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Systematic screening using FRAX® leads to increased use of, and adherence to, anti-osteoporosis medications: The UK SCOOP Trial

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Abstract

We aimed to investigate the effect of a population based, primary care-led fracture risk screening intervention, on initiation of anti-osteoporosis medication (AOM), and subsequent long-term adherence. The 'Screening of older women for prevention of fracture' (SCOOP) study was a primary care-based UK multi-centre randomised controlled trial (RCT) of screening for osteoporotic fracture risk. 12,483 women (70-85 years) were randomised to either usual NHS care, or assessment using the FRAX® tool +/- dual-energy X-ray absorptiometry (DXA) bone mineral density (BMD), with medication recommended for those found to be at high risk of hip fracture. Self-reported AOM use was obtained by postal questionnaires at 6, 12, 24, 36, 48 and 60 months. Ordered logistic regression was used to explore baseline determinants of adherence (defined as % study visits at which participants reported taking AOM, following a positive report of taking AOM at 6 months). The mean (SD) age of participants was 75.6 (4.2) years, with 6233 randomised to screening and 6250 to the control group. At 6 months, 75.8% of 828 screening participants classified at high hip fracture risk reported taking AOM compared with 12.3% of all screening participants and 2% of all participants in the control group. In the screening group, 37.1% of those on treatment at 6 months were still treated at 60 months; the corresponding figure for the control group was 21.6%. Older age was associated with lower adherence [OR 0.96 (95%CI: 0.93, 0.98), p=0.001], whereas history of parental hip fracture was associated with greater adherence [OR 1.68 (95%CI: 1.28, 2.20), p<0.001]. Systematic fracture risk screening using FRAX® leads to markedly greater use of AOM and greater adherence, in women at high fracture risk, compared with usual care. These findings inform public health strategies aimed at reduction of fragility fractures.

Introduction

Osteoporosis risk assessment has advanced markedly in recent decades. The introduction of an operational definition of osteoporosis based on dual-energy X-ray absorptiometry (DXA) bone mineral density (BMD) by the World Health Organisation in the mid-1990s permitted identification of those at risk of fracture due to a reduced bone mass.[1] Recognition of the contribution of risk factors other than BMD, and the latter's sub-optimal sensitivity for fracture prediction, led to the development of the FRAX® Fracture Risk Calculation tool. This uses a small number of intuitively reasonable and clinically readily available risk factors, together with femoral neck BMD if measured, to calculate an individualised 10-year probability of fracture, integrating risk of fracture with the competing hazard of death.[2]

There are around 120 guidelines internationally that use the FRAX® tool.[3] Whilst the majority of guidelines have suggested approaches based on opportunistic case finding (for example the earlier UK Royal College of Physicians Guidelines and subsequently the National Osteoporosis Guideline Group[4]), the effectiveness and cost effectiveness of systematic screening has recently been demonstrated in the SCOOP trial.[5-8] In this trial, identification in primary care of older women at high risk of fracture (using FRAX® probability of hip fracture and subsequent recommendation for treatment) led to a 28% reduction in hip fractures over 5 years compared with usual care.[6] Such advances must be viewed in the context of an international backdrop of declining medication use for both primary and secondary prevention for a variety of reasons but, critically, this makes interventions that optimise identification and treatment of patients at high fracture risk a global imperative.[9,10]

Whilst the SCOOP trial demonstrated that the intervention was acceptable and associated with increased medication use, a key component of efficacy is adherence.[11,12] In the present study, we used existing data from the trial to investigate whether the SCOOP screening intervention was associated with increased adherence to anti-osteoporosis medication, and explored the determinants thereof.

