

## Hip fracture prevention strategies in long-term care

### *A survey of Canadian physicians' opinions*

Anna M. Sawka MD PhD FRCPC Nofisat Ismaila Parminder Raina PhD Lehana Thabane PhD  
Sharon Straus MSc MD FRCPC Jonathan D. Adachi MD FRCPC Amiram Gafni PhD Alexandra Papaioannou MD FRCPC

#### ABSTRACT

**OBJECTIVE** To garner Canadian physicians' opinions on strategies to reduce hip fractures in long-term care (LTC) facilities, focusing on secondary prevention.

**DESIGN** A cross-sectional survey using a mailed, self-administered, written questionnaire.

**SETTING** Canada.

**PARTICIPANTS** Family physician members of the Ontario Long-Term Care Association (n=165) and all actively practising geriatricians registered in the Canadian Medical Directory (n=81).

**MAIN OUTCOME MEASURES** The strength of recommendations for fracture-reduction strategies in LTC and barriers to implementing these strategies.

**RESULTS** Of the 246 physicians sent the questionnaire, 25 declined study materials and were excluded. Of the 221 remaining, 120 responded for a response rate of 54%. About two-thirds of respondents were family physicians (78 of 120) and the rest were mostly geriatricians. Most respondents strongly recommended the following secondary prevention strategies for use in LTC after hip fracture: calcium, vitamin D, oral aminobisphosphonates, physical therapy, and environmental modification (such as handrails). Most respondents either did not recommend or recommended limited use of etidronate, intravenous bisphosphonates, calcitonin, raloxifene, testosterone (for hypogonadal men), and teriparatide. Postmenopausal hormone therapy was discouraged or not recommended by most respondents. Support was mixed for the use of hip protectors, B vitamins, and folate. Barriers to implementation identified by most respondents included a lack of strong evidence of hip fracture reduction (for B vitamins and folate, cyclic etidronate, and testosterone), side effects (for postmenopausal hormone therapy), poor compliance (for hip protectors), and expense (for intravenous bisphosphonates and teriparatide). Some respondents cited side effects or poor compliance as barriers to using calcium and potent oral bisphosphonates.

**CONCLUSION** Canadian physicians favour the use of calcium, vitamin D, potent oral bisphosphonates, physical therapy, and environmental modifications for LTC residents after hip fracture. Further study at the clinical and administrative levels is required to find ways to overcome the specific barriers to implementation and effectiveness of these interventions.

#### EDITOR'S KEY POINTS

- Approximately 2% to 6% of elderly nursing home residents sustain hip fractures, putting them at increased risk of death or another hip fracture within a year of the initial event; only 32% of affected patients regain long-term mobility. The economic and human costs of hip fractures sustained in long-term care (LTC) are considerable.
- Many interventions can reduce fracture risk; physicians with an interest in LTC were asked to identify preferred prevention strategies and barriers to their implementation.
- Participants believed that all LTC residents should be targeted with fracture prevention strategies, not only those at higher risk; strongly recommended interventions included calcium, vitamin D, potent oral bisphosphonates, physical therapy or exercise, and environmental modification.
- Barriers to implementation were intervention-specific and included side effect profiles, compliance with use and administration, costs, and lack of strong evidence for effectiveness.
- Funding programs to facilitate implementation of these strategies as part of routine care, drug development research to improve side effect profiles of pharmacotherapies, patient and administrator education to improve compliance, and further clinical research to identify effective strategies for reducing fracture risk are all required to improve outcomes in this relatively understudied population.

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# Stratégies pour prévenir les fractures de la hanche dans les soins de longue durée

Enquête pour connaître l'opinion des médecins canadiens

Anna M. Sawka MD PhD FRCPC Nofisat Ismaila Parminder Raina PhD Lehana Thabane PhD  
Sharon Straus MSc MD FRCPC Jonathan D. Adachi MD FRCPC Amiram Gafni PhD Alexandra Papaioannou MD FRCPC

## RÉSUMÉ

**OBJECTIF** Recueillir l'opinion de médecins canadiens sur les mesures susceptibles de réduire les fractures de la hanche dans les établissements de soins de longue durée (SLD), en insistant sur la prévention secondaire.

