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Fracture Related Issues

Effects of Individualized Bone Density Feedback and Educational Interventions on Osteoporosis Knowledge and Self-Efficacy: A 12-Yr Prospective Study

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Abstract

This is 12-yr follow-up of a randomized controlled trial aimed to evaluate the long-term effects of bone density feedback and osteoporosis education on osteoporosis knowledge and self-efficacy. We examined the effects of feedback of bone density-defined fracture risk (high [T-score <0] vs normal [T-score ≥ 0] risk) and 2 different educational interventions (the group-based Osteoporosis Prevention and Self-Management Course [OPSMC] vs an osteoporosis leaflet) on osteoporosis knowledge and self-efficacy in women aged 25−44. Seventy-four percent (N = 347) of 470 participants at baseline participated at 12 yr. Overall, the scores were higher for osteoporosis knowledge but lower for self-efficacy at 12 yr. However, neither intervention had an effect on the change in knowledge (T-score, $\beta = 0.4$, 95% confidence interval [CI] = −0.3 to 1.1; OPSMC, $\beta = 0.2$, 95% CI = −0.5 to 0.9) or self-efficacy (T-score, $\beta = -1.1$, 95% CI = −2.5 to 0.4; OPSMC, $\beta = -0.2$, 95% CI = −1.6 to 1.3). Women in households with an unemployed main financial provider had a decrease in knowledge at 12 yr compared with those in households with an employed main financial provider in whom knowledge increased ($\beta = -1.95$, 95% CI = −3.40 to −0.50), but there were no other predictors of change identified for knowledge or self-efficacy. In conclusion, beneficial effects of both OPSMC and feedback of high fracture risk on osteoporosis knowledge seen previously at 2 yr were not sustained after 12 yr although overall knowledge was still significantly higher than at baseline. Neither intervention improved osteoporosis self-efficacy. More frequent osteoporosis education and bone density feedback may be required to maintain knowledge, and other approaches to improve self-efficacy are necessary.

Key Words: Bone density; education; knowledge; osteoporosis; self-efficacy.

Introduction

Osteoporosis is a major public health problem worldwide. The financial burden on the health system it causes is increasing dramatically. For instance, in Australia, the total health expenditure for osteoporosis and osteopenia in individuals older than 50 yr was $2.75 billion in 2012, and it is predicted that this will increase to $3.84 billion in 2022 *(1)*. Low bone mineral density (BMD) is a major risk factor for osteoporotic fracture *(2)*. Because BMD in later life is a function of peak bone mass and the rate of subsequent bone loss *(3)*, it is therefore critical to ensure that preventative behaviors are taken up in younger population that improve and maintain BMD and consequently delay the onset of osteoporosis and reduce the risk of fracture.

Osteoporosis knowledge and the concept of self-efficacy are 2 key factors involved in lifestyle behavior change related to osteoporosis prevention. Self-efficacy refers to “people’s confidence in their ability to change osteoporotic preventive behaviors, specifically calcium intake and physical activity,” which is related to behaviors in 3 ways: the conviction that an

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individual has the ability to (1) initiate the activity, (2) maintain the activity, and (3) persist in performing the activity in the face of obstacles (4). Both osteoporosis knowledge and self-efficacy are suggested to be important determinants of calcium intake and exercise behaviors (5). Despite this, levels of osteoporosis knowledge (6,7) and self-efficacy (6,8,9) are low worldwide. Studies suggest that osteoporosis knowledge and self-efficacy can be improved by a variety of interventions (6,8,9), at least in the short term (up to 2 yr). We previously (7) examined the effect of individualized risk feedback based on bone density and group education (the Osteoporosis Prevention and Self-Management Course [OPSMC]) on osteoporosis knowledge and osteoporosis self-efficacy in premenopausal women. In the study, women with T-score <0 who were told that they were at higher risk of fracture in later life, based on data showing that those in the lower half of the BMD distribution have a 3-fold higher fracture risk in later life (10), had a greater increase in osteoporosis knowledge at 6 wk and 2 yr compared with those who were told that they were not at higher risk (T-score ≥ 0). Similarly, receiving the OPSMC was associated with a greater increase in osteoporosis knowledge compared with receiving an osteoporosis information leaflet. However, neither T-score group nor type of education received was associated with changes in osteoporosis self-efficacy over 2 yr.