Materials and methods

Study Design

The 'Screening of older women for prevention of fracture' (SCOOP) study was a pragmatic, unblinded, two group, parallel randomised controlled trial to assess the effectiveness of screening to prevent fractures in older women. Details of the study have been published:[5] in brief, women aged

70-85 years were invited from primary care lists within seven UK centres; those responding were randomised to either a screening arm or a control arm. In the screening arm, the FRAX® risk algorithm was used to determine baseline fracture risk (10-year probability of hip fracture) and those participants identified as being at moderate or high risk of fracture (using an age-dependent threshold, equivalent to the 10-year probability consequent to the presence of a previous fracture) had a DXA scan to obtain femoral neck bone mineral density (BMD). Their 10-year hip fracture probability was then recalculated including BMD. Those in the control arm received usual UK NHS care (opportunistic discussion of osteoporosis). In the screening arm, anti-osteoporosis medication was recommended to those participants found to be at high risk of fracture after inclusion of the BMD measurement in FRAX®.

Data collection

Self-reported anti-osteoporosis medication (AOM) use was obtained by postal questionnaire at 6, 12, 24, 36, 48 and 60 months after randomisation for both study arms.

Prescription adherence was calculated as the percentage of subsequent time points at which the participants reported taking anti-osteoporosis medication, following a positive report of medication taking at the 6 month (or subsequent) questionnaire.

Statistical analysis

Characteristics of participants were described using means and standard deviations (SD) for normally distributed continuous variables, and using medians and inter-quartiles ranges for skewed variables. Frequencies and percentages were used to summarise binary and categorical variables. Ordered logistic regression was used to investigate baseline determinates of adherence, with the odds ratio (OR) reflecting the odds per additional adherent timepoint. Self-reported AOM use was obtained at 6 time points, and so the adherence outcome could take one of six percentage outcomes. The risk factors of FRAX® were considered as exposure variables. Since some patients may have been started on treatment as a result of experiencing a fracture during follow-up rather than as a direct result of the screening, we also examined initiation and adherence firstly amongst those who did not experience an incident (post-baseline) fracture before initiation of treatment, and secondly amongst the group who did experience an incident fracture before commencing medication. Given that information on fractures and medication was obtained at the follow-up questionnaires, it was not possible to establish the order of such events prior to 6 months, and so analysis of initiation at 6 months assumes no prior fracture between baseline and this time point. The analysis based on medication initiation after an incident fracture thus only used follow-up from 12 months onwards. All analysis were undertaken using Stata 14.[13]

Full ethics approval was obtained from the North Western – Haydock Research Ethics Committee of England in September 2007 (REC 07/H1010/70). The trial was registered on the International Standard Randomised Controlled Trial Register in June 2007 (ISRCTN55814835). All participants gave written, informed consent.

Results

Participant characteristics

A total of 12,483 participants were randomised: 6,233 women to the screening arm and 6,250 to the control arm. Overall, the mean age was 75.6 years and the median body mass index (BMI) 26kg/m^2. At baseline, the median FRAX® hip fracture probability of all participants calculated without BMD was 6.3% and of those with BMD measured the mean T-score was -1.7. Just under 5% of participants reported smoking at baseline, 3.6% drank more than 3 units of alcohol a day and 10% of participants reported a parental history of hip fracture. Characteristics of all study participants are presented by randomisation group in Table 1, demonstrating that the baseline characteristics were well balanced between the two groups. Of those in the screening arm, 14.3% were classified at high risk of fracture based on FRAX® 10-year hip fracture probability (Figure 1). Over the 60 month study duration, 15.7% reported an incident fracture.

Medication initiation by time and group

At six months, 7.2% of the whole study population reported using anti-osteoporosis medication (AOM)(Figure 2). Of those study participants in the screening arm identified to be at high risk of fracture, 75.8% were taking AOM compared with only 2.0% in the control arm overall. By 60 months, 11.5% of all study population were taking an AOM, with 56.6% of those identified as at high risk of fracture reporting taking medication, compared with 9.7% in the control arm overall.