**TYPE D'ÉTUDE** Enquête transversale par questionnaire écrit auto-administré transmis par la poste.

**CONTEXTE** Le Canada.

**PARTICIPANTS** Médecins de famille membres de l'Ontario Long-Term Care Association (n=165) et tous les gériatres en pratique active inscrits au Canadian Medical Directory (n=81).

**PRINCIPAUX PARAMÈTRES À L'ÉTUDE** Le degré d'insistance pour recommander les mesures de réduction des fractures dans les SLD et les obstacles à l'implantation de ces mesures.

**RÉSULTATS** Sur les 246 médecins auxquels le questionnaire a été adressé, 25 se sont désistés et ont été exclus. Sur les 221 restants, 120 ont répondu, soit un taux de réponse de 54%. Les deux tiers environ des répondants étaient des médecins de famille (78 sur 120), les autres étant surtout des gériatres. La plupart des répondants recommandaient fortement d'instaurer les mesures de prévention secondaires suivantes dans les SLD après une fracture de la hanche : calcium, vitamine D, aminobisphosphonates oraux, physiothérapie et modifications de l'environnement (p. ex. mains courantes). La majorité des répondants ne recommandaient pas, ou recommandaient un usage limité d'etidronate, de bisphosphonates intraveineux, de calcitonine, de raloxifène, de testostérone (pour les hommes avec hypogonadisme) et de téraparatide. L'hormonothérapie postménopausique était découragée ou non recommandée par la plupart des répondants. L'utilisation de protecteurs de hanche, de vitamines B et de folate obtenait un certain appui. Pour la plupart des médecins, les obstacles à la mise en place des mesures comprenaient un manque de preuves solides pour une réduction des fractures de la hanche (pour les vitamines B, le folate, l'etidronate cyclique et la testostérone), les effets indésirables (pour l'hormonothérapie postménopausique), la faible observance (pour les protecteurs de hanche) et les coûts (pour les bisphosphonates intraveineux et le téraparatide). Certains répondants ont indiqué que les effets indésirables et la faible observance faisaient obstacle à l'utilisation du calcium et des bisphosphonates oraux.

**CONCLUSION** Les médecins canadiens favorisent l'usage de calcium, de vitamine D, de bisphosphonates oraux puissants, de physiothérapie et des modifications environnementales pour les résidents des SLD ayant subi une fracture de hanche. Il faudrait d'autres études aux niveaux clinique et administratif pour trouver des façons de vaincre les obstacles spécifiques qui gênent l'instauration et l'efficacité de ces mesures.

## POINTS DE REPÈRE DU RÉDACTEUR

- Entre 2 et 6% des résidents de centres d'hébergement pour personnes âgées subissent des fractures de hanche, ce qui entraîne un plus fort risque de décès ou d'une nouvelle fracture de la hanche dans l'année suivant le premier accident; seulement 32% de ces patients retrouvent une mobilité à long terme. Les conséquences économiques et humaines des fractures qui surviennent dans les établissements de soins de longue durée (SLD) sont considérables.
- Plusieurs mesures peuvent réduire le risque de fracture; on a demandé à des médecins intéressés aux soins de longue durée (SLD) d'indiquer les stratégies de prévention qu'ils préféreraient et les obstacles qui gênent leur application.
- Les participants estimaient que tous les résidents de ces établissements devraient être visés par les mesures de prévention des fractures, pas seulement les plus à risque; parmi les mesures les plus recommandées, mentionnons le calcium, la vitamine D, les bisphosphonates oraux puissants, la physiothérapie, l'exercice et les modifications de l'environnement.
- Les obstacles à l'implantation de ces mesures étaient spécifiques à chaque intervention et incluaient le profil des effets indésirables, le degré d'observance dans l'utilisation et l'administration, les coûts et le manque de preuves solides de l'efficacité.
- Financement de programmes visant l'intégration de ces mesures dans les soins habituels, recherche de nouveaux médicaments ayant moins d'effets indésirables, formation des patients et des administrateurs pour améliorer l'observance, et recherches cliniques additionnelles pour trouver des stratégies efficaces pour réduire le risque de fracture sont tous des éléments essentiels pour améliorer les issues dans cette population relativement peu étudiée.

