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Osteoporosis Preventive Practice Between Veteran and Non-Veteran Older Adults: Findings from Patient-Reported Data

Eun-Shim Nahm, PhD, RN,

University of Maryland School of Nursing, 655 W. Lombard St, Suite 455 C, Baltimore, MD 21201,
Tel: (W) 410-706-4913, FAX: 410-706-3289

Kathleen Charters, PhD, RN,

TRICARE Management Activity, Office of the Chief Medical Officer

Eunhae Yoo, MS, RN,

University of Maryland School of Nursing

Linda M. Keldsen, RN, MBA-HC, CPHRM, and

VA Maryland Health Care System

Shijun Zhu, PhD

University of Maryland School of Nursing

Abstract

Veterans are prone to bone-related illnesses due to multiple risk factors, such as prior injuries. The aim of this study was to compare trends in osteoporosis preventive practices between veteran and non-veteran older adults. This was a secondary data analysis using selected baseline data and discussion postings from an online bone health trial including participants (N = 866) recruited from My HealtheVet (MHV) and SeniorNet (SN). Data were analyzed using descriptive statistics, parametric statistics, and content analysis. Overall, MHV participants were younger and included more men than SN participants. However, they reported higher rates of bone health issues, spent less time exercising, took fewer calcium and vitamin D supplements, and were less likely to discuss bone health with their care providers. More MHV participants discussed pain and disabilities as barriers to bone health-related health behaviors and fear of deteriorating health as motivators. Additionally, more MHV participants found participating in the original study helpful for changing health behaviors. Overall, the findings suggest a disparity in bone health between veterans and non-veterans and a significant potential for using eHealth programs for veterans.

Keywords

Bone health; osteoporosis; prevention; veterans; older adults

Introduction

The United States has 22 million veterans who are in need of health care (U.S. Department of Veterans Affairs, 2014). From the health care delivery perspective, veterans are a unique population that is predominately older (72.3% ≥ 50 years old) and male (74.6%) (U.S. Department of Veterans Affairs, 2014). In general, many are in poorer health, with more comorbidities, than the non-veteran population (Reeder, Gillette, Franck, & Frohnapple, 2012). Based on a health care utilization report on veterans who served in Operation Enduring Freedom, Operation Iraqi Freedom, or Operation New Dawn, the most common diagnoses were musculoskeletal ailments ($n = 687,723$, 61.1%) (U.S. Department of Veterans Affairs, 2015). Osteoporosis and osteoporotic fractures are more problematic in veterans than in their civilian counterparts (Kramarow & Pastor, 2012; U.S. Department of Health and Human Services, 2012; U.S. Department of Veterans Affairs, 2014). Although osteoporosis is more prevalent in women (8 million; one in five U.S. women), it also affects men (National Osteoporosis Foundation [NOF], n.d.). Currently, 2 million American men have osteoporosis, and 12 million are at risk (Orwig, Chiles, Jones, & Hochberg, 2011).

Veterans in general have a higher risk of developing osteoporosis due to their lifestyles and health issues related to military service (NOF, 2015; Park, Zhu, Potter, & Kolonel, 2011). Compared to non-veterans, veterans have more limited physical activity levels and higher prevalence of obesity (Park, et al., 2011; U.S. Department of Health and Human Services [DHHS], 2012). They also have higher smoking rates (Chapman & Wu, 2015; NOF, n.d.-b). In a study by Park et al. (2011), male veterans were more likely to be overweight/obese than non-veterans (61% vs. 55%) and former smokers (54% vs. 47%). Female veterans also showed similar trends (overweight/obese, 61.2% vs. 55.9%; smoking, 18.5% vs. 15.5%) and reported less physical activity (20.7% vs. 29.3%) (DHHS, 2012). In addition to lifestyle risk factors, some male veterans are more prone to develop prostate cancer because of their prior exposure to certain chemicals, such as Agent Orange (NIH/National Cancer Society). The main treatment option for prostate cancer, androgen deprivation therapy (ADT), has been shown to increase the risk of developing osteoporosis (American Cancer Society [ACS], 2014; Smith & Crawford, 2015; Yee, White, Murata, Handanos, & Hoffman, 2007).

