Postfracture care for older women

Gaps between optimal care and actual care

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ABSTRACT

Objective. *To investigate rates of assessment and treatment of osteoporosis among older women during the year after they have had fractures.*

Design. *Observational, historical, population-based cohort study.*

Setting. *Manitoba, which maintains a comprehensive population-based repository of health care services provided and has a publicly funded health care system.*

Participants. *Women 50 years old and older who had suffered fractures between 1997 and 2002. These women were chosen from among approximately 175 000 women of this age in Manitoba.*

Methods. *We examined each woman's annual medical record between April 1, 1997, and March 31, 2002, to find any International Classification of Diseases fracture codes that have been consistently associated with osteoporosis. We looked for postfracture care during the first 12 months after fractures: bone mineral density (BMD) testing or treated with osteoporosis pharmacotherapy. Analysis was stratified by type of fracture: designated type 1 fractures (spine or hip) and type 2 fractures (not spine or hip).*

Main outcome measures. *Use of BMD testing or osteoporosis pharmacotherapy during the first 12 months following fractures.*

Results. *For type 1 fractures, BMD assessment during the first year after fracture increased from 2.6% in 1997-1998 to 4.6% in 2001-2002 (P for trend .0004). Rates of therapy with osteoporosis medication increased from 4.9% in 1997-1998 to 17.6% in 2001-2002 (P for trend < .0001). Results were similar for type 2 fractures. In the final year of the study, only 20.5% of women with either type of fracture underwent any identifiable intervention (BMD assessment or osteoporosis pharmacotherapy). The intervention rate was substantially higher among women 50 to 64 years old (26.4%) than among those 75 years old or older (17.9%, P for trend < .0001).*

Conclusion. *Women at highest risk of future fractures are assessed infrequently for osteoporosis with BMD testing and given pharmacotherapy to prevent future fractures just as infrequently. This gap in care was particularly striking for BMD testing despite the fact that testing is free in Manitoba's publicly funded system. Data from this study could be educational for physicians treating osteoporosis and should encourage them to improve their practice patterns and optimize patient care.*

EDITOR'S KEY POINTS

- Research suggests that 30% to 50% of women will experience fractures characteristic of osteoporosis during their lives; the substantially increased rates of morbidity and mortality among patients with osteoporosis make it a compelling public health problem, especially as effective prevention and treatment strategies are available.
- Serious gaps between what could be done for postfracture patients and what is done

in actual practice have been observed, and researchers in this study found the same gaps exist even in a publicly funded health system like Canada's. Four out of 5 women received no pharmacologic treatment within the year following hip or vertebral fractures, and fewer than 1 in 10 underwent bone mineral density assessment.

- Women most at risk (those 75 years of age and older) were the least likely to receive postfracture interventions, even though research has shown that older women can benefit from appropriate treatment, which has been shown to reduce fracture rates within 1 year of initiation.

There is a serious gap in the care of patients with fractures characteristic of osteoporosis. Osteoporosis is increasingly being recognized as an important public health problem because of its agerelated increase in prevalence and the morbidity, mortality, and economic consequences associated with it. Yet many family physicians appear to be unaware of the magnitude of this problem and the importance of identifying people at high risk for appropriate intervention, and of the process of diagnosis and management of the disease. (1,2) Researchers currently estimate that 30% to 50% of women will experience fractures characteristic of osteoporosis during their lives. (3) Women's lifetime risk of hip fractures is greater than the sum of their lifetime risk of having breast, endometrial, or ovarian cancer. (4)

The rate of premature death (at younger than 75 years) and substantially increased morbidity among patients with osteoporosis make it a particularly compelling public health problem. Women who have sustained major osteoporotic fractures have a 2-fold increase in ageadjusted risk of mortality. (3) Hip fractures are the cause of up to 40% of fall-related hospitalizations among those 65 years old and older, (5) and 40% of all nursing home admissions occur as a result of fractures among people older than 65 years. (6)

These morbidity and mortality rates are especially distressing given that effective prevention and treatment strategies are available for those at highest risk of osteoporotic fractures – that is, people needing secondary prevention because they have already experienced spine, hip, or other fractures characteristic of osteoporosis. Appropriate intervention can be very effective. Pharmacologic therapy has been shown to reduce risk of fracture by 30% to 60% in women at high risk. Additional nonpharmacologic intervention with calcium and vitamin D supplementation, (7) exercise, (8) smoking cessation, and fall prevention (9) can further contribute to preventing fractures.

