

Osteoporosis prescribing trends in primary care: a population-based retrospective cohort study

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Background: Osteoporosis is a highly prevalent and costly disease associated with aging. Previous studies have indicated low intervention rates in primary care; however, there is little research investigating the prescribing patterns of osteoporosis medications by primary-care physicians. **Methods:** We conducted a population-based retrospective cohort study to examine trends in osteoporosis medication utilization in primary care between 1 January 2000 and 31 December 2009 in Ontario, Canada. All Ontario residents aged 65 years or older and eligible for public health coverage were included in the analysis (~1.46 million residents in 2000, ~1.75 million residents in 2009). **Results:** Analysis of 10-year data indicates a trend toward higher utilization of osteoporosis medications among elderly primary-care patients. In 2000, 100 038 unique patients were prescribed an osteoporosis medication by a family physician; by 2009, this number increased to 301 679. Age-group analyses suggest an inverted U-shaped pattern, whereby utilization rates increase with advancing age and then decline for the oldest age groups. Utilization rates were the lowest for the 100+ age group. **Conclusions:** This study indicates increased utilization of osteoporosis-related medications among elderly primary-care patients over a recent 10-year time period. It is unclear whether the observed increase in utilization is due to higher rates of osteoporosis. Further research is needed to determine the appropriateness of this higher utilization.

Keywords: bisphosphonates; family physician; osteoporosis; primary care

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Introduction

Osteoporosis is a highly prevalent and costly disease associated with advancing age. Over 75 million people worldwide are affected, and in any given year there are more than nine million instances of osteoporotic fractures, making it the

fourth most significant noninfectious disease after cardiovascular disorders, cancer, and diabetes (European Foundation For Osteoporosis (EFFO) and National Osteoporosis Foundation (NOF), 1997). Although perceived to be a disease primarily affecting older women, the disease burden is also significant in older men. Although women are more prone to osteoporotic fractures, the mortality rate associated with fractures is higher in men (Guggenbuhl, 2009).

Previous studies have demonstrated that available medications may slow the progress of osteoporosis

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and reduce the risk of fracture (Harris, 2001; McClung *et al.*, 2001; Hodsman *et al.*, 2002; Black *et al.*, 2007). Despite the accumulating evidence of efficacy, a recent review of osteoporosis management indicated that intervention rates remain low, which raises concerns about underinvestigation, underdiagnosis, and undertreatment (Manek, 2010). Perhaps most concerning is that the consistently low intervention rates persist even among those patients who have suffered a previous fragility fracture.

Primary-care physicians are responsible for the majority of osteoporosis medication prescriptions; however, previous research has suggested that confusion exists among these providers, regarding how best to manage osteoporosis (Jaglal *et al.*, 2003). Significant knowledge gaps are known to exist in the medical management of osteoporosis (Taylor *et al.*, 2001). A recent study in the Australian primary-care setting confirms this to be a continuing problem, with low rates of osteoporosis medication prescription in primary care, even in those patients with a previous fracture or other identified risk factors (Chen *et al.*, 2009). This pattern of evidence emphasizes the need for further exploration of barriers to osteoporosis management in the primary-care setting.

Indeed, given the increasing prevalence of osteoporosis in an aging population and the associated burden of disease, it is important to understand current trends in osteoporosis medication utilization. To the best of our knowledge, there have been no population-level studies of prescribing trends of osteoporosis medications in primary care. Thus, the objective of the present study was to investigate recent trends in the utilization of osteoporosis medications among primary-care patients aged 65 years and above in Ontario, Canada.

Methods

Study design

We conducted a population-based retrospective cohort study to examine annual trends in osteoporosis medication utilization in the Ontario primary-care setting. The study period was from 1 January 2000 to 31 December 2009. All Ontario adults aged 65 years and above were included

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in the analysis. Ethics approval for this study was received from the Research Ethics Board at Sunnybrook Health Sciences Centre in Toronto, Canada.