The past decade of research on osteoporosis has demonstrated multiple effective measures to maintain and strengthen bone density, such as exercise, diet, screening tests, vitamin and mineral replacements, and bone-active medications (Bass, Pracht, & Foulis, 2007; Kimber & Grimmer-Somers, 2008; NOF, 2013). These measures, however, have not been effectively integrated into people's lives (Bailey, et al., 2010; Curtis, et al., 2008; President's Council on Fitness, 2010). The issue may become more problematic for veterans because they are likely to have inactive lifestyles and smoking (DHHS, 2012; Park, et al., 2011). Many male veterans who are treated with ADT do not receive osteoporosis screening, prevention, or treatment (Yee, et al., 2007). Based on national data, only 8.4% to 30% of adults at high risk for osteoporosis have received a bone mineral density test (Curtis, et al., 2008).

In an effort to increase awareness of bone health and to disseminate effective bone health interventions to a large number of older adults, a longitudinal online trial (Bone Power study) was conducted with older adults recruited from SeniorNet (SN) and My HealtheVet

(MHV) (Nahm, et al., in press). The aim of the study was to compare osteoporosis preventive practices between veteran and non-veteran older adults using selected baseline data and discussion board postings from the Bone Power study.

Methods

The Original Study

The Bone Power study was an online three-armed randomized controlled trial that included two interventions: the 8-week Bone Power program and the 12-month Bone Power Plus program (Bone Power program followed by biweekly eHealth newsletters for 10 months). These interventions were developed and implemented using social cognitive theory, and the study used a small-group approach (~20 per group). The 8-week Bone Power program consisted of learning modules, moderated discussion boards, an Ask-the-Experts section, and a virtual library. Participants also had access to video lecture libraries and a health toolkit that included various online health tools, such as the Fracture Risk Assessment Tool (FRAX®) (World Health Organization Collaborating Centre for Metabolic Bone Diseases, n.d.). Participants in the intervention groups were to visit the Bone Power website at least once a week to review the new learning module(s) for the week and share their experiences and thoughts in the moderated discussion boards. No specific intervention was provided to the control group. All participants completed online surveys at baseline, end of treatment (8 weeks), and 6, 12, and 18 months. Institutional review board approvals were obtained from the University of Maryland, Baltimore, and the U.S. Department of Veterans Affairs.

Selected Data Sets

The data sets included selected demographic and descriptive data from the baseline survey (Tables 1 and 2) and discussion forum postings (Table 3). Discussion boards were used by the intervention participants only (n , SN = 123, MHV = 480).

Selected baseline survey data—Demographic variables included age, gender, marital status, and education level. Other descriptive variables were web experience (years), presence of chronic illnesses (e.g., cardiac problems, diabetes mellitus, depression, osteoporosis) (yes/no), number of falls in the past three months, and discussion about bone health with the primary care provider in the past 12 months (yes/no). In addition, data on osteoporosis knowledge, dietary calcium intake, and exercise behavior were also included.

Osteoporosis knowledge was measured by the revised Osteoporosis Knowledge Test (Qi, Resnick & Nahm, 2014), which includes a total of 26 items focused on knowledge about exercise, calcium, and vitamin D intake. There was sufficient evidence for the internal consistency reliability ($\alpha = .81$) in the presented study, and the validity of the measure was supported using Rasch analysis (Qi, et al., 2014).

Dietary calcium and vitamin D intake was estimated using a short screening tool developed by Blalock and colleagues (Blalock, Norton, Patel, Cabral, & Thomas, 2003). It includes 22 items that assess both frequency (9-point scale, “never” to “every day”) and portions (3-point scale, small, medium, large) of various foods that contain calcium and vitamin D. The amount of dietary calcium and vitamin D intake was calculated using the Diet History

Questionnaire database developed by the National Cancer Institute (2008). Evidence of concurrent validity of the measure was reported using estimates of calcium intakes derived from the 7-day food diary (Blalock, et al., 2003). The online version of the measure used in our prior online study was sufficiently sensitive to detect changes over time (Nahm, et al., 2010). Participants were also asked if they were taking calcium and vitamin D supplements (yes/no).

Exercise behavior was assessed using a 6-item exercise subscale that is part of the Yale Physical Activity Survey (Dipietro, Caspersen, Ostfeld, & Nadel, 1993). Participants reported the type and amount of time they engaged in specific exercise activities, such as brisk walking or aerobics, and then weekly energy expenditure (Kcal) and time (minutes) spent on exercise was estimated. The measure has been validated against several physiological variables (Dipietro, et al., 1993) and was successfully used in our prior online study (Nahm, et al., 2010).

eHealth Literacy was assessed using the eHealth Literacy Scale (eHEALS) (Norman & Skinner, 2006). This is an 8-item tool developed to assess individuals' knowledge, comfort, and perceived skills for locating, evaluating, and applying electronic health information for specific health issues. The calculated alpha in this study was .94. Its validity was assessed using exploratory factor analysis and the hypothesis testing procedure (Chung & Nahm, 2015).