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Each year, approximately 2% to 6% of elderly nursing home residents sustain hip fractures.<sup>1-15</sup> Elderly nursing home residents frequently have 1 or more risk factors for hip fracture, including frequent falls,<sup>4,10</sup> osteoporosis,<sup>1,11</sup> vitamin D insufficiency or deficiency,<sup>12</sup> and dementia (with associated falls).<sup>1</sup> Residents who sustain hip fractures are at increased risk of death<sup>16</sup> or of suffering another hip fracture<sup>16,17</sup> within a year of the initial event. Also, long-term mobility is recovered by only 32% of elderly long-term care (LTC) residents after hip fracture.<sup>18,19</sup> The average 1-year total health care cost for a hip fracture sustained by a single Ontario nursing home resident is estimated to be \$33 729.<sup>20</sup> Therefore, hip fractures in LTC facilities are an important concern, considering the human and economic costs.

There are many potential interventions intended to reduce fracture risk, yet those such as osteoporosis therapy are used by only about 9% to 25% of nursing home residents.<sup>21</sup> Our first objective was to identify preferred strategies for reducing hip fractures in LTC facilities, focusing on secondary prevention. Our target informants were physicians involved in clinical or administrative work related to LTC. Our second objective was to better understand physicians' perspectives on the barriers to implementation of fracture-prevention strategies in LTC. By identifying prevention preferences and barriers to implementation, we hope to shed some light on why such interventions might be underused.

## METHODS

### Study design and participants

We conducted a self-administered, written survey of all family physician members of the Ontario Long Term Care Association (n=165) and all actively practising Canadian geriatricians identified using the Canadian Medical Directory (n=81). A mailing list of all family physician members of the Ontario Long Term Care Association was obtained by an investigator (A.P.) who was a member of this organization. Geriatricians in active practice in Canada were identified using the MD Select online version of the Canadian Medical Directory. Geriatricians were sampled beyond the province of Ontario because we expected there would be an insufficient number of Ontario geriatricians for meaningful analysis.

### Questionnaire

An English-language questionnaire was developed by a multidisciplinary panel that included representatives from the fields of internal medicine, geriatrics, gerontology, endocrinology, rheumatology, and epidemiology. Participants were asked who should be targeted for hip fracture prevention strategies in LTC facilities (ie, all residents or only those at high risk of fracture), and

responses were collected using a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Participants were asked to consider the case of an 83-year-old woman transferred from hospital to an LTC facility after a hip fracture. For the case in question, respondents were to assume that the individual had never received any osteoporosis treatment. The strength of recommendations for various potential fracture prevention strategies was sought. The following potential interventions were available for consideration in the sample case: calcium, vitamin D, oral cyclic etidronate, oral aminobisphosphonates (including alendronate or risedronate), intravenous bisphosphonates, calcitonin, raloxifene, postmenopausal hormone therapy, testosterone replacement therapy (if the case in question was a hypogonadal man), teriparatide, B vitamins and folate (ie, homocysteine-lowering therapy), physical therapy and exercise, and environmental modification (such as bathroom handrails) to prevent falls.

Respondents were asked to choose a level of strength of recommendation for each of these potential interventions: 1) very strongly recommend, 2) strongly recommend, 3) use only if other treatments are contraindicated or not tolerated, 4) do not recommend, or 5) discourage use. For each of the interventions listed, the respondents were asked to choose 1 or more of the following choices, with respect to barriers to implementation in the nursing home setting: no barriers to implementation, lack of strong evidence for hip fracture reduction, side effect profile, poor compliance with use or proper administration, prescribing contraindications or drug interactions, and expense.

The study population was asked to complete the questionnaire and return it to the research team using self-addressed, stamped envelopes included with the questionnaire. Individuals were offered the opportunity to decline participation or receipt of further study materials by checking a box on an enclosed cover sheet and returning this sheet to the research team. The first mailing of the questionnaire occurred in April 2008, with a second mailing to nonrespondents about 6 weeks later. Test-retest reliability of the questionnaire was assessed among the first 60 respondents at about 2 weeks. The study was approved by the Research Ethics Board of the University Health Network in Toronto, Ont. Consent for participation was implied by completion of the questionnaire by participants. No fee or incentive was provided to participants to complete the survey.

### Statistical analyses

We summarized participant demographic characteristics, response rates, percentage of choices for multiple-choice questions, and degrees of agreement (on a scale of 1 to 7) with Likert scale questions. For questions relating to the strength of recommendation of various interventions, data were tabulated according to the 2 most frequently selected recommendation categories.

