Factors Associated With Pharmacologic Treatment of Osteoporosis in an Older Home Care Population

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Background. A number of studies have shown low rates of osteoporosis treatment. Few, if any, have assessed a comprehensive range of functional and clinical correlates of treatment coverage. Our objective was to examine which sociodemographic, clinical, and functional characteristics are associated with pharmacotherapy for osteoporosis among community-based seniors.

Methods. The study sample included 48,689 home care clients aged ≥ 65 years in Ontario, Canada. Treatment coverage (calcium and vitamin D and/or anti-osteoporotic drugs) was assessed in two subgroups, clients with a diagnosis of osteoporosis (without fracture) and those with a prevalent fracture. Sociodemographic, health, and functional measures available from the Resident Assessment Instrument for Home Care (RAI-HC) were assessed as correlates of treatment in multivariable logistic regression analyses.

Results. Approximately 59% of clients with a diagnosis of osteoporosis were receiving pharmacotherapy, compared with 27% of those with a prevalent fracture. For both subgroups, treatment coverage was significantly lower among clients with at least three chronic conditions, health instability, fewer than nine medications, functional impairment, and depressive symptoms and among those clients who were widowed. Among clients with a diagnosis of osteoporosis, treatment was positively associated with cognitive impairment and negatively associated with confinement to a wheelchair or bed. Men with a prevalent fracture were significantly less likely to receive treatment, particularly in the absence of an osteoporosis diagnosis.

Conclusions. Many older adults with presumed osteoporosis in our study were not receiving drug therapy for this condition. Indicators of clinical instability and functional decline appear to represent influential factors in treatment decisions. Despite a lower likelihood of treatment among men with a prevalent fracture, this sex difference in treatment largely disappeared in the presence of an osteoporosis diagnosis.

OSTEOPOROSIS is a metabolic bone disease that results in compromised bone strength and subsequent increased risk of fragility fractures (1). The health and economic burden of this disease in North America is substantial (2,3). Those persons who experience an osteoporotic fracture are at increased risk for further fractures (4) and significantly reduced quality of life (5). In the year following a hip fracture, the risk of institutionalization and mortality is significantly increased among community-dwelling older adults (6,7).

Current clinical practice guidelines for the diagnosis and treatment of osteoporosis highlight the importance of considering several risk factors (8,9), most notably, the presence of a past fragility fracture (4,8). However, a large proportion of patients at highest risk (≥ 30%) are not receiving any of the recommended drug therapies (10–20). In the United States and Canada, drugs for osteoporosis include bisphosphonates, hormone replacement therapy (HRT), selective estrogen receptor modulators, calcitonin, and teriparatide, in addition to adequate calcium and vitamin D intake (8,9). Selected agents can potentially reduce future fracture risk by up to 50%, compared with treatment with calcium and vitamin D, with antifracture efficacy most evident among high-risk patients with a history of a fragility fracture (21).

Reasons for the lack of appropriate pharmacotherapy remain unclear. Lower treatment rates have been observed among men and patients attended by a general practitioner, but the findings regarding other potential correlates have been inconsistent (17). Previous investigations have often been restricted by small sample sizes (10,14–16,18,19) or use of administrative databases (20,22,23), where data are usually limited to items submitted for billing purposes (e.g., prescription claims, disease, and diagnostic codes).

Bone mineral density (BMD) measurement has become widely used in the clinical diagnosis of osteoporosis (8,9). Ironically, the increasing reliance on BMD as a diagnostic tool may lead to a failure to treat persons at highest risk (i.e., with a history of fragility fracture) and even unnecessary treatment if diagnosis is based solely on the BMD measurement (24).

It is important to identify factors associated with osteoporosis treatment to better understand how treatment decisions are being made and to permit the delineation of “at-risk” patient groups in need of targeted interventions (both pharmacological and nonpharmacological). The primary aim of this study was to examine treatment coverage and key sociodemographic, clinical, and functional characteristics associated with pharmacological treatment for osteoporosis in a large, well-defined older home care.
population with a diagnosis of osteoporosis or prevalent fracture. To our knowledge, this is the largest study to date to examine a comprehensive range of participant characteristics as potential correlates of drug therapy among older high-risk adults residing in the community.