Administrative data sources

Three administrative data sources were used in the analysis: (1) the Ontario Drug Benefit (ODB) prescription claims database, (2) the Institute for Clinical Evaluative Sciences Physician Database (IPDB), and (3) the Ontario Registered Persons Database (RPDB). The ODB database includes data on all prescription medications dispensed to patients aged 65 years and above in Ontario, including the unique encrypted patient health-card number, the type of drug dispensed, the unique Drug Information Number (DIN), the date the prescription was filled, the quantity of the drug dispensed, and the physician ID of the prescriber. The IPDB contains information about all licensed physicians in Ontario, including physician specialty and physician ID. The RPDB contains demographic information about all Ontario health-card holders, including the identifying encrypted patient health-card number.

Validated algorithms were used to link the three administrative databases. To obtain patient demographic information (ie, age and sex), the ODB database was linked to the RPDB via encrypted patient health-card number. To isolate the family physicians among all prescribers, the ODB claims were linked to the IPDB via physician ID.

Data analysis

The ODB database was used to identify osteoporosis medication claims prescribed by family physicians between 1 January 2000 and 31 December 2009. Claims were identified as osteoporosis medications via the unique DIN in the ODB database. The specific osteoporosis medication categories analyzed in this study were bisphosphonates and selective estrogen receptor modulators. Claims without valid health-card numbers were excluded from the analysis.

The percentage of Ontarians aged 65 years and above who had at least one osteoporosis prescription from a family physician was analyzed by age group and sex. Population denominators for overall rates were obtained from Statistics

Canada census data; intercensal estimates based on 2001 and 2006 census data were used. Rates by age group were calculated using population estimates from the RPDB. All statistical analyses were performed using SAS for UNIX (v 9.1).

Results

Figure 1 presents annual rates of osteoporosis medication use among older Ontarians. Rates are higher for women than for men. For both sexes,

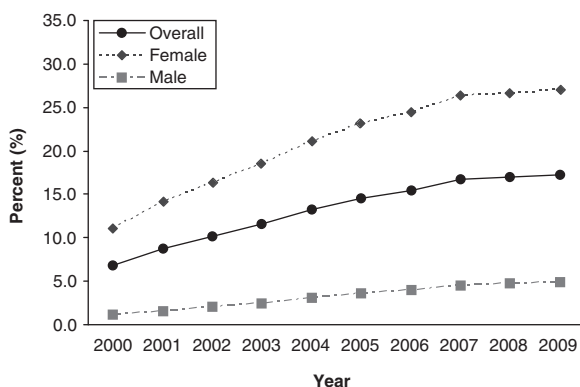


Figure 1 Ten-year trends in the percentage of older adults aged 65+ who had at least one osteoporosis prescription from a family physician in Ontario, Canada

utilization rates increased in each successive year across the 10-year study period. From 2007 onward, the annual rate of increase has slowed down and appears to have stabilized in recent years. This pattern holds true for both sexes, although the increase in utilization is steeper for women. In 2000, 11% of women aged 65 years and above used osteoporosis medication; by 2009, utilization had increased to 27%. For men, the utilization rate increased from 1% in 2000 to 5% in 2009.

Table 1 indicates age-specific utilization rates of osteoporosis medication for men and women across the 10-year study period. From 2000 to 2009, observed rates increased with age for both sexes. For all age groups, utilization was higher among women than among men. Among women, in the year 2000, the utilization rate peaked at 11.3% (in the 75–79 age group) and then began declining for those aged 80 years and older. By 2009, the highest observed rate was 29% in the 80–84 age group. Among men, in the year 2000, utilization peaked at 1.8% in the 85–89 age group and then began declining for those aged 90 years and older. In 2009, the highest utilization rate was 7.7% (again, in the 85–89 age group). For both men and women, and across all years of the study period, utilization rates were lowest in the 100+ age group.