Data were summarized using descriptive summary measures, expressed as mean (SD) for continuous variables and number (percent) for categorical variables. For data on barriers to implementation of various potential fracture prevention strategies, the category chosen by most respondents was described. However, if no single barrier accounted for most responses, we described the categories between which responses were largely split. For test-retest reliability evaluation,  $\kappa$  statistics (with a 95% confidence interval [CI]) were calculated for categorical data using CIA software. For interval or quantitative data, intraclass correlation coefficients (ICCs), with 95% CIs, were calculated using SPSS version 12.0. To compare demographic characteristics of individuals who completed the survey with those who did not (data obtained from the Canadian Medical Directory online version),  $\chi^2$  analyses were used for categorical data and unpaired  $t$  tests were used for continuous data, both of which were calculated using SPSS version 12.0. Missing or uninterpretable responses (such as 2 answers checked for questions for which only 1 choice was requested) were excluded from the analysis.

## RESULTS

### Description of the study population

A total of 246 physicians were surveyed; 25 individuals declined study materials and were excluded from the survey. Of the remaining 221 physicians, 120 participated in the study for a response rate of 54%. The characteristics of the participating physicians are shown in **Table 1**. About two-thirds of respondents were family physicians; specialists (mostly geriatricians) comprised the rest of the study population. About two-thirds of physicians had completed their clinical training more than 15 years before the study. Approximately three-quarters of the study population were men and about half of respondents were affiliated with universities. Most respondents (90%) were active in the clinical care of LTC facility residents. There were no significant differences in medical specialty, sex, years since graduation from medical postgraduate training, or practice location between physicians who completed the survey and those who did not ( $P > .05$ ). Details of analysis are available from the corresponding author upon request.

### Test-retest reliability assessment

Approximately 2 weeks after completion of the initial mailing of the questionnaire, the first 60 respondents were sent a second copy of the same questionnaire to evaluate test-retest reliability. The response rate to retesting was 60% (36 of 60). For demographic questions relating to sex, clinical practice, and university affiliation, the respective  $\kappa$  statistics were each 1.00 (95% CI 1.00 to 1.00).  $\kappa$  Statistics for other demographic questions were

greater than 0.50 for all responses, with the exception of a question on involvement in healthy policymaking relating to LTC residents, for which  $\kappa = 0.47$  (95% CI 0.48 to 0.95). For a Likert scale question querying whether all nursing home residents should be targeted for hip fracture prevention strategies, the ICC was 0.64 (95% CI 0.40 to 0.80). For a question querying whether hip fracture prevention strategies should be selectively targeted only to nursing home residents considered at highest risk of hip fracture, the ICC was 0.39 (95% CI 0.07 to 0.64). For questions inquiring about level of support for the use of various interventions in the sample case, the ICC values were 0.50, with the exception of questions on calcitonin (0.39, 95% CI 0.08 to 0.64) and a question on physical therapy and exercise training (0.36, 96% CI 0.00 to 0.54). Thus, most responses were consistent upon retesting.

**Table 1. Study population demographic characteristics: N=120.**

CHARACTERISTIC	N (%)*
Self-identified physician specialty	
• Family medicine	78 (65)
• Geriatrics	35 (29)
• Both family medicine and geriatrics	3 (2)
• Other (including internal medicine)	4 (4)
Sex	
• Men	86 (72)
• Women	34 (28)
Time since completion of clinical training (residency or fellowship), <sup>†</sup> y	
• ≤ 5.0	7 (6)
• 5.1 to 10.0	15 (13)
• 10.1 to 15.0	14 (12)
• > 15.0	82 (69)
Active in clinical care of LTC facility residents <sup>†</sup>	
• Yes	106 (90)
• No	12 (10)
Active in administrative work related to LTC	
• Yes	66 (55)
• No	54 (45)
Involved in health policy making related to LTC	
• Yes	39 (32)
• No	81 (68)
Current affiliation with a university	
• Yes	57 (48)
• No	63 (52)

LTC—long-term care.

\*Percentages were calculated from the total number of responses for each question.

<sup>†</sup>Only 118 responses were included for this question, owing to missing or uninterpretable results.