Discussion forum postings—The original Bone Power study included one to two discussion topics per module, resulting in 27 discussion forums (one forum per topic). Among those, this analysis included postings on seven forums that accompanied the following core modules: overview of osteoporosis, importance of bone health, calcium and vitamin D, and physical activities. These topics were selected because the modules were directly associated with osteoporosis preventive practices. A total of 978 discussion postings were included.

Data Analysis

Quantitative data—The data were assessed for normality, and descriptive statistics were computed on each variable (mean, standard deviation [SD], range, frequency, and proportion). After initial screening and cleaning data, the variables with a relatively large SD, such as Yale exercises and fall frequency, were reassessed for outliers using the Box and Whisker Plots analysis. The potential outliers were then examined compared with other demographical characteristics to assess their plausibility. The group differences were also tested with and without outliers. For the Yale exercise variables, the groups did not differ with and without outliers. For the fall frequency, a large number of participants (72%) had no falls during the previous three months; thus, the frequencies were categorized into three groups: 0 falls, 1 to 2 falls, and 3 or more falls.

The differences between SN and MHV groups were tested using *t*-tests for continuous variables and chi-square tests for categorical variables. For the race and ethnicity variables, a nonparametric test, Fisher's exact test, was used to test the differences due to small cell

sizes. For the categorized fall frequencies, Wilcoxon Rank Sum nonparametric test was used.

Qualitative data—The qualitative data were analyzed using a combination of a content analysis method suggested by Krippendorff (2003) and an inductive coding approach (e.g., generation of themes as coding progresses) (Marks & Yardley, 2003; Pain, Chadwick, & Abba, 2008). Three coders analyzed the discussion postings separately. One coder was a doctorally prepared researcher who had conducted and published several qualitative studies. The other two coders were research associates who had completed doctoral-level qualitative research courses and had experience in qualitative data analysis.

In the initial phase of the coding process, the coders reviewed postings on each discussion forum multiple times and identified potential themes that could reveal differences in osteoporosis preventive practices between SN and MHV participants. Based on the reviews, the coders initially developed 38 themes. Each coder then conducted content analysis using those themes. The unit of analysis for coding was each posting (i.e., if one posting included multiple sentences on a theme, the posting was counted as one). The context of each unit (Krippendorff, 2003), which defined the amount of the information to be considered when the analysis unit was coded, was each discussion forum. Mutually exclusive themes within a forum were developed as the coding progressed. Generally, the initial coding was similar among coders. Discrepancies were discussed, and a consensus was reached. Table 4 describes the final 33 themes (3 to 6 per forum), and frequencies of the units per each theme were documented.

Results

Quantitative Data

Table 1 summarizes demographic characteristics of the participants in the two groups and their web experience. The majority of participants in both groups were White; however, the SN group had a significantly higher proportion of Whites than the MHV group (93.4% vs. 88.6%, $p = .002$). There were more men in the MHV group (76.1% vs. 15.9%, $p < .001$), and the participants in the MHV group were significantly younger (mean age, 61.0 vs. 69 years; $p < .001$). With the exception of osteoporosis (MHV 19.8% vs. SN 36.6%, $p < .001$), a higher proportion of MHV participants had selected chronic conditions, such as cardiac problems and hypertension. In particular, the ratios for diabetes (MHV 29.1% vs. SN 8.2%, $p < .001$) and depression (MHV 44.8% vs. SN 9.8%, $p < .001$) were more than triple. Generally, the MHV participants had less education than the SN participants (some college, 85.9% vs. 91.8%; $p = .035$). However, they had more years of web experience (14.8 vs. 13.3 years, $p = .006$) and were more eHealth literate (31.2 vs. 30.0; range, 8–40; $p = .013$).

In regard to bone health knowledge and bone health–related behavior (Table 2), MHV participants showed significantly lower levels of knowledge ($t = -9.0$, $p < .001$), spent less time exercising ($t = -4.8$, $p < .001$), and experienced more falls in the previous 3 months ($t = 2.7$, $p = .008$). They also had a high likelihood of falls ($z = 3.2$, $p = .00$). In addition, a much smaller number of MHV participants discussed bone health with their primary care

providers ($\chi^2 = 19.3, p < .001$) and took calcium ($\chi^2 = 75.8, p < .001$) and/or vitamin D ($\chi^2 = 63.8, p < .001$) supplements. The amount of dietary calcium and vitamin D intake was similar in both groups.