**METHODS**

The sample included 48,689 home care clients aged ≥65 years from all 42 Community Care Access Centres (CCACs) across the province of Ontario, Canada. CCACs are local agencies established to coordinate public access to government-funded home and community services and long-term care facilities. Clients’ health and functional data are available from comprehensive intake assessments conducted by trained home care case managers (primarily nurses) between February and July of 2004. The data are from the Resident Assessment Instrument for Home Care (RAI-HC), recently mandated in 2002 for clinical use among all adult Ontario home care clients expected to be receiving services for ≥ 60 days. Research using this data set was possible through a data sharing agreement between the Ontario Ministry of Health and Long Term Care and interRAI (represented by Dr. Hirdes). Ethics approval for secondary analyses of these anonymized data was provided by The University of Waterloo Office of Research.

The RAI-HC tool provides a standardized assessment of clients’ sociodemographic, physical, and cognitive status; psychological and health conditions; formal and informal service use; and use of prescription and over-the-counter drugs. The reliability and validity of the tool have been previously established (25,26).

The RAI-HC tool includes diagnostic items for assessing the presence of hip fracture, other fracture (i.e., fractures at sites other than the hip), and osteoporosis. Prevalent fractures were defined as those that had either resulted in a hospitalization (in the last 90 days) or currently required monitoring, treatment, or symptom management by home care staff. Medication information is directly transcribed from medication containers and includes all prescribed and over-the-counter therapeutic products used by the client in the past 7 days. Treatment coverage was examined for calcium and vitamin D (minimal therapy) and/or any of the anti-osteoporotic prescription therapies approved for use in 2004, including etidronate, alendronate, risedronate, HRT, raloxifene, and calcitonin. Patients taking one of the prescription therapies used primarily for osteoporosis (a bisphosphonate, raloxifene, or calcitonin), but without a recorded diagnosis of osteoporosis or prevalent fracture \( (n = 2138) \), were also included in the analyses (i.e., combined with the osteoporosis diagnosis–no fracture group), given that osteoporosis is the primary indication for these agents (8). Whereas it is unlikely that prevalent fractures would have been underreported, documentation of the diagnosis of osteoporosis may have been missed in selected cases.

Sociodemographic, health, and functional variables assessed as potential correlates of treatment included age, sex, marital status, education, living arrangements, communication problems, confinement to wheelchair or bed, recent falls (in the past 90 days), comorbidity, prognosis of < 6 months to live, number of and nonadherence with prescribed medications. Nonadherence was coded as positive for clients who were judged to have deviated from their prescribed medication regimen > 20% of the time (in the last week) based on self-report and a medication review. Our analyses also included four health index measures previously developed and validated for use with the RAI-HC tool: (i) the Activities of Daily Living (ADL) self-performance hierarchy scale (range 0–6) (27); (ii) the Changes in Health, End-stage disease and Symptoms and Signs (CHESS) score (range 0–5) (28); (iii) the Cognitive Performance Scale (CPS) score (range 0–6) (29); and (iv) the Depression Rating Scale (DRS) (range 0–14) (30). Higher scores are all indicative of more severe impairment. For the ADL and CPS scales, a cut point of 2 was used (at least mild impairment) and a cut point of 3 was used for the DRS (indicating at least mild to moderate depressive symptoms) (30).

Descriptive statistics were calculated, and prevalence estimates of pharmacotherapy for osteoporosis among clients with a diagnosis of osteoporosis and/or fracture were reported. Although not specific to osteoporosis or fractures, the RAI-HC tool also includes items regarding the scheduling and use of special therapies (e.g., exercise therapy [ET], occupational therapy [OT], and physical therapy [PT]) in the last 7 days. Descriptive estimates of the proportion of clients receiving (or scheduled to receive) ET, OT, and/or PT, with or without concurrent drug therapy, were provided according to clients’ indication(s) for osteoporosis treatment to explore potential nonpharmacological interventions. However, given the absence of data on therapeutic indication and concerns that such therapies may primarily reflect short-term rehabilitation interventions in the home care setting, they were not included as “osteoporosis treatments” in our multivariate analyses.