Serious gaps between what could be done for postfracture patients and what is done in actual practice have been observed. A recent meta-analysis of 37 studies of diagnosis and treatment of osteoporosis and intervention for those who have sustained fragility fractures revealed that, in some studies, none of the fracture patients was investigated or treated for underlying osteoporosis. (1) Studies have demonstrated that all patients, including those older than 75 years, can benefit from treatment, and yet older women have been least likely to receive bone mineral density (BMD) testing or appropriate treatment for osteoporosis. (10,11)

This gap in the care of fracture patients should be less evident in a publicly funded health care system such as Canada's. Bone mineral density testing as a medically necessary diagnostic procedure does not require payment from patients, and drug benefit programs are available to most Canadian residents 65 years old and older. As a prelude to developing interventions to improve diagnosis and treatment of osteoporosis, we examined the rates of investigation and treatment of osteoporosis among older women in an entire Canadian province during the first year after they had had fractures. ❑

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METHODS

We conducted a repeated historical cohort study from April 1, 1997, to March 31, 2002. Women in our cohort were 50 years old or older as of April 1st for each panel year, were residents of Manitoba, and had experienced fractures during that year. Patients who died, left the province, or moved into the province during the study period were excluded from the analysis to eliminate those with partial data.

Manitoba has developed a system for building longitudinal files of individual patients' use of health care services. Links between hospital, physician, and pharmacy databases and clinic-based data are possible through unique but anonymous identifiers. Computerized provincial government health databases capture claims for physician services, hospitalizations, and pharmaceutical dispensings for each person in the system. Databases include information on patients' identities, dates of services, services provided, drugs dispensed, and diagnoses classified under the World Health Organization's *International Classification of Diseases,* 9th revision, Clinical Modification (ICD-9-CM) codes. (12)

All clinical bone densitometry in Manitoba is done under a single program that maintains uniform testing indications, requisitions, and reporting. Criteria for testing are broadly consistent with most published guidelines and emphasize the importance of female sex, older age, previous fragility fractures, and other clinical risk factors. The Manitoba Bone Density Program maintains a population-based database that includes all dualenergy x-ray absorptiometry results. It is more than 99% complete and accurate as judged by chart audit. (13)

Each woman's annual medical record between April 1, 1997, and March 31, 2002, was assessed for the presence of any ICD-9-CM fracture codes (ICD-9-CM 805, 807-829). Vertebral fractures without cord injury (ICD- 9-CM code 805) and hip fractures (ICD-9-CM code 820) have been consistently associated with osteoporosis and were analyzed as a specific fracture category designated type 1 fractures. All other fractures (ie, not hip or spine) were designated as type 2 fractures.

We examined postfracture care during the first 12 months after type 1 or type 2 fractures. The availability of a province-wide BMD testing database allowed us to identify when BMD scans were done. Use of pharmacologic therapy postfracture was determined by examining dispensing of recognized osteoporosis drugs available from the province's Drug Programs Information Network, which captures prescriptions dispensed for outpatient use. (14) Dispensing of at least 1 prescription for a bisphosphonate or selective estrogen receptor modulator for all age groups and hormone replacement therapy (HRT) for women aged 65 or older was included in our analysis. During the years of our study, HRT use by women older than 65 years with fractures was taken to be evidence of its use for prevention of osteoporosis. This is consistent with the general view that HRT was a first-line agent for prevention and treatment of osteoporosis among postmenopausal women that was held until after publication of the Women's Health Initiative study in July 2002. (15)

The denominators for calculating yearly fracture rates were based on the population of women resident in Manitoba for the complete year of the panel and are reported per 1000 women. Rates of BMD assessment and pharmacologic treatment for osteoporosis were calculated based on the proportion of women who had 1 of these interventions within 12 months of fracture and are reported as percentages. Analyses are stratified by type of fracture (type 1 and type 2) and age group (50 to 64 years, 65 to 74 years, and 75 years and older). Rates are reported for each panel year and are compared using c^2 tests with analysis for linear trend.