Qualitative Data

The total number of participants in the intervention groups was 113 for SN and 480 for MHV, a ratio of approximately 1:4. For five out of seven discussion forums, the ratio for the total number of postings from SN and MHV was between 1:3 and 1:4, which was similar to the ratio of the sample sizes (Table 4). For the other two forums, strategies to consume enough vitamin D and strategies that help stay with an exercise program, SN participants tended to post more messages. The proportion of postings coded using the selected themes showed an interesting trend (Table 4). The ratio of the proportion of 19 themes reversed from the ratio of the entire original postings on the discussion forum.

Topic 1. Thinking about your own lifestyle, do you plan to start any preventive measures based on what you've learned so far?

—In general, the majority of participants in both groups reported that they had started or planned to start exercising and/or taking more calcium and vitamin D. More MHV participants discussed having health conditions and habits that hindered them from practicing health behaviors, such as amputee status (MHV 19 vs. SN 0), prior fractures (MHV 6 vs. SN 0), and smoking habits (MHV 8 vs. SN 0).

“Being 64 yrs old and with a disability [leg amputation] I am going to do what I can to make a decent attempt. ...” (MHV); “I drink lots of caffeine and smoke cigarettes. I shall use a “weaning” strategy for the caffeine and nicotine--and modify my diet to include more calcium-rich foods.” (MHV)

Topic 2. Has your provider ever spoken to you about your bone density, or have you been tested for bone mass? What has been your experience with this?

—Although the number of postings from the SN group ($n = 33$) was smaller than from the MHV group ($n = 100$), the majority of SN participants ($n = 22, 66.7\%$) reported having had a bone density scan, compared with less than half of the MHV participants ($n = 42, 42\%$).

“I felt strange for the first scan because I was the only man in a women's hospital. The women all stared at me when I was called in for the scan. I also had a nuclear bone scan. Neither were uncomfortable.” (MHV); “I have had two bone scans with strange results. One said I had the bone density of someone 30 years younger and 2 year later said I was minimal and might be very close to osteoporosis...” (SN)

Topic 3. What techniques for changing behavior have worked for you in the past?

—This discussion forum included 112 (90 MHV and 22 SN) postings. Thirteen MHV participants (14.4%) responded that they changed their health behaviors because of fear of deteriorating health. None of the SN postings mentioned this. Six MHV participants specifically mentioned that the Bone Power program motivated them to change their behaviors. No SN postings in the discussion forum addressed this point. Many other

participants (20 MHV and 6 SN) also reported that setting specific goals helped them improve their health behaviors. Others (18 MHV and 7 SN) also highlighted the support from their friends and family members as a motivator in maintaining health behaviors.

“my best motivation would be my health. i try to eat healthy. when you get a certain age you do not want any broken bones, take time for yourself.”(MHV); “When it comes to exercise, having an exercise buddy is definitely motivating for me!” (SN)

Topic 4. Can you name some barriers to exercise that you face in your everyday life?—Among the postings included in this topic (99 MHV and 23 SN), one third ($n = 38$, 30.4%) from the MHV group discussed veterans’ physical limitations and health problems as barriers, compared to only 13.6% ($n = 3$) from the SN group. In 16 MHV postings (16.2%), veterans reported pain as a barrier to exercise, whereas no SN participants mentioned pain as a barrier. More veterans reported that “having no motivation” was a barrier (MHV, 18.2%; SN, 13.6%).

“I relate to depression & back pain. 40 years & lots of procedures later, it is what it is. I find that being too specific about WHAT constitutes a valid exercise regimen can be a deterrent in itself...” (MHV); “I really have no motivation and I'm hoping to overcome that thru this program. I love to walk, but it is very hilly where we live and just walking up a slight incline just take the breath out of me. To overcome this is one of my goals.” (SN)

Topic 5. What strategies do you use to consume enough calcium through your diet on a daily basis?—A total of 154 postings (117 MHV and 37 SN) were included in this forum. A higher proportion of SN participants (SN, 35% vs. MHV, 26%) reported that they were getting enough calcium. Through this study, however, many of them started reevaluating their calcium intake. A much higher proportion (43.2%, $n = 16$) of SN participants also reported taking calcium supplements than MHV participants (26.5%, $n = 31$).