Associations between selected correlates and osteoporosis treatment were examined among two subgroups of clients: (i) those with a recorded diagnosis of osteoporosis (or without a diagnosis but receiving a bisphosphonate, raloxifene, or calcitonin) and no fractures, and (ii) those with a prevalent fracture (with or without a recorded diagnosis of osteoporosis). Bivariate associations were examined using unadjusted odds ratios, 95% confidence intervals, and Fisher’s exact test. Variables significant at \( p \leq .05 \) were considered as candidates for inclusion in the multivariable analyses. For correlated variables, inclusion in subsequent multivariable analyses was based on previous research findings, clinical relevance, and stratified analyses. Selected variables were then examined in multivariable analyses using logistic regression models with backward elimination. Education was excluded from the final analyses because of a high rate of missing values (see Table 1) and because the inclusion of alternate coding versions for this variable (e.g., allowing types of missing data to represent dummy variables) did not alter the findings for our final models. All analyses were performed using the SAS version 9.1 software packages (SAS Institute Inc., Cary, NC).

**RESULTS**

A total of 15,718 (32%) home care clients had a recorded diagnosis of osteoporosis and/or prevalent fracture (Table 1).
An estimated 20.5% of clients had a diagnosis of osteoporosis but no fractures, 11.8% had a prevalent fracture, and 5.1% had a prevalent hip fracture. Among the 15,718 clients, the mean age was 82.4 years (82.5 and 81.3 years for women and men, respectively), and the majority were female, widowed, and lived in private homes. At least some level of cognitive and functional (ADL) impairment was reported for about 30% and 20% of this sample, respectively, and 11% had clinically significant depressive symptoms. Almost two-thirds had three or more comorbid conditions and some indication of health instability. Approximately 30% had experienced a fall in the past 90 days, and > 50% were using nine or more medications.

Functional (ADL) impairment, confinement to a wheelchair or bed, and recent falls were significantly more common among clients with a prevalent fracture (27%, 12.3%, and 42.6%, respectively) than among clients with a recorded diagnosis but no fractures (19.4%, 6.9%, and 26.2%, respectively; \(p < .05\)). Factors associated with previous falls (e.g., unsteady gait and fear of falling) were also more prevalent among clients with any prevalent fracture (e.g., 64% and 51% vs 57% and 44% among clients with a diagnosis but no fracture; data not shown).

Approximately 59% of clients with a diagnosis of osteoporosis alone were receiving pharmacotherapy for osteoporosis (Table 2). Among those with a prevalent fracture (hip or other), approximately 27% were receiving drug therapy, regardless of osteoporosis diagnosis. An estimated 14% of clients with a hip or other fracture, but no diagnosis of osteoporosis, were receiving drug treatment. Of clients with a diagnosis of osteoporosis and/or fracture who were receiving therapy, most (82%) were treated with a bisphosphonate (i.e., 39% of the total group) (Figure 1). An estimated 4% of the total received two or more of the recommended therapies (i.e., approved drugs, calcium with vitamin D). Few patients were treated with calcium with vitamin D (2%), HRT (1%), calcitonin (1%), or raloxifene (1%) alone. An additional 13% of clients were taking a multivitamin and/or calcium supplements.

Clients with a prevalent hip or other fracture were more likely to receive ET, OT and/or PT compared with clients with a recorded diagnosis of osteoporosis only (28%, 24%,

Table 1. Distribution of Demographic and Health Characteristics Among Older Home Care Clients in Ontario, by Indication(s) for Treatment