The study was approved by the Health Research Ethics Board at the University of Manitoba and by Manitoba's Health Information Privacy Committee. ❑

RESULTS

During the first year (April 1, 1997, to March 31, 1998), there were 162 009 women 50 years old or older in the province of Manitoba, and by the final year (April 1, 2001, to March 31, 2002), there were 175 072 women 50 years old or older (Table 1). Annualized fracture rates were stable during this time (9.6 to 10.5 per 1000 women for type 1 fractures, and 26.5 to 28.6 per 1000 women for type 2 fractures). As expected, fracture rates were strongly related to age and were much higher among women 75 years old and older (Figure 1). Within each age group, fracture rates were stable over the 5 years of the study.

Figure 2 shows the proportion of women with type 1 fractures (hip or spine) or type 2 fractures (not hip or spine) who received either BMD assessment or pharmacologic treatment after the fractures. For all ages combined, BMD assessment after type 1 fractures rose from 2.6% in 1997-1998 to 4.6% in 2001-2002 (*P* for trend .0004).

During the same period, pharmacologic treatment rates increased from 4.9% in 1997-1998 to 17.6% in 2001-2002 (*P* for trend < .0001). When BMD assessments and pharmacologic treatments were considered together, 6.9% of women with type 1 fractures received these interventions within 1 year of having fractures in 1997-1998, and 20.5% received them in 2001-2002. Women 50 to 64 years old had significantly higher rates of intervention after type 1 fractures (26.4%) than women 75 years old and older did (17.9%, *P* <.0001).

The rate of BMD assessment among women with type 2 fractures increased over the study period (*P* for trend <.0001) and reached a high of 7.0% in 2000-2001. The proportion of women in this group who received pharmacologic treatment showed a similar pattern (*P* for trend <.0001) with the highest rate (15.5%) in 2001-2002. As with women with type 1 fractures, the rate of intervention among women with type 2 fractures was substantially higher among women 50 to 64 years old (25.5%) than among those 75 years old or older (16.8%, *P* <.0001). ❑

DISCUSSION

This population-based analysis found large gaps in the assessment and treatment of women older than 50 years with fractures characteristic of established osteoporosis (type 1 fractures) or of increased risk of osteoporosis (type 2 fractures). In contrast to other studies that have relied on chart audits, patient reports, or selected patient recruitment, the population-based data set upon which this analysis was based was free from selection bias at both physician and patient levels.

Although some improvement was observed in clinical management of osteoporosis over the 5 years of observation, even in the project's final year, 4 out of 5 women received no pharmacologic treatment within the year following hip or vertebral fractures, and fewer than 1 in 10 underwent BMD assessment. Similar gaps were noted in those at increased risk of osteoporosis based on having had type 2 fractures. The very large gap between optimal care and actual care identified in Manitoba is comparable to that reported by others. (16-18)

Canada's recent efforts to define, collect, and report data on chronic diseases uniformly (19) could reveal gaps similar to those found here. It might be, however, that family physicians need to be convinced that these women need treatment or, at least, that they as physicians need to reorient their practices to improve delivery of chronic care. The population-based nature of the study effectively allowed us to document the collective practice patterns of approximately 1000 physicians in Manitoba and gave us critical baseline data for design and implementation of strategies to improve diagnosis and treatment of osteoporosis.

Interventions based on data demonstrating need could address the following points. The occurrence of fractures in postmenopausal women, one of the entry criteria for this study, has been shown to be one of the strongest independent risk factors for future fractures. (20) Women who have sustained vertebral fractures have a 4-fold increased risk of future vertebral fractures, and the risk escalates with the number of previous fractures. There is compelling evidence that timely treatment of these patients using approved antiresorptive therapies can have a substantial clinical effect and reduce future risk of fractures by 40% to 60%. (21)

Our findings show also that the overall rate of assessment and treatment of women in the 50- to 64-year old age group is significantly higher than in the 2 older groups, demonstrating a tendency to focus attention on younger women who are actually at lowest risk. In reality, this understates the discrepancy, as use of HRT was

Table 1. Overall rates of fracture and postfracture care among women 50 years old or older in Manitoba, 1997-2002: ***Intervention was defined as bone mineral density testing or dispensing of designated osteoporosis medication during the first year after fracture.***

