanish.

A form was developed to guide the consultation process. First, results of the bone density exam were described and projections of future bone density levels were explained utilizing graphs generated from the computer software. Next, individualized dietary recommendations were developed

based on bone density readings and other medical issues and concerns as well as food preferences. Individualized guidelines for calcium supplementation were also provided, and these sometimes varied from recommendations provided in the Supplements Class. For example, women who are menopausal or postmenopausal and are not able to take hormone replacement therapy require 1500 mg/ calcium per day instead of 1200 mg/day.

A physical activity program was developed for each participant based on bone density levels and activity preferences. Women with severe osteopenia or osteoporosis must be cautious when engaging in physical activity. Several of these women responded favorably to acquiring an exercise video produced by the National Osteoporosis Foundation for people with osteoporosis. The final part of the individual consultation included advice about other lifestyle behaviors such as tobacco and alcohol use. Some women were advised to talk with their medical doctors about medications, and referrals to physicians were provided for women who did not have a medical doctor. Handouts regarding available medications produced by the National Osteoporosis Foundation were disseminated when appropriate.

DISCUSSION AND CONCLUSIONS

Osteoporosis is a serious public health problem that affects 20 million U.S. women (McBean, Forgas & Finn, 1994). National health objectives indicate an urgent need to increase the number of women educated about osteoporosis (U.S.D.H.H.S., 2010). The most effective osteoporosis reduction strategies include prevention through health education and health promotion (Mark & Link, 1999).

Studies examining the design and implementation of osteoporosis prevention education are limited. Researchers have established that improvements in knowledge, attitudes or behaviors have resulted from participation in osteoporosis education (Sedlak, Doheny & Jones, 2000; Blalock et al., 2000; Jamal et al., 1999). The use of health behavior theory in the planning and implementation of health promotion programs is recommended (Glanz, Lewis & Rimer, 1997). To enhance the effectiveness of an osteoporosis education program, applying constructs of the Health Belief Model can be valuable. The purpose of this paper was to describe the design and implementation of an Osteoporosis Prevention Program using the Health Belief Model.

The target goal was to obtain 300 middle aged women to participate in the study. The response was positive as 392 people attended the initial Orientation Class. Attendance and participation in classes were positive; 381 people attended the Nutrition Class; 375 women participated in the Supplements

Class; and 350 women attended the Exercise Class. Participants were attentive and interactive. They showed interest and asked questions. Many positive comments of appreciation were received.

Increasing perceived severity, perceived susceptibility, perceived benefits, self-efficacy and cues to action while decreasing perceived barriers were actions that encouraged participation. The program provided informational and instrumental support. Informational support was provided by way of class materials and individual consultation. Instrumental support was provided by classes being taught at a centrally-located facility with child-care services. More studies are needed to examine the use of the Health Belief Model as well as other behavior theories in the design and implementation of osteoporosis prevention education programs.

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QUESTIONS

1. What were the beliefs studied in the article?
2. Which beliefs of the HBM were used to develop the prevention program and why?
3. In your brainstorming session, did you think of these?

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