Medication adherence

Of the 823 SCOOP participants who self-reported AOM use at 6 months (and assumed not to have experienced a fracture between the baseline assessment and the 6 month questionnaire), 79.2% (n=652) remained on treatment at 12 months, 65.0% (n=535) at 24 months and 34.9% (n=287) remained on treatment for the entire 60 month duration of follow-up. Similar patterns of treatment decay were seen when study participants commenced medication at later study time points (restricted to those individuals who had not experienced a fracture between baseline assessment and treatment commencement, demonstrated graphically in Figure 3a). Of the 628 study participants who were identified at high risk of fracture in the screening arm and reported treatment

at 6 months, 38.2% (n=240) remained on treatment for the 60 month duration; the respective figure for the control group was 21.6% (n=25).

Medication adherence following initiation after an incident fracture

Figure 3b demonstrates the decay in adherence following initiation of medication after an incident fracture. At 12 months, 30 participants had initiated treatment following a post-baseline fracture prior to this assessment. 96.7% (n=29) were still adherent at 24 months and 36.7% (n=11) at 60 months. Patterns of adherence decay were similar with treatment initiation at later time points.

Baseline characteristics associated with adherence

As expected, the components of the FRAX score were associated with initiation of treatment, and on univariate modelling, there was evidence that older age was associated with lower adherence [OR 0.96 (95%CI: 0.93, 0.98), p=0.001] whereas a history of a parental hip fracture was associated with greater adherence [OR 1.68 (95%CI: 1.28, 2.20), p<0.001] to AOM over the five-year study duration (Table 2). In a multivariate model, both age and a history of a parental hip fracture remained associated with adherence [OR 0.96 (95%CI: 0.94, 1.00), p=0.033 and OR 1.62 (95%CI: 1.23, 2.13), p=0.001 respectively].

Discussion

In this pragmatic randomised trial of systematic screening for fracture risk in older women, using FRAX® in primary care, the screening intervention was associated with markedly greater rates of AOM prescription, and medication adherence, than that those observed with usual NHS care. Furthermore, greater adherence was associated with younger age and a history of parental hip fracture.

To our knowledge, this is the first study to demonstrate the benefit of systematic screening on osteoporosis medication adherence. Good adherence to osteoporosis medications is clearly essential, demonstrated by the reduced efficacy of medications such as alendronic acid when prescription regimens are poorly followed.[14,15] Similar to the prevention of many other common chronic non-communicable diseases, adherence to bisphosphonates is generally sub-optimal, with reported rates as low as 40%.[11,16,17] Reasons for poor adherence are not well understood, but there is evidence from a large, international cohort study of 60,000 older women, that appreciation of individual risk is variable, and the majority of women underestimate their risk of fracture, even having experienced a prior fracture.[18,19] In recent years, there has been concern over rare serious side effects of long-term antiresorptive treatment.[9,10] These have often been excessively reported

in the media (and sometimes also in the scientific press); in particular, communication of the appropriate balance between risk and benefit has usually not occurred, especially in the context of the global media.[20,21] It is notable that rates of medication use for both primary and secondary prevention appear to be falling over recent years.[10,20,22-24]

Previous investigations have explored a variety of methods to improve medication adherence. These have included measurement of bone turnover markers, BMD, nurse/practitioner review, and educational programmes, with the aim of providing positive feedback and monitoring of progress.[11,15,25] However, there are clear resource implications for such interventions, and the value of specific measures such as bone turnover markers over and above simple contact with a health professional is not certain.[11] It is therefore notable that the present screening intervention, undertaken in primary care using the FRAX® tool, led not just to increased uptake of medication but also to improved adherence compared with those individuals prescribed medication in the usual care group.

That family history of hip fracture was associated with better adherence is easily comprehensible, although the lack of association with prior fracture is perhaps counterintuitive, albeit consistent with findings from the GLOW study.[18] Our analysis explored adherence amongst those individuals who had (or had not) experienced a fracture after the baseline assessment, but before initiation of medication, and suggested perhaps greater adherence in the first 12 months after initiation for the post-incident fracture group commencing medication at one year. However, the percent adherence was similar at the end of the study, and the numbers were not large enough to permit a logistic regression analysis based on incident fracture.

