

Screening of Osteoporosis in Aging Populations

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Abstract : Osteoporosis affects more than 200 million people worldwide. About 75% of osteoporosis cases are undiagnosed or diagnosed only when a bone fracture occurs. Since osteoporosis related fractures are significant determinants of the burden of disease and health and social costs of aging populations, we believe that this is the early identification and treatment of high-risk patients should be a priority in actual healthcare systems. Screening for osteoporosis by dual energy x-ray absorptiometry (DEXA) is not cost-effective for general population. An alternative is pulse-echo ultrasound (PEUS) because of the minor costs. To this end, we developed an early detection program for osteoporosis with PEUS, and we evaluated its possible impact and sustainability. We conducted a cross-sectional study including 1,050 people in Italy. Subjects with >1 major or >2 minor risk factors for osteoporosis were invited to PEUS bone mass density (BMD) measurement at the proximal tibia. Based on BMD values, subjects were classified as healthy subjects ($BMD > 0.783 \text{ g/cm}^2$) and pathological including subjects with suspected osteopenia ($0.783 \leq BMD < 0.719 \text{ g/cm}^2$) or osteoporosis ($BMD \leq 0.719 \text{ g/cm}^2$). The responder rate was 60.4% (634/1050). According to the risk, PEUS scan was recommended to 436 people, of whom 300 (mean age 45.2, 81% women) accepted to participate. We identified 240 (80%) healthy and 60 (20%) pathological subjects (47 osteopenic and 13 osteoporotic). We observed a significant association between high risk people and reduced bone density ($p=0.043$) with increased risks for female gender, older ages, and menopause ($p<0.01$). The yearly cost of the screening program was 8,242 euros. With actual Italian fracture incidence rates in osteoporotic patients, we can reasonably expect in 20 years that at least 6 fractures will occur in our sample. If we consider that the mean costs per fracture in Italy is today 16,785 euros, we can estimate a theoretical cost of 100,710 euros. According to literature, we can assume that the early treatment of osteoporosis could avoid 24,170 euros of such costs. If we add the actual yearly cost of the treatments to the cost of our program and we compare this final amount of 11,682 euros to the avoidable costs of fractures (24,170 euros) we can measure a possible positive benefits/costs ratio of 2.07. As a major outcome, our study let us to early identify 60 people with a significant bone loss that were not aware of their condition. This diagnostic anticipation constitutes an important element of value for the project, both for the patients, for the preventable negative outcomes caused by the fractures, and for the society in general, because of the related avoidable costs. Therefore, based on our finding, we believe that the PEUS based screening performed could be a cost-effective approach to early identify osteoporosis. However, our study has some major limitations. In fact, in our study the economic analysis is based on theoretical scenarios, thus specific studies are needed for a better estimation of the possible benefits and costs of our program.

Keywords : osteoporosis, prevention, public health, screening

Conference Title : ICAAR 2020 : International Conference on Advances in Aging Research

Conference Location : Singapore, Singapore

Conference Dates : November 19-20, 2020