		TYPE 1 FRACTURES (SPINE OR HIP)			TYPE 2 FRACTURES (NOT SPINE OR HIP)		
YEAR	NO. OF WOMEN AGED 50 OR OLDER	NO. OF FRACTURES	FRACTURE RATE PER 1000 WOMEN	NO. ASSESSED OR TREATED (%)	NO. OF FRACTURES	FRACTURE RATE PER 1000 WOMEN	NO. ASSESSED OR TREATED (%)
1997-1998	162 009	1661	10.3	114 (6.9%)	4639	28.6	312 (6.7%)
1998-1999	164 579	1578	9.6	145 (9.2%)	4654	28.3	413 (8.9%)
1999-2000	167 389	1666	10.0	169 (10.1%)	4460	26.6	438 (9.8%)
2000-2001	172 096	1802	10.5	200 (11.1%)	4564	26.5	551 (12.1%)
2001-2002	175 072	1802	10.3	370 (20.5%)	4673	26.7	959 (20.5%)

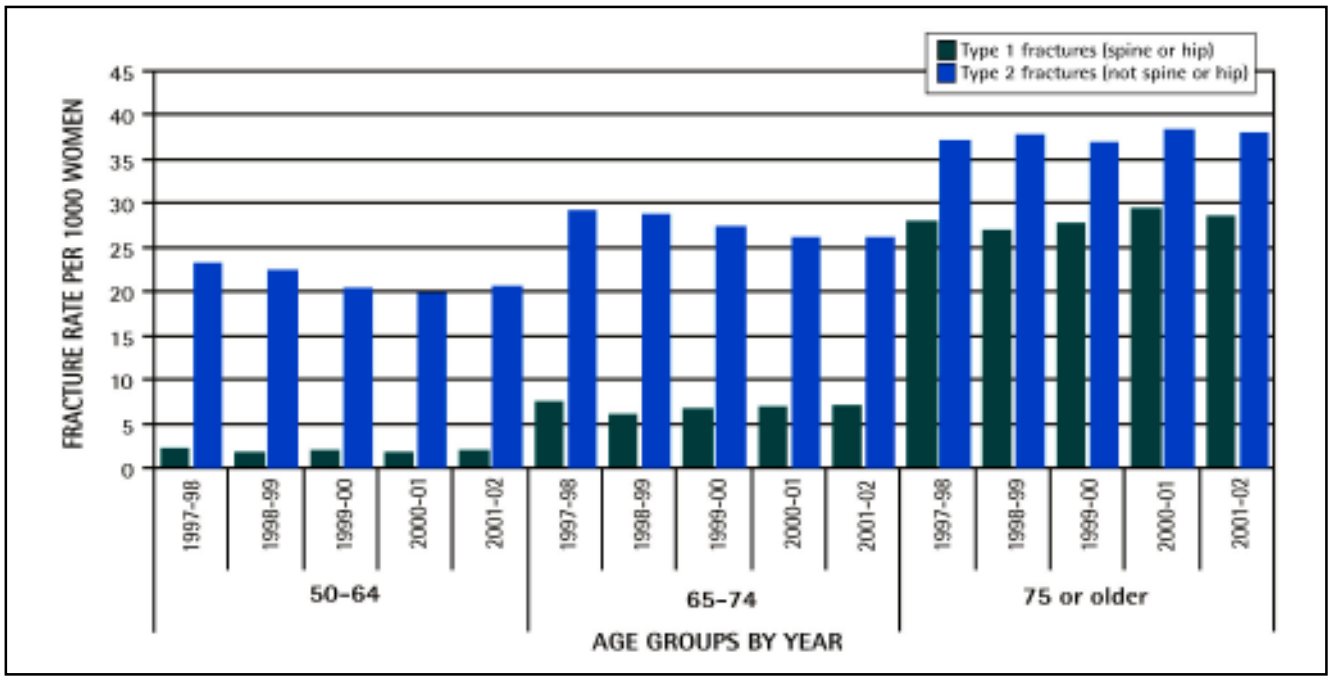

Figure 1. Fracture rates among women aged 50 and older by age group

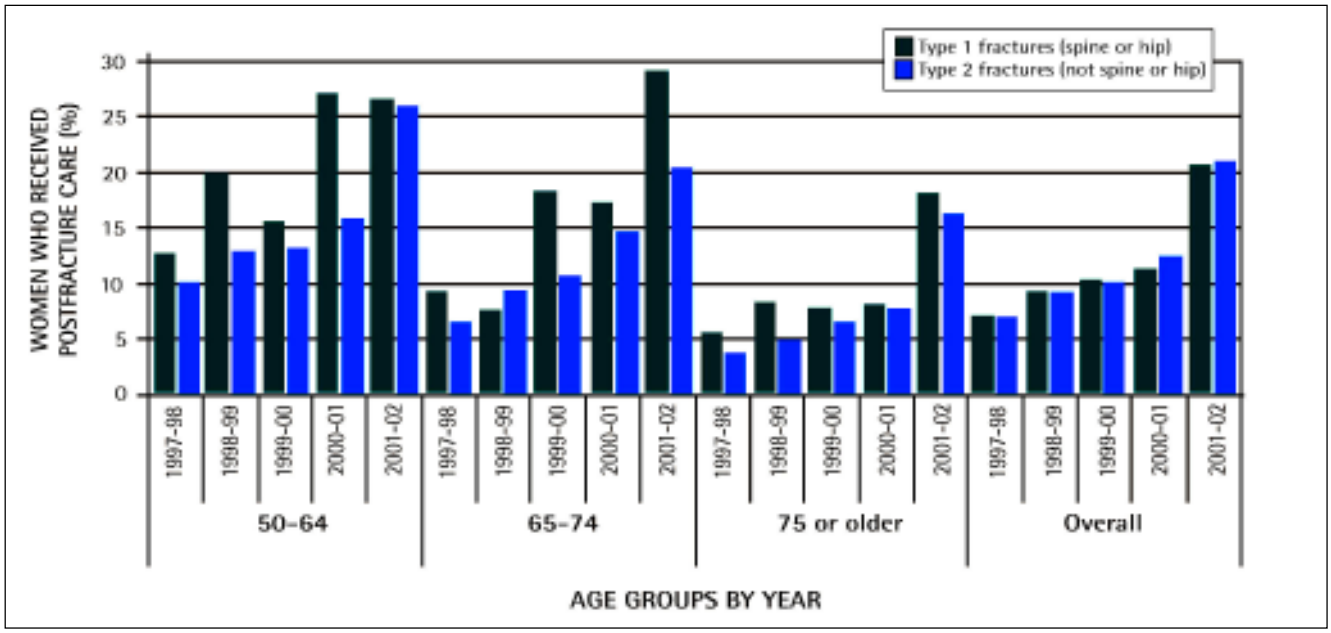

Figure 2. Percentage of women 50 years old or older who had bone mineral density testing or designated osteoporosis medications dispensed during the first 12 months after fractures

counted for the older women but not for the women 50 to 64 years old. Older women sustain the largest number of fractures and thus are at greatest risk, yet they receive the least clinical intervention. This observation reflects a potential inequity in the treatment of women older than 65 years that has been observed for other chronic conditions also. (22) Women aged 70 have an average life expectancy of 12 more years and can benefit from appropriate treatment that has been shown to reduce fracture rates within 1 year of initiation. (23)

Limitations

One limitation of this study is that fractures identified from administrative health databases tend to be underreported, as is the case with asymptomatic vertebral fractures. (24) Thus, the gap in identification of these highrisk women is likely even larger. Our inclusion of HRT as an

osteoporosis agent for older women could be questioned. Pharmacoepidemiologic data confirm that prescribing HRT for osteoporosis therapy increased steadily during the time frame of our study, up until the Women's Health Initiative results were publicly available, and justify our inclusion of HRT use as treatment for osteoporosis for older women. (25) The data set had no accessible information on calcium and vitamin D supplementation, exercise, fall prevention, or other nonpharmacologic interventions. An additional limitation might be our focus only on women, and hence, the lack of generalizability of the findings to men. At the time the study was conceived, little was known about the prevalence of osteoporosis among men; it was known, however, that women's osteoporosis-related fracture rates by age were double those of men.26 Others have since examined gaps in the care of men, and they appear to be as extensive as the gaps we observed in this study. (27)