Our finding of lower adherence at older ages may reflect a higher burden of comorbidity and associated medications. Indeed, key perceptions that influence older women with regard to adherence to such medications was investigated in a qualitative study, nested within the SCOOP trial[26]. In this investigation of 30 women aged 70-85 years who were offered anti-osteoporosis medication, there were no overall predictors of adherence across two years of assessment. The women's perceptions and motivations related to persistence with medication were influenced by factors such as their understanding of adherence/non-adherence, motivations and self-care, appraising/prioritising risk, anticipating/managing side effects and issues relating to problems of understanding and decision-making. Importantly, those engaged with supportive professionals better tolerated/overcame potential barriers posed by side effects.[26] The present results complement these detailed findings from interviews in a small group of women, by elucidating overarching predictors of adherence across the whole trial population.

We studied a unique multicentre, primary care-based UK randomised controlled trial with comprehensive assessment of medication use. However, there are some limitations that could should be considered in the interpretation of our findings. Firstly, medication use was obtained by self-report questionnaire at specific time points. It is possible that transient use was therefore underestimated, though if anything this would tend to reduce the chances of observing differences between the groups. Secondly, we have limited capacity to explore psychosocial aspects related to adherence, but these have been investigated previously in subsets of the trial.[26,27] Thirdly, the study population consisted of older women, limiting the generalisability of these findings to younger women and to men. Finally, it is possible that trial participants were somewhat healthier than the general population. This "healthy selection effect" may limit generalisability, but should not materially influence differences between the two groups, since participants were randomly allocated to screening or usual care.

In conclusion, systematic screening for fracture risk using FRAX® in primary care led to increased use of, and adherence to, anti-osteoporosis medications, compared with usual care. Taken with recent evidence that this intervention results in a reduction in risk of hip fracture, the present findings further support the use of systematic screening approaches for fracture prevention.

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Authors' roles

NCH and CC developed and supervised the medications analysis protocol. CP and NCH wrote the draft manuscript. CP undertook statistical analysis. EL was responsible for the organisation and coordination of the original trial. LS was the chief investigator and also responsible for the original

data analysis. LS, CC, SC, NG, IH, AHe, RH, AHo, JK, TM, TO, TP, DTo, and EM developed the trial design and led the trial execution. All authors contributed to trial execution and writing of the final manuscript. All members of the SCOOP Study Team contributed to the management or administration of the trial. CC is guarantor.

References

1. World Health Organisation. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis. Geneva: WHO 1994.

2. Kanis JA. Assessment of osteoporosis at the primary health care level. WHO Scientific Group Technical Report. Geneva: World Health Organization; 2007.

3. Kanis JA, Harvey NC, Cooper C, Johansson H, Oden A, McCloskey EV. A systematic review of intervention thresholds based on FRAX : A report prepared for the National Osteoporosis Guideline Group and the International Osteoporosis Foundation. Archives of osteoporosis. 2016;11(1):25.

4. Compston J, Cooper A, Cooper C, et al. UK clinical guideline for the prevention and treatment of osteoporosis. Archives of osteoporosis. 2017;12(1):43.

5. Shepstone L, Fordham R, Lenaghan E, et al. A pragmatic randomised controlled trial of the effectiveness and cost-effectiveness of screening older women for the prevention of fractures: rationale, design and methods for the SCOOP study. Osteoporos Int. 2012;23(10):2507-15.

6. Shepstone L, Lenaghan E, Cooper C, et al. Screening in the community to reduce fractures in older women (SCOOP): a randomised controlled trial. Lancet. 2017.

7. Turner DA, Khioe RFS, Shepstone L, et al. The Cost-Effectiveness of Screening in the Community to Reduce Osteoporotic Fractures in Older Women in the UK: Economic Evaluation of the SCOOP Study. J Bone Miner Res. 2018;33(5):845-51.