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Clients With Diagnosis of Osteoporosis* and/or Fracture N = 15,718</th>
<th>Clients With Osteoporosis only N = 9982</th>
<th>Clients With Any Fracture N = 5736</th>
<th>Clients With Hip Fracture N = 2468</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age mean (SD)</td>
<td>82.4 (7.1)</td>
<td>82.3 (7.0)</td>
<td>82.6 (7.2)</td>
<td>83.6 (7.0)</td>
</tr>
<tr>
<td></td>
<td>65–74 y</td>
<td>16.4 (2583)</td>
<td>16.6 (1660)</td>
<td>16.1 (923)</td>
</tr>
<tr>
<td></td>
<td>75–84 y</td>
<td>48.1 (7564)</td>
<td>48.5 (4850)</td>
<td>47.3 (2174)</td>
</tr>
<tr>
<td></td>
<td>85+ y</td>
<td>35.4 (5571)</td>
<td>34.7 (3472)</td>
<td>36.6 (2099)</td>
</tr>
<tr>
<td>Sex (female)</td>
<td>86.9 (13,655)</td>
<td>90.4 (9021)</td>
<td>80.8 (4634)</td>
<td>81.5 (2012)</td>
</tr>
<tr>
<td>Widowed</td>
<td>62.4 (9802)</td>
<td>63.3 (6318)</td>
<td>60.7 (3484)</td>
<td>62.7 (1547)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>40.3 (6328)</td>
<td>40.7 (4065)</td>
<td>39.5 (2263)</td>
<td>38.5 (951)</td>
</tr>
<tr>
<td>Private home (alone)</td>
<td>44.4 (6917)</td>
<td>45.2 (4476)</td>
<td>43.0 (2441)</td>
<td>40.0 (976)</td>
</tr>
<tr>
<td>Living arrangement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private home (with others)</td>
<td>46.1 (7179)</td>
<td>45.8 (4542)</td>
<td>46.4 (2637)</td>
<td>45.9 (1120)</td>
</tr>
<tr>
<td>Lodge/Residential care facility</td>
<td>9.6 (1493)</td>
<td>9.0 (893)</td>
<td>10.6 (600)</td>
<td>14.1 (343)</td>
</tr>
<tr>
<td>Cognitive impairment (CPS score 2+)</td>
<td>37.5 (4315)</td>
<td>27.4 (2735)</td>
<td>27.5 (1580)</td>
<td>30.1 (744)</td>
</tr>
<tr>
<td>Depression (DRS 3+)</td>
<td>11.0 (1731)</td>
<td>11.1 (1110)</td>
<td>10.8 (621)</td>
<td>9.6 (236)</td>
</tr>
<tr>
<td>ADL impairment, (ADL score 2+)</td>
<td>22.2 (3481)</td>
<td>19.4 (1933)</td>
<td>27.0 (1548)</td>
<td>30.0 (741)</td>
</tr>
<tr>
<td>Communication problems</td>
<td>8.9 (1392)</td>
<td>6.9 (685)</td>
<td>12.3 (707)</td>
<td>16.3 (402)</td>
</tr>
<tr>
<td>Health instability (CHESS score 1+)</td>
<td>65.1 (10,224)</td>
<td>63.4 (6331)</td>
<td>67.9 (3893)</td>
<td>63.9 (1578)</td>
</tr>
<tr>
<td>Prognosis of &lt; 6 mo to live</td>
<td>0.71 (112)</td>
<td>0.62 (62)</td>
<td>0.87 (50)</td>
<td>0.73 (18)</td>
</tr>
<tr>
<td>Fall(s) in past 90 d</td>
<td>32.2 (5057)</td>
<td>26.2 (2614)</td>
<td>42.6 (2464)</td>
<td>40.0 (988)</td>
</tr>
<tr>
<td>No. of comorbid conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–2</td>
<td>35.5 (5577)</td>
<td>35.5 (3548)</td>
<td>35.4 (2029)</td>
<td>37.2 (918)</td>
</tr>
<tr>
<td>3–5</td>
<td>52.4 (8238)</td>
<td>53.2 (5313)</td>
<td>51.0 (2925)</td>
<td>49.8 (1230)</td>
</tr>
<tr>
<td>6+</td>
<td>12.1 (1903)</td>
<td>11.2 (1121)</td>
<td>13.6 (782)</td>
<td>13.0 (320)</td>
</tr>
<tr>
<td>No. of medications (9+)</td>
<td>51.7 (8127)</td>
<td>53.9 (5376)</td>
<td>48.0 (2751)</td>
<td>45.9 (1133)</td>
</tr>
<tr>
<td>Nonadherent with prescribed medications</td>
<td>8.2 (1284)</td>
<td>8.3 (821)</td>
<td>8.1 (463)</td>
<td>7.3 (180)</td>
</tr>
</tbody>
</table>

Notes: Estimates are % (n) unless otherwise indicated.

*Also includes the 2138 clients on treatment (bisphosphonate, raloxifene, or calcitonin) who did not have a recorded diagnosis or prevalent fracture.

