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EDITORIAL

# Risk factors for osteoporosis 2000–2012

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With the availability of bone mineral density testing by dual energy X-ray absorptiometry (DXA) and since the mid-1990's generally safe and effective osteoporosis treatment, the evaluation and management of patients at risk for fracture has evolved. DXA and important fracture prediction tools, such as FRAX [1], plus additional therapies have led to fewer hip fractures in some countries, such as Canada [2]. More recently, however, concerns about long term bisphosphonate therapy side effects, such as osteonecrosis of the jaw [3] and atypical femoral fracture [4] have led to decreased bisphosphonate use [5], whereas fracture liaison services [6] have identified very high risk patients, leading to treatment, fewer second fractures, and even lower mortality. How these competing factors have influenced the management of osteoporosis likely varies from country to country.

Holm, et al. [7] provide a "real world" picture of the clinical practice of osteoporosis in women over the years 2000–2012. They took advantage of the remarkably complete pharmacy data of the Danish System, but on the other hand, they were forbidden to assess alcohol intake in their questionnaire. For univariate analyses they were able to evaluate 6285 women, but because of missing data, 4599 were available for multivariate analysis. This is still a remarkable number because they studied consecutive women evaluated in their clinic. Bone density by DXA was performed, as well as a series of laboratory tests based on what has been recommended [8, 9]. The main outcome was osteoporosis by DXA assessed in 3–4-year periods. At the beginning, the women were relatively young (mean age 61.2 years) and had DXA results that were also surprisingly good with mean T-scores of −1.12 to −1.47. The majority of the patients heeded recommendations about calcium, vitamin D, and exercise; about 1/3 had experienced a fracture.

Over the 12 years of new evaluations, more patients had osteoporosis by DXA, chronic pulmonary disease (yet smoking prevalence decreased), and more had already started pharmacologic treatment. The authors assessed how risk factors, both those included in the FRAX calculation and those not, were associated with bone mineral density. Not surprisingly, in older women, the risk factors were more closely associated with hip bone density than with spine, most likely due to spuriously elevated DXA spine readings from common degenerative changes. Among the FRAX risk factors confirmed by this real world study, increasing age, smoking, rheumatoid arthritis, and previous osteoporotic fracture were predictive of osteoporosis by DXA. Interestingly, diuretics were variably associated with bone density. Loop diuretics were associated with lower bone density by DXA. Thiazide diuretics were associated with better bone density, despite the fact that patients on thiazides may be at risk for hyponatremia, which has been reported to be a risk factor for fracture [10]. This risk may be balanced by the decrease in calcium excretion in thiazide-treated patients. Exercise was clearly good for bone; chronic pulmonary disease and current smoking showed some effects on DXA independent of each other. Thus, while current smoking is included in FRAX, it may not be adequate to capture all patients with pulmonary disorders.

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The lesson from this very careful analysis of Danish women attending an osteoporosis clinic is that a comprehensive evaluation of osteoporosis risks is still helpful. In addition at least in Denmark, the female population referred for osteoporosis evaluation is working to mitigate modifiable risks for fracture by taking calcium and vitamin D and exercising. While the practice has changed over time, good clinical care is still needed.

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**Compliance with ethical standards**

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## References

1. E.V. McCloskey, N.C. Harvey, H. Johansson, J.A. Kanis, FRAX updates 2016. Curr. Opin. Rheumatol. **28**, 433–441 (2016)
2. S. Jean, S. O'Donnell, C. Lagace, P. Walsh, C. Bancej, J.P. Brown, S. Morin, A. Papaioannou, S.B. Jaglal, W.D. Leslie, Osteoporosis Surveillance Expert Working Group, Trends in hip fracture rates in Canada: an age-period-cohort analysis. J. Bone Miner. Res. **28**, 1283–1289 (2013)
3. A.A. Khan, A. Morrison, D.A. Hanley, D. Felsenberg, L.K. McCauley, F. O'Ryan, I.R. Reid, S.L. Ruggiero, A. Taguchi, S. Tetradis, N.B. Watts, M.L. Brandi, E. Peters, T. Guise, R. Eastell, A.M. Cheung, S.N. Morin, B. Masri, C. Cooper, S.L. Morgan, B. Overmayer-Pietsch, B.L. Langdahl, R. Al Dabagh, K.S. Davison, D.L. Kendler, G.K. Sanders, J.P. Brown, J. Compston, International task force on osteonecrosis of the jaw: a systematic review and international consensus. J. Bone Miner. Res. **30**, 3–23 (2015)
4. R.A. Adler, Bisphosphonates and atypical femoral fractures, Curr. Opin. Endocrinol. Diabetes Obes. **23**, 430–434 (2016)
5. S. Jha, Z. Wang, N. Laucis, T. Bhattacharyya, Trends in media reports, oral bisphosphonate prescriptions, and hip fractures 1996-2012: an ecological analysis. J. Bone Miner. Res. **30**, 2179–2187 (2015)
6. K.M.B. Huntjens, A.C.M.T.A.C.M. van Geel, P.W.J.P.W. van den Bergh, S. vsn Helden, P. Willems, B. Winkens, J.A. Eisman, P.P. Geusens, P.R.G. Brink, Fracture liaison service: impact on subsequent nonvertebral fracture incidence and mortality. J. Bone Joint Surg. Am. **96**, e29 (1-8) (2014)
7. J.P. Holm, L. Hyldstrup, J-E. Beck Jensen, Time trends in osteoporosis risk factor profiles: a comparative analysis of risk factors, comorbidities, and medications over twelve years. Endocrine (2016). doi:10.1007/s12020-106-0987-5
8. C. Tannenbaum, J. Clark, K. Schwartzman, S. Wallenstein, R. Lapinski, D. Meier, M. Luckey, Yield of laboratory testing to identify secondary contributors to osteoporosis in otherwise healthy women. J. Clin. Endocrinol. Metab. **87**, 4431–4437 (2002)
9. R.A. Adler, Laboratory testing for secondary osteoporosis evaluation. Clin. Biochem. **45**, 894–900 (2012)
10. S. Upala, A. Sanguankeo, Association between hyponatremia, osteoporosis, and fracture: a systematic review and meta-analysis. J. Clin. Endocrinol. Metab. **101**, 1880–1886 (2016)