For early life interventions to be effective at preventing osteoporosis in later life, their effects need to persist in the long term, but there are no published studies, to our knowledge, assessing the very long-term effect of either risk feedback or osteoporosis education on osteoporosis knowledge and self-efficacy. Therefore, the aim of this study was to conduct a 12-yr follow-up of participants from our original trial to determine whether the effect of fracture risk feedback and OPSMC on osteoporosis knowledge persisted, and which, if any, factors affect osteoporosis self-efficacy in the long term.

Materials and Methods

This was a 12-yr follow-up of a randomized controlled trial previously conducted in 2000 in Southern Tasmania, Australia, the methods of which have already been described in detail (7). We randomly selected women aged 25–44 yr, from the 2000 electoral roll, excluding women if they had previous measurement of bone density, thyroid disease, renal failure, malignancy, or rheumatoid arthritis, a history of hysterectomy or were taking hormone replacement therapy, pregnant or planning pregnancy within 2 yr of study entry, and lactating. Ethics approval was obtained from Royal Hobart Hospital Ethics Committee, and all participants gave written informed consent.

A computer-generated random number list was used to randomly assign participants to 1 of 2 osteoporotic education groups: an information leaflet from Osteoporosis Australia "Understanding Osteoporosis" or the OPSMC. The OPSMC is a chronic disease self-management course developed by the Arthritis Foundation of Victoria and used by Osteoporosis Australia. This small-group patient education program aimed to increase knowledge and improve confidence, awareness, and self-management of osteoporosis prevention with an emphasis on promoting appropriate lifestyle changes. OPSMC sessions of 2 h were held weekly for 4 wk with a maximum of 16 participants per group. The osteoporosis information leaflet provided a comprehensive description of osteoporosis and discussed the role of lifestyle factors, including diet, exercise, and smoking, as well as optimal levels of calcium intake and exercise (11).

BMD at the spine and hip was measured (Hologic QDR-2000; Hologic Inc., Waltham, MA) at baseline. Participants with a mean spine and hip T-score <0 received a letter informing them that their results indicated that they were at higher risk of fractures in the future and encouraging them to discuss the results and treatment options with their general practitioner, whereas those with a mean T-score ≥ 0 were informed that they were not at a higher risk. The cutoff of a T-score of 0 was chosen based on data showing that those in the lower half of the BMD distribution have 3-fold higher fracture risk both in later life and in the early postmenopausal period (10). Data specific to a younger population were not available, but as evidence suggests that bone mass tracks throughout life as has been recorded in children (12), young (13), middle-aged, and aged population (14), premenopausal women who are in the lower BMD range are likely to still have lower BMD during postmenopausal period.

Participants randomized to the leaflet information group received their feedback of fracture risk with the leaflet by mail, and those in the OPSMC group received the feedback at the first session of the course.

Osteoporosis knowledge was measured at baseline, 6 wk, 2 yr, and 12 yr using the Osteoporosis Knowledge Assessment Tool, which has previously been validated with demonstrated good discriminatory power (Ferguson's sigma = 0.96 and Cronbach alpha = 0.70) (15). The Osteoporosis Knowledge Assessment Tool has 20 questions with true, false, and do not know options for each. Scoring was 1 for a correct answer or 0 otherwise. The possible range of total scores was 0–20.

The Osteoporosis Self-Efficacy Scale (4) was used to measure osteoporosis self-efficacy at baseline, 1 yr, 2 yr, and 12 yr. The Osteoporosis Self-Efficacy Scale has 2 subscales with 6 items each for calcium intake and physical activity. We used a 4-point adjectival scale with ratings of not at all confident (score 1), mildly confident (score 2), confident (score 3), and very confident (score 4). The possible range of total scores was 12–48.

Other study factors measured at baseline included height by stadiometer (The Leicester height measure; Invicta Plastics Ltd, Oadby, England) and weight by a single set of calibrated scales (Heine, Dover, NH). Body mass index was calculated as (weight [kg]/height^2 [m^2]). Smoking history, breastfeeding history, number of children, family history of osteoporosis and/or fracture, and fracture history in the subject, education level, employment status of main financial provider in the household, and marital status were measured by questionnaire. Calcium intake and calcium supplement