Future research

Keeping these limitations in mind, the results provide a foundation for further investigation into how gaps in delivery of chronic care like these in osteoporosis could be filled. This is particularly important to consider for older women with osteoporosis who suffer fractures yet whose quality of life could be improved with interventions responsive to demonstrated need. (10) We do know that effective care for chronic illness, which includes management of osteoporosis, requires an appropriately organized team-based delivery system linked to complementary community resources. (28) The question for future research now becomes how to transform a system of care based on acute episodes of illness into one focused on improving delivery of chronic care. Specifically, future research needs to consider how to implement the 6 elements of care we know work together to improve patient outcomes (29): self-management support strategies (eg, using methods to instill confidence in osteoporotic women to undertake nonpharmacologic strategies), delivery system design (case managers to overcome disconnections in clinical pathways), decision support (use of all the evidence-based information that crosses physicians' desks), information support (use of reminders and in-office registries), community linkages for support of patient interventions, and finally, health system support similar to that operating in British Columbia. (30)

Conclusion

This Canadian population-based study demonstrates a large gap between optimal care and actual care of women 50 years old and older who have sustained fractures and are thus at high risk of having future fractures. The magnitude of this gap in care in a publicly funded health care system is alarming: 80% of women who had had fractures in the final year of this study had been neither investigated nor treated for osteoporosis. Similar percentages continue to be reported in investigations worldwide. (26) Diagnostic and therapeutic resources are not being directed toward those at highest risk of future fractures. In fact, older women are receiving the least attention for this condition. Future research is needed to determine how these gaps in care could be overcome. ❑

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Contributors

All of the authors made the 3 types of contributions required by the International Committee of Medical Journal Editors. They contributed substantially to concept and design of the study, or acquisition of data, or analysis and interpretation of data; they either drafted the article or revised it critically for important intellectual content; and they gave final approval to the version to be published.