“I'm a little confused. I take 1200mg of calcium in supplements. I will try to get more calcium from food, mainly from milk. Should I cut down on supplements?” (SN); “... I have not calculated on a daily basis how much I take. I have a question I'm going to ask my PCP next time about a blood test he had me take.”(MHV)

Topic 6. How would you ensure that you are getting enough vitamin D? If you haven't been successful in getting enough vitamin D, what changes can you make?—This discussion forum included a total of 164 postings (95 MHV and 38 SN). A higher proportion of SN participants than MHV participants reported that they had had a vitamin D test done (SN 29.9% vs. MHV 0.08%) and took vitamin D supplements (SN 47.0% vs. MHV 36.0%). More SN participants (SN 24% vs. MHV 16%) expressed that they had learned about vitamin D through this program. Some participants also wondered about the reasons for their low vitamin D levels, as they could not think of any specific reasons.

“My provider tested for Vitamin D, recommended a loading dose and then supplements... With this study, I am trying to add more fatty fishes to my diet....” (SN); “Honestly I am really not understanding WHY I have such a high deficiency

of Vitamin D....I am outside daily in the sun.... I eat tuna and salmon. Drink Orange juice with D added. I just shake my head as I have tried so hard to bring these levels up.” (MHV)

Topic 7. If you are currently exercising, are there any strategies that help you to stay on a program? If you are not exercising, can you share the reason(s)?

—A total of 94 postings (69 MHV and 25 SN) were included in this forum. Many participants in both groups (23 MHV and 10 SN) shared their specific experiences with and tips for exercise regimens. A much higher proportion of SN members (80%) were regularly exercising than MHV participants (43.5%). More MHV participants (39 % vs. 12% SN) listed poor health conditions as reasons for not exercising. Although the number was small, more SN participants mentioned that working with others helped them stay with their exercise program (SN 24% vs. MHV 0.06%).

“Thank you for your encouragement. I did start yesterday after dinner. I only walked about 4 blocks total, but it was a start. Today I spent 30 minutes digging with the children next door.” (MHV); “I go to a water aerobics class. I find that having an exercise buddy helps so much! We carpool, so we rely on each other that way also. It is strange, but I find it easier to do something like exercising when I know my friend is counting on me, as opposed to when I am just counting on myself.” (SN)

Discussion

Triangulation of the findings from both quantitative and qualitative data in this study revealed robust information about the current osteoporosis preventive practices between veteran and non-veteran older adults. Overall, participants in the MHV group were younger than the SN participants (61.0 vs. 69.5 years). However, MHV participants are at higher risk for bone health problems, as they have poorer health conditions and less bone-health knowledge and spend less time exercising (MHV 94.7 vs. SN 159.7 minutes) (NOF, 2015). The data from the discussion postings provided more in-depth contextual information to the survey data. On the discussion board, MHV participants explained how their poor health conditions, such as amputated limbs and needing an oxygen tank, hindered them from exercising. Many of them also described various types of pain that they suffered on a daily basis, most of which was associated with prior injuries. No SN older adults addressed pain as a specific barrier for bone health.

The findings from this study are consistent with prior reports that indicated more bone health problems among veterans than their civilians (Kramarow & Pastor, 2012; DHHS, 2012; U.S. Department of Veterans Affairs, 2014). Even though muscular skeletal illnesses are the most frequent health problems in veterans (U.S. Department of Veterans Affairs, 2015), evidence-based measures to prevent and manage osteoporosis have not been emphasized in military and veteran health care. For example, 96.3% ($n = 1,361$; mean age, 77) of patients who were admitted to the VA hospitals for hip and spine fractures from July to September 2008 were men. These men, however, were less likely than women to be appropriately managed for

osteoporosis after a fracture (Department of Veterans Affairs Office of Inspector General, 2010).

Ongoing pain has been an important health issue in veterans, and there has been extensive research on the management of chronic pain in this population, including telemonitoring interventions (Frank, et al., 2015; Stratton, Bender, Cameron, & Pickett, 2015; U.S. Department of Veterans Affairs, 2010). These studies can be further expanded in conjunction with health promotion studies, such as bone health.