Table 1 Age- and sex-specific ten-year trends in the percentage of older adults aged 65+ who had at least one osteoporosis prescription from a family physician in Ontario, Canada

| Age group | 2000 (%) | 2001 (%) | 2002 (%) | 2003 (%) | 2004 (%) | 2005 (%) | 2006 (%) | 2007 (%) | 2008 (%) | 2009 (%) |
|----------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Females | | | | | | | | | | |
| 65–69 | 8.7 | 11.1 | 12.8 | 14.0 | 15.5 | 16.7 | 17.4 | 19.1 | 18.9 | 18.7 |
| 70–74 | 10.8 | 13.6 | 15.6 | 17.5 | 19.7 | 21.2 | 22.2 | 23.7 | 23.6 | 23.7 |
| 75–79 | 11.3 | 14.5 | 16.9 | 19.3 | 22.0 | 23.9 | 25.3 | 26.8 | 27.2 | 27.4 |
| 80–84 | 10.2 | 13.5 | 16.6 | 19.2 | 22.1 | 24.6 | 26.0 | 28.0 | 28.5 | 29.0 |
| 85–89 | 9.6 | 12.9 | 15.5 | 18.3 | 21.9 | 24.2 | 25.8 | 27.2 | 27.8 | 28.5 |
| 90–94 | 6.8 | 9.5 | 12.3 | 14.9 | 17.8 | 20.2 | 21.9 | 23.6 | 24.7 | 25.3 |
| 95–99 | 3.8 | 5.3 | 7.7 | 9.4 | 11.6 | 13.5 | 14.8 | 15.9 | 16.5 | 16.8 |
| 100+ | 0.9 | 1.5 | 2.2 | 2.8 | 3.4 | 4.1 | 4.7 | 4.4 | 4.2 | 3.8 |
| Males | | | | | | | | | | |
| 65–69 | 0.7 | 0.9 | 1.1 | 1.3 | 1.5 | 1.8 | 2.0 | 2.3 | 2.3 | 2.3 |
| 70–74 | 0.9 | 1.3 | 1.7 | 2.0 | 2.5 | 2.8 | 3.0 | 3.5 | 3.6 | 3.7 |
| 75–79 | 1.3 | 1.8 | 2.2 | 2.7 | 3.4 | 3.9 | 4.3 | 4.9 | 5.1 | 5.2 |
| 80–84 | 1.5 | 2.1 | 2.8 | 3.5 | 4.3 | 5.0 | 5.5 | 6.1 | 6.4 | 6.7 |
| 85–89 | 1.8 | 2.6 | 3.3 | 4.0 | 5.0 | 5.7 | 6.4 | 7.0 | 7.5 | 7.7 |
| 90–94 | 1.5 | 2.3 | 2.9 | 3.7 | 4.8 | 5.5 | 6.2 | 6.7 | 6.9 | 7.2 |
| 95–99 | 0.8 | 1.7 | 2.4 | 2.5 | 3.3 | 3.6 | 3.4 | 4.4 | 4.6 | 4.4 |
| 100+ | 0.3 | 0.3 | 0.8 | 1.0 | 1.1 | 0.8 | 0.6 | 1.0 | 0.9 | 0.8 |

Discussion

Our study indicates significant increases in the utilization of osteoporosis medications among elderly primary-care patients over a recent 10-year time period in Ontario, Canada. From 2000 to 2007, the annual rate showed a marked annual increase, after which the rate of increase slowed and then appeared to have stabilized in recent years. Age-specific rates indicate an inverted U-shaped utilization pattern, whereby medication utilization rates increased with advancing age and then declined for the oldest age groups. For all age groups, utilization was higher among women than men. For both sexes, rates were lowest for the 100+ age group.

There is considerable evidence that osteoporosis medications are effective in the prevention of osteoporosis-related fractures and the treatment of osteoporosis (Harris *et al.*, 1999; Chesnut *et al.*, 2004; Cadarette *et al.*, 2008; Siris *et al.*, 2009; Siris *et al.*, 2011). During the present study period, the 2002 Canadian clinical practice guidelines were in effect. These guidelines recommended bisphosphonates as the first-line treatment for the management of osteoporosis (Brown and Josse, 2002). Studies have indicated that prescriptions for bisphosphonates increased dramatically during this period, both in Canada and in other countries (Jaglal *et al.*, 2005; Huot *et al.*, 2008; Hollingworth *et al.*, 2010), which is consistent with the utilization patterns presented here. At the same time, however, our data suggest that utilization rates in Ontario have stabilized in recent years. Similar patterns have been reported for other Canadian provinces (Canadian Institute for Health Information, 2009). Given that the treatment of osteoporosis is still widely considered inadequate (Guggenbuhl, 2009; Leslie *et al.*, 2011), ongoing investigation of medication utilization patterns is warranted.