Competing interests

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REFERENCES

1. **Elliot-Gibson V, Bogoch ER, Jamal SA, Beaton DE** – Practice patterns in the diagnosis and treatment of osteoporosis after a fragility fracture: a systematic review. *Osteoporos Int* 2004;15(10):767-78.
2. **Hamel ME, Sebaldt RJ, Siminoski K, Adachi JD, Papadimitropoulos E, Petrie A, et al** – Influence of fracture history and bone mineral density testing on the treatment of osteoporosis in two non-academic community centers. *Osteoporos Int* 2005;16(2):208-15.
3. **Randell A, Sambrook PN, Nguyen TV, Lapsley H, Jones G, Kelly PJ, et al** – Direct clinical and welfare costs of osteoporotic fractures in elderly men and women. *Osteoporos Int* 1995;5(6):427-32.
4. **Cummings SR, Black DM, Rubin SM** – Lifetime risks of hip, Colles', or vertebral fracture and coronary heart disease among white postmenopausal women. *Arch Intern Med* 1989;149(11):2445-8.
5. **Peel NM, Kassulke DJ, McClure RJ** – Population based study of hospitalised fall related injuries in older people. *Inj Prev* 2002;8(4):280-3.
6. **Tinetti ME, Williams CS** – Falls, injuries due to falls, and the risk of admission to a nursing home. *N Engl J Med* 1997;337(18):1279-84.
7. **Dawson-Hughes B, Harris SS, Krall EA, Dallal GE** – Effect of withdrawal of calcium and vitamin D supplements on bone mass in elderly men and women. *Am J Clin Nutr* 2000;72(3):745-50.
8. **Nguyen TV, Center JR, Eisman JA** – Osteoporosis in elderly men and women: effects of dietary calcium, physical activity, and body mass index. *J Bone Miner Res* 2000;15(2):322-31.
9. **Parker MJ, Gillespie WJ, Gillespie LD** – Effectiveness of hip protectors for preventing hip fractures in elderly people: systematic review. *BMJ* 2006;332(7541):571-4.
10. **Andrade SE, Majumdar SR, Chan KA, Buist DS, Go AS, Goodman M, et al** – Low frequency of treatment of osteoporosis among postmenopausal women following a fracture. *Arch Intern Med* 2003;163(17):2052-7.
11. **Neuner JM, Binkley N, Sparapani RA, Laud PW, Nattinger AB** – Bone density testing in older women and its association with patient age. *J Am Geriatr Soc* 2006;54(3):485-9.
12. **Roos LL, Walld R, Wajda A, Bond R, Hartford K** – Record linkage strategies, outpatient procedures, and administrative data. *Med Care* 1996;34(6):570-82.
13. **Leslie WD, Metge C** – Establishing a regional bone density program: lessons from the Manitoba experience. *J Clin Densitom* 2003;6(3):275-82.
14. **Metge C, Black C, Peterson S, Kozyrskyj AL** – The population's use of pharmaceuticals. *Med Care* 1999;37(6 Suppl):JS42-59.
15. **Rossouw JE, Anderson GL, Prentice RL, LaCroix AZ, Kooperberg C, Stefanick ML, et al** – Risks and benefits of estrogen plus progestin in healthy postmenopausal women: principal results from the Women's Health Initiative randomized controlled trial. *JAMA* 2002;288(3):321-33.
16. **Solomon DH, Finkelstein JS, Katz JN, Mogun H, Avorn J** – Underuse of osteoporosis medications in elderly patients with fractures. *Am J Med* 2003;115(5):398-400.
17. **Eisman J, Clapham S, Kehoe L** – Australian BoneCare Study. Osteoporosis prevalence and levels of treatment in primary care: the Australian BoneCare Study. *J Bone Miner Res* 2004;19(12):1969-75.
18. **Hajcsar EE, Hawker G, Bogoch ER** – Investigation and treatment of osteoporosis in patients with fragility fractures. *CMAJ* 2000;163(7):819-22.
19. Centers for Disease Control and Prevention, Council of State and Territorial Epidemiologists, Association of State and Territorial Chronic Disease Program Directors. Indicators for chronic disease surveillance. *MMWR Recomm Rep* 2004;53(RR-11):1-6.
20. **Kanis JA, Johnell O, De Laet C, Johansson H, Oden A, Delmas P, et al** – A meta-analysis of previous fracture and subsequent fracture risk. *Bone* 2004;35(2):375-82.
21. **Cranney A, Guyatt G, Griffith L, Wells G, Tugwell P, Rosen C, et al** – Metaanalyses of therapies for postmenopausal osteoporosis. IX: summary of meta-analyses of therapies for postmenopausal osteoporosis. *Endocr Rev* 2002;23(4):570-8.
22. **Avorn J** – Improving drug use in elderly patients: getting to the next level. *JAMA* 2001;286(22):2866-8.
23. **Roux C, Seeman E, Eastell R, Adachi J, Jackson RD, Felsenberg D, et al** – Efficacy of risedronate on clinical vertebral fractures within six months. *Curr Med Res Opin* 2004;20(4):433-9.
24. **Kim N, Rowe BH, Raymond G, Jen H, Colman I, Jackson SA, et al** – Underreporting of vertebral fractures on routine chest radiography. *AJR Am J Roentgenol* 2004;182(2):297-300.
25. **Udell JA, Fischer MA, Brookhart MA, Solomon DH, Choudhry NK** – Effect of the Women's Health Initiative on osteoporosis therapy and expenditure in Medicaid. *J Bone Miner Res* 2006;21(5):765-71.
26. **Leslie WD, Derksen S, Metge C, Lix LM, Salamon EA, Wood Steiman P, et al** – Fracture risk among First Nations people: a retrospective matched cohort study. *CMAJ* 2004;171(8):869-73.
27. **Papaioannou A, Kennedy CC, Ioannidis G, Gao Y, Sawka AM, Goltzman D, et al** – The osteoporosis care gap in men with fragility fractures: the Canadian Multicentre Osteoporosis Study. *Osteoporos Int* 2008;19(4):581-7.
28. **Groves T, Wagner EH** – High quality care for people with chronic diseases. *BMJ* 2005;330(7492):609-10.
29. **Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A** – Improving chronic illness care: translating evidence into action. *Health Aff* (Millwood) 2001;20(6):64-78.
30. Ministry of Health. *Chronic disease management.* Victoria, BC: Government of British Columbia; 2007. Available from: www.health.gov.bc.ca/cdm/ Accessed 2008 Jul 30

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