The findings from this study highlight the importance of fall prevention in veterans. Even though MHV participants were younger than SN participants, they experienced more falls, and many of them reported physical limitations on the discussion board. VA health care offers helpful resources on fall prevention (U.S. Department of Veterans Affairs, n.d.); however, the research on falls in this specific population is limited. Although falls are an important health problem in older adults in general (Centers for Disease Control and Prevention, 2015; U.S. Department of Veterans Affairs, 2015), the onset and causes of falls in veterans may be different than in non-veteran older adults. Further investigation in this area may lead to the development of more optimal fall prevention strategies for veterans.

Regarding the lifestyle of participants in relation to bone health, eight MHV participants discussed smoking as an area they need to improve, whereas no SN participants discussed smoking. Smoking cessation is important to maintain healthy bones (Lupsa, 2015); however, a high prevalence of smoking among veterans is a significant health issue (Boyko et al., 2015). Even though various efforts have been made to reduce smoking among veterans, bone health topics have rarely been included in those efforts. Inclusion of bone health education in smoking cessation programs can extend the benefits of those programs.

Many veterans start their military careers at a young age, and the federal government has the ability to provide a continuum of health care throughout much of the veteran's lifetime. Thus, the government is in an excellent position to engage these individuals in positive health behaviors early in their lives through its health care systems and other resources (e.g., military stores, food services). Bone health education and screening tests must be started while veterans are in the military system, as people tend to lose bone density as they age. One of the findings from our qualitative analysis revealed that consequences from deteriorating health were an important motivator for changing behaviors for veterans. Bone diseases can cause disability and long-lasting pain, which can be avoided through various preventive measures and screening tests. These aspects must be emphasized in provision of health care to military personnel and veterans. The government also can play an important role in veterans' dietary habits. For example, a calcium-rich and well-balanced diet can be emphasized in the military, beginning with institutional meal preparation that is high in calcium. Military personnel who are exposed to high-risk areas should also receive early screening tests before they experience fractures.

Recently, there have been increasing numbers of scientific discoveries on the effects of vitamin D on general health, including bone health (NOF, 2014). Many providers correct their patients' vitamin D deficiency with high loading doses for a short time period, followed

by maintenance doses (NOF, 2014). Although high rates of depression and physical disabilities may hinder veterans from getting sun exposure (a source of vitamin D), a significantly smaller proportion of veterans discussed having vitamin D levels checked (MHV 0.08% vs. SN 29.9%). In addition, a smaller proportion of veterans was taking vitamin D supplements. The potential health issues relating to vitamin D deficiency in veterans need to be investigated further. Some participants who were tested and had low vitamin D levels wondered about specific reasons, suggesting that more education on vitamin D is needed.

On the discussion board, more veterans reported changing or planning to change health behaviors after they started this program (MHV 32% vs. SN 22%). Some participants mentioned that they asked or would ask their providers about bone health. Based on the survey data, a significantly smaller proportion of MHV participants discussed bone health with their primary care providers (MHV 43% vs. SN 61.8%, $p < .001$). These findings suggest significant potential benefits of using the Bone Power program for veterans. In particular, use of the online bone health program can have a large impact on veterans, as the Veterans Health Affairs (VHA) already has a national health infrastructure that supports veterans nationwide.

Limitations

A major limitation of this study relates to sampling. Although the membership of both online communities is national, participants may not be representative of older adults in the general community settings and all enrollees of the VHA. Use of discussion boards was voluntary, and not all participants posted their thoughts. Thus, findings from the discussion postings can be better interpreted with the survey data that were submitted by all Bone Power study participants. Other limitations relate to the tenets of the secondary data analysis. Discussion postings primarily focused on the discussion topics that accompanied learning modules, rather than on the inquiry of this study. In addition, the data sets used in this study lack objective data, such as frequency of bone mineral density tests and objective measures of physical activities.

Conclusion

Prevention of osteoporosis and maintenance of bone density are important for older adults' quality of life and independent living. Veterans tend to be at higher risk for osteoporosis and live with health conditions that can hinder physical activities. Many of these conditions might have been related to their prior military services. For example, many military men and women experience multiple injuries during service. Some of their unhealthy habits, such as smoking and poor diet, could be associated with the stress and danger they face while they are in military. Thus, by the time these individuals become veterans, their bone health could be significantly compromised. Findings from our study suggest disparities in bone health-related conditions between veteran and non-veteran older adults. Many bone health-related problems can be prevented by practicing efficacious measures. The federal government has an excellent opportunity to institute those interventions throughout its military and veteran health care systems. Further studies in this field may contribute to the improvement of bone

health among our veterans, ultimately contributing the well-being of these individuals in their later lives.