8. McCloskey E, Johansson H, Harvey NC, et al. Management of Patients With High Baseline Hip Fracture Risk by FRAX Reduces Hip Fractures-A Post Hoc Analysis of the SCOOP Study. J Bone Miner Res. 2018;33(6):1020-6.

9. Kanis JA, Svedbom A, Harvey N, McCloskey EV. The osteoporosis treatment gap. J Bone Miner Res. 2014;29(9):1926-8.

10. Harvey NC, McCloskey EV, Mitchell PJ, et al. Mind the (treatment) gap: a global perspective on current and future strategies for prevention of fragility fractures. Osteoporos Int. 2017;28(5):1507-29.

11. Diez-Perez A, Naylor KE, Abrahamsen B, et al. International Osteoporosis Foundation and European Calcified Tissue Society Working Group. Recommendations for the screening of adherence to oral bisphosphonates. Osteoporos Int. 2017;28(3):767-74.

12. Emmett CL, Redmond NM, Peters TJ, et al. Acceptability of screening to prevent osteoporotic fractures: a qualitative study with older women. Fam Pract. 2012;29(2):235-42.

13. 2015 S. Stata Statistical Software. Texas2015.

14. Hiligsmann M, Rabenda V, Gathon HJ, Ethgen O, Reginster JY. Potential clinical and economic impact of nonadherence with osteoporosis medications. Calcif Tissue Int. 2010;86(3):202-10.

15. Kanis JA, Cooper C, Hiligsmann M, Rabenda V, Reginster JY, Rizzoli R. Partial adherence: a new perspective on health economic assessment in osteoporosis. Osteoporos Int. 2011;22(10):2565-73.

16. Cramer JA, Gold DT, Silverman SL, Lewiecki EM. A systematic review of persistence and compliance with bisphosphonates for osteoporosis. Osteoporos Int. 2007;18(8):1023-31.

17. Kothawala P, Badamgarav E, Ryu S, Miller RM, Halbert RJ. Systematic review and meta-analysis of real-world adherence to drug therapy for osteoporosis. Mayo Clin Proc. 2007;82(12):1493-501.

18. Siris ES, Gehlbach S, Adachi JD, et al. Failure to perceive increased risk of fracture in women 55 years and older: the Global Longitudinal Study of Osteoporosis in Women (GLOW). Osteoporos Int. 2011;22(1):27-35.

19. Litwic AE, Compston JE, Wyman A, et al. Self-perception of fracture risk: what can it tell us? Osteoporos Int. 2017.

20. Jha S, Wang Z, Laucis N, Bhattacharyya T. Trends in Media Reports, Oral Bisphosphonate Prescriptions, and Hip Fractures 1996-2012: An Ecological Analysis. J Bone Miner Res. 2015;30(12):2179-87.

21. Peeters G, Tett SE, Duncan EL, Mishra GD, Dobson AJ. Osteoporosis medication dispensing for older Australian women from 2002 to 2010: influences of publications, guidelines, marketing activities and policy. Pharmacoepidemiology and drug safety. 2014;23(12):1303-11.

22. van der Velde RY, Wyers CE, Curtis EM, et al. Secular trends in fracture incidence in the UK between 1990 and 2012. Osteoporos Int. 2016.

23. Hawley S, Leal J, Delmestri A, et al. Anti-Osteoporosis Medication Prescriptions and Incidence of Subsequent Fracture Among Primary Hip Fracture Patients in England and Wales: An Interrupted Time-Series Analysis. J Bone Miner Res. 2016;31(11):2008-15.

24. Hernlund E, Svedbom A, Ivergard M, et al. Osteoporosis in the European Union: medical management, epidemiology and economic burden : A report prepared in collaboration with the International Osteoporosis Foundation (IOF) and the European Federation of Pharmaceutical Industry Associations (EFPIA). Archives of osteoporosis. 2013;8(1-2):136.

25. Hiligsmann M, Salas M, Hughes DA, et al. Interventions to improve osteoporosis medication adherence and persistence: a systematic review and literature appraisal by the ISPOR Medication Adherence & Persistence Special Interest Group. Osteoporos Int. 2013;24(12):2907-18.