Although it is well known that the risk for osteoporosis increases with age, our findings indicate a marked decrease in medication use among the oldest age groups. For both sexes, rates were lowest in the 100+ age group. A possible explanation here is that time-to-benefit considerations are factoring into decisions regarding therapy initiation, which results in lower medication use among the oldest old. A recent study of US Medicare beneficiaries suggests that utilization of osteoporosis medications declines as the

likelihood of dying increases (Shaffer *et al.*, 2010). Another possible explanation is the healthy survivor effect, such that those surviving into the oldest age groups are generally healthier in relative terms.

Not surprisingly, we found that osteoporosis medication rates were significantly lower for male patients. Although osteoporosis is gaining attention as an important health problem in elderly men (Olszynski *et al.*, 2004), it continues to be perceived as a disease primarily affecting older women. Current Canadian estimates are that at least one in three women and one in five men will suffer from an osteoporotic fracture during their lifetime (Osteoporosis Canada, 2012). According to our data, however, in 2009, less than 5% of men aged 65 years and above filled a prescription for an osteoporosis medication. Both underdiagnosis and undertreatment could play an important role in explaining this discrepancy. Our data indicate that the medication utilization curve for men peaks at a higher age as compared with women. This may be explained by the fact that osteoporosis is often not identified in men until it has reached an advanced stage (Sawka *et al.*, 2004). Male patients are known to have poor knowledge about osteoporosis and do not perceive themselves to be susceptible to the disease (Burgener *et al.*, 2005; Solimeo, 2011). Importantly, this is compounded by the fact that clinicians significantly underestimate osteoporosis risk in men (Papaioannou *et al.*, 2008).

Notwithstanding concerns about undertreatment, the dramatic increase in rates of osteoporosis medication use among older adults observed here gives rise to competing concerns regarding patient safety. Recent research has shown that treatment with a bisphosphonate for more than five years was associated with an increased risk of subtrochanteric or femoral shaft fractures (Lenart *et al.*, 2009; Park-Wyllie *et al.*, 2011). As has been noted elsewhere, the balance of risks and benefits of bisphosphonate therapy remains unclear. Further research is needed to improve our current understanding of how many years osteoporosis medications should be taken in order to optimize the benefits while minimizing the risks (Seeman, 2009).

A major strength of the present study is the use of province-wide population-based data, which permits an analysis of utilization patterns across multiple specific age groups and across multiple years. To the best of our knowledge, there are no

other similar peer-reviewed studies examining population-level patterns of osteoporosis prescribing in the primary-care setting. It is important to note that the data utilized in this study were originally collected for administrative purposes, and therefore the specific indication for medication prescriptions was not available. The medications under investigation in this study can be prescribed for other indications (eg, breast cancer). In the present study, a diagnosis of osteoporosis was not confirmed for the patients included in our dataset; in future, this may become more feasible with enhanced linkages to electronic medical records. Another limitation of our study is that we do not have data for those medications that are not covered in ODB (eg, ibandronate) or for over-the-counter products that are recommended for osteoporosis prevention (eg, vitamin D and calcium supplements). Finally, prescription claims data indicate only the number of prescriptions filled, not whether those medications were actually taken as prescribed.

In summary, our analysis of utilization rates of osteoporosis medications among elderly primary-care patients in Ontario, Canada indicates dramatic increases between 2000 and 2007 and then a slower rate of increase in more recent years. It is unclear whether the observed increase in prescribing is due to higher rates of osteoporosis. Further research is needed to determine the appropriateness of current prescribing patterns. The revised 2010 Canadian guidelines represent a paradigm shift in the prevention and treatment of osteoporotic fractures, moving the focus from treating low bone mineral density to better identifying fragility fractures (Papaioannou *et al.*, 2010). Further research will be required to evaluate the impact of these new guidelines on the utilization of osteoporosis medications going forward.

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