## Targets for hip fracture prevention strategies

Respondents generally agreed with the statement that *all* residents of LTC facilities should be targeted for hip fracture prevention strategies (mean [SD] Likert scale score of 6.2 [1.1]). Similarly, respondents generally disagreed with the statement that hip fracture prevention strategies should be selectively targeted only to those LTC residents who are deemed to be at highest risk of fracture (mean [SD] Likert score 3.2 [1.8]). The results of these 2 questions were consistent, suggesting criterion validity of the concepts examined.

## Recommendations for interventions

A sample case of an elderly woman admitted to an LTC facility after hip fracture was presented; physicians were asked to comment on the strength of their recommendation for each potential intervention listed. Their recommendations are outlined in **Table 2**.

## Barriers to implementation of prevention strategies

Most respondents identified no barriers to the use of the following fracture prevention strategies in LTC: vitamin D (85 of 120, 71%), physical therapy or exercise (71 of 120, 59%), and environmental modification to prevent falls (75 of 120, 63%). In contrast, most respondents identified a lack of strong evidence for the prevention of hip fractures as a barrier to the use of the following strategies in LTC: B vitamins and folate (65 of 120, 54%), cyclic etidronate (65 of 120, 54%), and testosterone treatment in hypogonadal men (66 of 120, 55%). Most respondents identified expense as a barrier to the use of the following pharmacologic treatments in the LTC setting: intravenous bisphosphonates (95 of 120, 80%) and teriparatide (70 of 120, 58%). Poor compliance was cited as a barrier to the use of hip protectors (72 of 120, 60%). The side effect profile of postmenopausal hormone therapy was cited as the main barrier precluding its use in LTC (68 of 120, 57%). For calcium and oral aminobisphosphonates (such as alendronate or risedronate), most responses were split among the following 3 categories: no barriers to their use in LTC, side effects, and poor compliance with use or proper administration. Note that more than 90% of responses were accounted for by one of these 3 categories for these interventions, but no single category accounted for the majority of responses.

vitamin D, potent oral bisphosphonates, physical therapy or exercise, and environmental modification. Although the use of calcium and aminobisphosphonates was strongly supported by physicians, important barriers to their implementation in LTC facilities included their side effect profiles and compliance with use or proper administration.

About 10 years ago, McKercher et al<sup>22</sup> surveyed Ontario medical directors of LTC facilities and learned that only 30% of physicians would use osteoporosis therapies in the context of a recent fracture sustained by an LTC resident, citing the following barriers in general: cost of therapy, patient or family reluctance to accept therapy, time or cost of diagnosis, unproven effectiveness, side effects, and lack of access to bone densitometry.<sup>22</sup> In this study, we have learned that barriers to implementation of fracture prevention strategies in LTC institutions are intervention-specific. Given that, approaches to addressing these barriers must be multifaceted. For example, for preferred secondary prevention strategies for which no barriers to implementation were perceived by most physicians (eg, vitamin D supplementation, physical therapy and exercise, environmental modification to reduce risk of falls),

**Table 2. Strength of recommendation for various interventions in the sample case of an elderly woman admitted to an LTC facility after sustaining a hip fracture**

INTERVENTIONS GROUPED BY STRENGTH OF RECOMMENDATION*	N/N (%)
<b>Strongly or very strongly recommended</b>	
• Calcium	114/119 (96)
• Vitamin D	116/120 (97)
• Oral aminobisphosphonates (eg, alendronate, risedronate)	104/116 (90)
• Physical therapy or exercise	115/119 (97)
• Environmental modification (eg, bathroom handrails)	117/119 (98)
<b>Not recommended or limited use<sup>†</sup></b>	
• Oral etidronate	80/107 (75)
• Intravenous bisphosphonates	90/112 (80)
• Calcitonin	102/116 (88)
• Raloxifene	99/113 (88)
• Testosterone treatment (for a hypogonadal man)	87/111 (78)
• Teriparatide	94/109 (86)
<b>Not recommended or discouraged use</b>	
• Postmenopausal hormone therapy	95/115 (83)

LTC—long-term care.

\*Support was mixed for the following interventions: hip protectors and B vitamins with folate (ie, homocysteine-lowering therapy). For these interventions, responses ranged from do not recommend to strongly recommend for the most frequent categories selected, suggesting strongly conflicting views among participants.