26. Salter C, McDaid L, Bhattacharya D, Holland R, Marshall T, Howe A. Abandoned acid? Understanding adherence to bisphosphonate medications for the prevention of osteoporosis among older women: a qualitative longitudinal study. PloS one. 2014;9(1):e83552.

27. Salter CI, Howe A, McDaid L, Blacklock J, Lenaghan E, Shepstone L. Risk, significance and biomedicalisation of a new population: older women's experience of osteoporosis screening. Social science & medicine (1982). 2011;73(6):808-15.

Figure legends

Figure 1: Consort diagram

Figure 2: Anti-osteoporosis medication use over the duration of the SCOOP trial by randomisation group [screening (intervention) vs usual care (control)].

Figure 3a: Anti-osteoporosis medication (AOM) adherence over the 5 year duration of the SCOOP trial in study participants who initiated treatment, and who had not experienced a fracture between baseline and commencement of medication. (Calculated as the percent study participants who remained on AOM at each subsequent timepoint having initiated treatment at each index timepoint.)

Figure 3b: Anti-osteoporosis medication (AOM) adherence over the 5 year duration of the SCOOP trial in study participants who initiated treatment after the occurrence of a fracture post-baseline. (Calculated as the percent study participants who remained on AOM at each subsequent timepoint having initiated treatment at each index timepoint.)

Table 1: Participant characteristics at baseline assessment.

	Screening arm			Control arm		
Characteristic	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**
Age (years)	6233	75.5	4.2	6250	75.6	4.1
Height (cm)	6233	160.7	6.3	6250	160.9	6.4
T-Score	2818	-1.7	1.0	-	-	-
	n	**Median**	**Inter-quartile range**	**n**	**Median**	**Inter-quartile range**
BMI (kg/m^2)	6233	26.0	23.4-29.3	6250	26.1	23.4-29.2
Weight (kg)	6233	67.1	60.3-76.2	6250	67.6	60.3-76.2
FRAX® Probability (hip without BMD)	6233	6.3	3.8-10.5	6250	6.3	3.8-10.5
	n		**%**	**n**		**%**
Parental history of hip fracture	585		9.4	577		9.2
Incident fracture (post baseline)	956		15.3	1010		16.2
Prior fracture [b]	1399		22.7	1463		23.6
Smoker	291		4.7	290		4.6
Taken corticosteroids for more than a few weeks	316		5.1	312		5.0
Rheumatoid arthritis	426		6.8	410		6.6
> 3 units of alcohol a day	219		3.5	225		3.6
Risk category [a]						
Low	5342		85.7	-		-
High	891		14.3	-		-

[a] Risk categorisation undertaken in intervention arm only; [b] Broken bone since age of 50 years

Table 2: Univariate associations between participant characteristics (at baseline) and adherence to anti-osteoporosis medication (AOM) over the 5 year follow-up period (Ordered logistic regression).

	Adherence during follow-up		
	Odds ratio	**95% CI**	**p-value**
Age (years)	0.96	(0.93, 0.98)	0.001
Weight [log(kg)]	0.90	(0.45, 1.80)	0.764
Height (cm)	1.00	(0.98, 1.02)	0.768
Prior fracture (Y/N)	0.94	(0.73, 1.20)	0.594
Parent broken hip (Y/N)	1.68	(1.28, 2.20)	<0.001
Smoker (Y/N)	0.90	(0.59, 1.39)	0.634
Taken corticosteroids (Y/N)	0.81	(0.56, 1.17)	0.251
Rheumatoid arthritis (Y/N)	0.79	(0.53, 1.19)	0.261
Alcohol consumption (Y/N)	0.75	(0.46, 1.21)	0.234
Total hip BMD T-score (SD)	1.03	(0.85, 1.25)	0.788
Incident fracture (post baseline) (Y/N)	1.10	(0.84, 1.45)	0.475