Variables with missing values > 10 in diagnosed sample: education (missing = 1531); living arrangement (missing = 129); nonadherence (missing = 66). SD = standard deviation; CPS = Cognitive Performance Scale; DRS = Depression Rating Scale; ADL = Activities of Daily Living Hierarchy Scale; CHESS = Changes in Health, End-stage disease and Symptoms and Signs.
and 13%, respectively). Estimates for the receipt of special therapies without concurrent drug therapy were lower for each of these client subgroups (16% for hip fracture, 15% for other fracture, and 5% for osteoporosis alone).

For both subgroups, treatment coverage was significantly lower among clients with three or more comorbid conditions, health instability, fewer than nine medications, functional (ADL) impairment, and depressive symptoms and among clients who were widowed (Table 3). An increasing number of comorbidity conditions was a particularly strong correlate of the absence of pharmacotherapy for both subgroups. Among clients with a diagnosis alone, treatment was more likely among those with cognitive impairment but less likely among those confined to a wheelchair or bed. Men with a prevalent fracture were significantly less likely to receive treatment, particularly in the absence of an osteoporosis diagnosis (p = .02 for interaction term).

**Discussion**

In this large study of older home care clients, 59% of those with a recorded diagnosis of osteoporosis but no fractures were receiving any approved drug therapy, a slightly higher percentage than that reported in a previous investigation (16). Of concern in view of current treatment guidelines is the finding that only 14% of clients with a hip or other fracture, but no charted diagnosis of osteoporosis, were receiving pharmacotherapy. This estimate is lower than previous estimates (approximately 50% for hip and 28% for other fractures) observed for older home care clients in the province of Alberta (16). This result may be attributable to provincial differences in access to osteoporosis therapies. In both provinces, etidronate is the only osteoporosis drug not subject to restricted access. However, the Ontario requirements for access to drugs with higher levels of evidence for efficacy are more stringent than the requirements in Alberta (31,32). Etidronate may be prescribed less often given the limited data showing fracture prevention efficacy compared with newer agents (8). Utilization of calcium and vitamin D was low in both provinces (2% and 6% of older clients in Ontario and Alberta, respectively). Although an additional 13% of clients in our Ontario sample were receiving calcium and/or a multivitamin, antifracture efficacy has not been demonstrated for calcium alone (i.e., without vitamin D), and multivitamins may not contain calcium and vitamin D in adequate doses.

Evaluation of nonpharmacological interventions was limited to special therapies assessed with the RAI-HC which are typically implemented for short-term rehabilitation (e.g., ET, OT, and PT). Relatively few older clients in the various subgroups received or were scheduled to receive these therapies alone (i.e., without concurrent approved drug therapy). About 17% of clients with hip or other fracture without a diagnosis received these therapies alone, and this estimate was lower in the presence of a diagnosis of osteoporosis. Although indication was not available, these preliminary findings argue against a substitution effect of nonpharmacological therapies in place of drug therapy and further highlight the elevated vulnerability of high risk clients to potential undertreatment and adverse health outcomes.

Given that a previous fracture is the strongest predictor of future fractures (8), one might have expected to see greater

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Table 2. Indication(s) for Treatment of Osteoporosis and Proportion Receiving Drug and/or Other Therapies Among Older Home Care Clients in Ontario