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Table 1

Selected Demographic and Other Descriptive Variables

Characteristic	Total Sample (N=866)	SeniorNet (n=183)	My HealtheVet (n=683)	t or χ^2	P
Age (Mean $\pm$ SD)	62.8 $\pm$ 8.5	69.5 $\pm$ 9.1	61.0 $\pm$ 7.4	-13.1	<.001
Gender				226.1	<.001
Male (n, %)	549 (63.4)	29 (15.9)	520 (76.1)		
Female	317 (36.6)	154 (84.2)	163 (23.9)		
Race:				10.3	.002 [†]
Caucasian (n, %)	776 (89.6)	171 (93.4)	605 (88.6)		
Black	64(7.4)	4(2.2)	60(8.8)		
Other	26(3.0)	8(4.4)	18(2.6)		
Ethnicity				2.8	.122 [†]
Hispanic	32 (3.7)	3 (1.6)	29 (4.3)		
Non-Hispanic	834 (96.3)	180 (98.4)	654 (95.8)		
Marital Status				2.4	.119
Married (n, %)	456 (52.7)	87 (47.5)	369 (54.0)		
Others	410 (47.3)	96 (52.5)	314 (46.0)		
Education				4.4	.035
Highest grade (some college; n, %)	755 (87.2)	168 (91.8)	587 (85.9)		
Highest grade (< some college; n, %)	111 (12.8)	15 (8.2)	96 (14.1)		
Chronic Conditions					
Cardiac problems (Yes; n, %)	184 (21.3)	21 (11.5)	163 (23.9)	13.2	<.001
High BP (Yes; n, %)	489 (56.5)	71 (38.8)	418 (61.2)	29.5	<.001
Diabetes (Yes; n, %)	214 (24.7)	15 (8.2)	199 (29.1)	34.0	<.001
Depression (Yes; n, %)	324 (37.4)	18 (9.8)	306 (44.8)	75.4	<.001
Osteoporosis (Yes; n, %)	202 (23.3)	67 (36.6)	135 (19.8)	22.9	<.001
Web experience (Mean $\pm$ SD, years)	14.5 $\pm$ 6.6	13.3 $\pm$ 5.8	14.8 $\pm$ 6.8	2.7	.006
eHealth Literacy (Mean $\pm$ SD; range, 8–40)	30.9 $\pm$ 6.0	30.0 $\pm$ 6.0	31.2 $\pm$ 6.0	2.5	.013

Note:

Fisher's exact tests were used.

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Table 2

Selected Bone Health-related variables

Characteristic	Total Sample (N = 866)	SeniorNet (n = 183)	My HealtheVet (n = 683)	t or χ^2 [†]	P
Discuss bone health w/PCP? (Yes; n, %)	409 (47.2)	113 (61.8)	296 (43.3)	19.3	<.001
Osteoporosis knowledge (range, 0–27)	15.3 ±4.9	18.5 ±3.9	14.4 ±4.8	–9.0	<.001
Total Calcium Intake (mg, Mean ± SD)	1247.4 ± 1073.3	1170.2 ± 879.6	1268.0 ± 1119.1	1.1	.274
Final Total Vitamin D intake (IU, Mean ± SD)	329.7 ± 347.8	309.9 ± 266.7	335.0 ± 366.4	.87	.387
Taking calcium supplement(s) (Yes; n, %)	388 (44.8%)	134 (73.2%)	254 (37.2%)	75.8	<.001
Taking vitamin D supplement(s) (Yes; n, %)	412 (47.6%)	135 (73.8%)	277 (40.6%)	63.8	<.001
Yale exercise expenditure (Kcals) (Mean ± SD)	597.2 ± 947.3	854.7 ± 953.5	528.5 ± 934.4	–4.2	<.001
Yale exercise total minutes (Mean ± SD)	108.4 ± 166.3	159.7 ± 172.7	94.7 ± 161.9	–4.8	<.001
Fall frequency in the last 3 months (Mean ± SD)	0.8 ± 2.7	0.3 ± 0.8	0.9 ± 3.0	2.7	.008
0 (n, %)	622 (72.0)	147 (80.3)	475 (69.8)	11.2	.004
1–2	174 (20.1)	31 (16.9)	143 (21.0)		
3	68 (7.9)	5 (2.7)	63 (9.3)		

Note:

[†]t test for continuous variables and χ^2 test for categorical variables

Table 3

Selected Discussion topics for Bone Power Discussion Forums

Module	Discussion Topic	Discussion Questions
1. Osteoporosis Overview	Topic 1: Prevention	There are several steps a person can take to help prevent bone loss. Thinking about your own lifestyle, do you plan to start any preventive measures based on what you've learned so far?
	Topic 2: Screening and Diagnosis	The only way to diagnose low bone mass is to do the appropriate screening and diagnostic tests. Has a provider ever spoken to you about your bone density or have you been tested for bone mass? What has been your experience with this?
2. Importance of Bone Health	Topic 1: Motivation	Motivating someone to change their behavior is challenging. What techniques for changing behavior have worked for you in the past?
	Topic 2: Barriers	Many factors affect one's motivation to exercise. Can you name some barriers to exercise that you face in your everyday life? How do you overcome them?
3a. Calcium	Topic 1: Tips for Calcium Intake	Consuming 1200 mg of calcium every day can be challenging but can be done without taking a supplement. We can all learn from the tips others have about how to do this. What strategies do you use to consume enough calcium through your diet on a daily basis?
3b. Vitamin D	Topic 1: Vitamin D Intake	Getting enough vitamin D on a daily basis is even more challenging than calcium. How would ensure you are getting enough vitamin D? If you haven't been successful in getting enough vitamin D, what changes can you make?
5. Physical Activity and Exercise	Topic 2: Exercise Strategies	If you are currently exercising, are there any strategies that help you to stay on a program? If you are not exercising, can you share the reason(s)?

Table 4

Selected Discussion Topics and Themes Associated with Osteoporosis Preventive Behaviors

Discussion Topic	Total Postings (n)		Coded Postings (n [%])	
	SN	MHV	SN	MHV
Topic 1. Plan to start preventive measures	41	185		
• Plan to reduce or quit smoking			0 (0)	8 (.04)
• Was on high dose of vitamin D			0 (0)	7 (.04)
• Experienced fracture(s)			0 (0)	6 (.03)
• Not doing weight-bearing exercise			1 (.02)	7 (.04)
• Being disabled or an amputee			1 (.02)	19 (.10)
Topic 2. Experience with bone density test	33	100		
• Experienced in improvement in bone density			6 (.18) *	0 (0)
• Have osteoporosis/osteopenia			19 (.57) *	17 (.17)
• Have done a bone scan/test			22 (.66) *	42 (.42)
Topic 3. Motivators for behavioral change	22	90		
• This project			0 (0)	6(.07)
• Consequences of deteriorating health			0(0)	13 (.14)
• Friends and family/others			7 (.32) *	18 (.21)
• Setting goals			6 (.27) *	20 (.22)
Topic 4. Everyday barriers to exercise	23	99		
• Lack of energy			2(.09) *	7(.07)
• Job-related work/lack of time			5(.22) *	7(.07)
• Pain			0(0)	16(.16)
• Season/weather			6(.26) *	14(.14)
• No motivation			3(.13)	18(.18)
• Physical limitations/problems			3(.13)	38(.38)
Topic 5. Strategies to consume enough calcium through diet	37	117		
• Doing well with calcium			13(.35) *	31 (.26)
• Changed or plan to change health behaviors (since starting this program)			8(.22)	37 (.32)
• Having calcium supplement			16 (.43) *	31(.26)
• This program is helpful			14 (.37) *	41(.35)
Topic 6. Strategies to consume enough vitamin D	38	95		
• Learned about vitamin D through this program			9(.24) *	15(.16)
• Have done vitamin D test previously			11(.29) *	8(.08)
• Will change/changed health behaviors			5(.13)	17(.18)
• Sun exposure			7(.18)	28(.29)
• Take vitamin D supplement			18(.47) *	34(.36)
Topic 7. Strategies that help stay on an exercise program	25	69		

Discussion Topic	Total Postings (n)		Coded Postings (n [%])	
	SN	MHV	SN	MHV
• Working with others			6(.24) *	4(.06)
• Make a schedule to exercise			4(.16) *	4(.06)
• Learned from this program/this study helped me start exercise			5(.2) *	7(.10)
• Health conditions as barriers			3(.12)	27(.39)
• Shared experiences/tips			10(.4) *	23(.33)
• Currently doing exercise			20(.8) *	30(.43)

Note: *n* = Number of postings on each discussion forum;

% = number of coded postings / number of total postings;

* The direction of the ratio of the coded postings for each theme between the two groups is reversed from the ratio of the total postings.