<table>
<thead>
<tr>
<th>Indication</th>
<th>Total</th>
<th>Receiving Drug Therapy*</th>
<th>Receiving ET, OT, and/or PT</th>
<th>Receiving ET, OT and/or PT, But No Drug Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (N) of Sample With Indication</td>
<td>% (N) of Sample With Indication</td>
<td>% (N) of Sample With Indication</td>
<td>% (N) of Sample With Indication</td>
</tr>
<tr>
<td>Osteoporosis† alone, without fracture</td>
<td>20.5 (9982)</td>
<td>59.3 (5916)</td>
<td>13.3 (1235)</td>
<td>4.9 (491)</td>
</tr>
<tr>
<td>Hip fracture and osteoporosis</td>
<td>1.8 (884)</td>
<td>49.1 (434)</td>
<td>30.2 (267)</td>
<td>12.8 (113)</td>
</tr>
<tr>
<td>Hip fracture—no osteoporosis</td>
<td>3.3 (1584)</td>
<td>14.1 (223)</td>
<td>26.1 (414)</td>
<td>17.6 (279)</td>
</tr>
<tr>
<td>Hip fracture total</td>
<td>5.1 (2468)</td>
<td>26.6 (657)</td>
<td>27.6 (681)</td>
<td>15.9 (392)</td>
</tr>
<tr>
<td>Other fracture and osteoporosis</td>
<td>2.3 (1120)</td>
<td>53.7 (601)</td>
<td>23.5 (263)</td>
<td>9.9 (111)</td>
</tr>
<tr>
<td>Other fracture—no osteoporosis</td>
<td>4.4 (2148)</td>
<td>14.6 (314)</td>
<td>24.8 (532)</td>
<td>17.4 (373)</td>
</tr>
<tr>
<td>Other fracture total</td>
<td>6.7 (3268)</td>
<td>28.0 (915)</td>
<td>24.3 (795)</td>
<td>14.8 (484)</td>
</tr>
<tr>
<td>Total osteoporosis and/or fracture†</td>
<td>32.3 (15,718)</td>
<td>47.6 (7488)</td>
<td>17.8 (2801)</td>
<td>8.7 (1367)</td>
</tr>
</tbody>
</table>

**Notes:** *Drug therapy includes one or more of the following: calcium with vitamin D, bisphosphonate, hormone replacement therapy, calcitonin, raloxifene.*

†Includes clients with a recorded diagnosis of osteoporosis and 2138 clients on treatment (bisphosphonate, raloxifene, or calcitonin) who did not have a recorded diagnosis or prevalent fracture.

ET = exercise therapy; OT = occupational therapy; PT = physical therapy.
variation in the correlates of drug therapy between our two client subgroups. However, the majority of factors associated with treatment coverage were similar for clients with a diagnosis of osteoporosis (but no fracture) and for clients with a prevalent fracture (with or without a diagnosis). For both groups, lower treatment was observed among clients with higher levels of comorbidity, functional impairment, and health or clinical instability. Older adults frequently have multiple chronic conditions. If one disease dominates the practitioner’s attention, there may be undertreatment of other prevalent conditions (33). Unfortunately, the cross-sectional nature of our study does not permit us to determine whether undertreatment leads to functional limitations or whether functional limitations lead to a decision not to treat osteoporosis.

Conversely, the use of nine or more medications was associated with higher treatment coverage among both client subgroups. Although this may be an indication of greater financial resources (e.g., additional insurance coverage) and health care access available to the older individual, it may also reflect, to a larger degree, the role of physician prescribing practices. This finding also raises a potential concern that some older adults may be at an increased risk for inappropriate treatment and/or subsequent nonadherence because of their complex medication regimens. Physicians need to remain cautious in weighing the expected benefits of any new drug therapy with the potential risks that accompany polypharmacy.

In addition to the role of physician prescribing practices, some of the associations observed in this study may illustrate the relative importance of patient-directed behaviors. Recent publications (34,35) have demonstrated high rates of nonadherence with osteoporosis therapy (approximately 50% at 1 year after initiating therapy). This may explain our finding of lower treatment coverage among clients with depressive symptoms and among those who were widowed. Depression is an important predictor of medication nonadherence (36,37) and is likely to be more prevalent among clients who have lower social support and who may be faced with increased barriers to appropriate health care access. Conversely, greater adherence may explain our finding of higher treatment coverage among clients with a diagnosis of osteoporosis and cognitive impairment. Not only is cognitive impairment a major risk factor for injurious falls (38), we have previously found it to be associated with an increased likelihood of assistance with medication administration (e.g., by family and care providers) and adherence (37). Although we attempted to adjust for nonadherence, the adherence measure available with the RAI-HC is not specific to osteoporosis therapy.

Among clients with a diagnosis of osteoporosis alone, pharmacotherapy was significantly less likely among those who were confined to a wheelchair or bed. Although the risk for falls may be lower among nonambulatory clients, a substantial number may still fall, particularly if they are able to self-transfer (39) and fail to exercise good judgment. The under-recognition of a persisting fall risk among these older adults may place them at even greater risk for fall-related fractures.
Among clients with a prevalent fracture, lower treatment coverage was also observed among clients younger than 75 years or 85 years of age and older and among men, particularly those without a coexisting diagnosis of osteoporosis. Several previous studies have reported lower treatment rates among men (14,15,17). Our findings suggest that observed sex differences in osteoporosis treatment may reflect a failure to appropriately diagnose osteoporosis in men, rather than undertreatment after a clinical diagnosis has been established. Osteoporosis has long been characterized as a women’s disease, thus this finding is not surprising. Previous findings regarding age have been inconsistent (17). In Ontario, age > 75 years is one of three clinical criteria for access to the restricted osteoporosis therapies (32), a factor which may result in undertreatment of younger clients.

Some limitations of this study must be addressed. It was not possible to differentiate between fragility and traumatic fractures, which may have resulted in an underestimate of treatment coverage. Although currently under debate, BMD results were also not available to us; consequently, their influence on treatment decisions could not be examined. Yet, a strong argument may be made that the fractures examined in this older home care sample (many of whom were women with prevalent risk factors for falls) carry with them such a strong likelihood of the diagnosis of osteoporosis that treatment is warranted. Approximately 90% of hip and vertebral fractures and 50% of fractures at other sites have been attributable to osteoporosis (40). Given our focus on pharmacotherapy and the limited data available on the use of other therapies (e.g., ET), additional efforts are needed to explore the prevalence and consequences of non-pharmacological options for seniors at high risk for fragility fractures. Recent studies, including a randomized controlled trial illustrating the benefits of weight-bearing exercise on balance and strength among older women at high-risk for fractures (41), suggest some promising avenues in this regard.

Conclusion

Physicians often face difficult treatment decisions among older populations with failing health and may not initiate osteoporosis therapy to minimize polypharmacy. However, effective osteoporosis therapies are available, and should normally be offered to persons at high risk for fractures. Educational interventions emphasizing the recognition of osteoporosis in men and fracture risk in vulnerable older adults are needed, and may also improve adherence to clinical practice guidelines (8). Enhanced patient involvement, such as providing patients (and their caregivers) with BMD results and information on risk factors, could also play a role in improving treatment. However, caution is required regarding an over-reliance on BMD as a diagnostic tool as it may lead to poorer treatment for patients at higher risk. Modifications to drug formularies could improve access to osteoporosis therapies with better evidence of efficacy in preventing fractures. Strategies should also be undertaken to increase awareness of the potential benefits of calcium and vitamin D (8,9), which could be implemented as “minimal therapy” when polypharmacy is a concern and/or when patients are reluctant to initiate pharmacotherapy.

Acknowledgments

Dr. Maxwell is funded by a New Investigator Award from the Canadian Institutes of Health Research (CIHR)—Institute on Aging and a Health Scholar Award from the Alberta Heritage Foundation for Medical Research (AHFMR). Shelly Vik is currently a PhD candidate (Epidemiology) and is funded by the Alberta Provincial CIHR Training Program in Bone and Joint Health. Dr. Hogan holds the Brenda Strafford Foundation Chair in Geriatric Medicine and the chair provides financial support to both Drs. Hogan and Maxwell. Micaela Jantzi, Jeff Poss, and Dr. Hirdes acknowledge the Primary Health Care Transition Fund, in part, for financial support. Dr. Hirdes’s participation was supported by a CIHR Investigator Award. We also thank Dr. Michael Eliaziw for consulting on the statistical analyses.

Preliminary findings from this study were presented in an oral presentation at the Annual Conference of the Canadian Association for Population Therapeutics and the 2nd Canadian Therapeutics Congress, Vancouver BC, April 13-19, 2005, and published as an abstract: Can J Clin Pharmacol. 2005;12(1):e43.

Competing interests for David A. Hanley include consultancies with, for example, speakerships and/or participation in research or trials, the following companies or organizations: Amgen, Astra-Zeneca, Aventis, the Dairy Farmers of Canada, Eli Lilly, Merck, Novartis, NPS Pharmaceuticals, Pfizer, Procter and Gamble, Roche, and Wyeth. David B. Hogan has participated in drug studies sponsored by Janssen Ortho, Neurochem, Novartis, and Pfizer. He has given sponsored presentations for Merck, Novartis, and Pfizer.

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Received April 7, 2006
Accepted October 26, 2006
Decision Editor: Luigi Ferrucci, MD, PhD