<sup>†</sup>Limited use of an intervention was defined by use of the intervention if other treatments were not tolerated or were contraindicated.

## DISCUSSION

In this survey, we learned that Canadian physicians with a specific interest in LTC for the elderly support targeting all residents of LTC facilities with fracture prevention strategies. The interventions most strongly supported for secondary prevention after hip fracture include calcium,

routine implementation of programs at the national, provincial, and institutional levels could be considered. Specific national or provincial funding programs to facilitate implementation of such strategies as part of routine care in LTC facilities might facilitate their success. For potent oral aminobisphosphonates, compliance with proper administration might need to be addressed through the education of dispensing pharmacies and administering staff (to ensure that drugs are administered separately from meals and all other medications). Moreover, selection of potent oral aminobisphosphonates with infrequent dosing (eg, once a week or once a month) might be more feasible in the LTC setting as opposed to daily dosing, given polypharmacy use in this setting. Drug development research to improve the gastrointestinal tolerance profile and bioavailability of potent oral aminobisphosphonates could also help lessen challenges with adherence. As for calcium supplementation, coadministration with food and tailoring the dosage and formulation to each individual could be considered as a way to address issues with compliance.

## Strengths and limitations

The strengths of our study include that the survey questions were generated by a specialized multidisciplinary team, that we evaluated test-retest reliability, and that responses to most questions were consistent. Our study was limited by a relatively small sample size, restriction of the family physician subgroup sampling to members of the Ontario Long Term Care Association (which might not necessarily be reflective of Ontario family physicians not belonging to this organization or those practising outside of Ontario), an imperfect response rate (albeit not an unreasonable one for a nonreimbursed physician survey), and a small number of missing or uninterpretable responses. We also did not address issues relating to patient or family preference.

## Conclusion

In this survey, Canadian physicians strongly agreed with targeting all LTC residents for hip fracture prevention strategies. Furthermore, respondents expressed strong support for the use of calcium, vitamin D, potent oral bisphosphonates, and physical therapy or exercise programs in the LTC setting. However, potential side effects and compliance with use or proper administration were identified by some respondents as important barriers to the implementation of calcium and potent oral bisphosphonates in LTC. Other osteoporosis pharmacotherapies, hormone therapies, or vitamins were not strongly favoured for first-line use in secondary hip fracture prevention in the LTC setting. The information gathered in this physician survey should be of interest to clinicians and administrators working in the field of LTC, as well as health policy makers considering the feasibility and acceptability of funding various potential strategies to reduce hip fractures in nursing homes. In the future, more clinical research is also needed

to identify effective strategies for hip fracture prevention in elderly LTC residents, as this group is relatively understudied, particularly with respect to pharmacotherapy.

**Dr Sawka** is an endocrinologist and clinician scientist at the University Health Network in Toronto, Ont, an Assistant Professor at the University of Toronto, and holds a Health Services Research Chair from Cancer Care Ontario. **Ms Ismaila** was a research analyst at the University Health Network at the time of submission. **Dr Raina** is a Professor in the Department of Epidemiology and Biostatistics at McMaster University in Hamilton, Ont. **Dr Thabane** is an Associate Professor and Associate Chair in the Department of Epidemiology and Biostatistics at McMaster University. **Dr Straus** is a Professor in the Department of Medicine at the University of Toronto and a Scientist in the Keenan Research Centre of the Li Ka Shing Knowledge Institute at St Michael's Hospital in Toronto. **Dr Adachi** is a rheumatologist in the Department of Medicine at St Joseph's Healthcare in Hamilton and a Professor in the Department of Medicine at McMaster University. **Dr Gafni** is a Professor in the Department of Clinical Epidemiology and Biostatistics at McMaster University. **Dr Papaioannou** is a Professor in the Department of Medicine at Hamilton Health Sciences.

### Competing interests

**Dr Jonathan D. Adachi** has been a consultant or speaker for Amgen, AstraZeneca, Eli Lilly, GlaxoSmithKline, Merck Frosst, Novartis, Nycomed, Pfizer, Procter & Gamble, Roche, Sanofi Aventis, Servier, Wyeth, and Bristol-Myers Squibb; he has also provided clinical trials support for Amgen, Eli Lilly, GlaxoSmithKline, Merck Frosst, Novartis, Pfizer, Procter & Gamble, Sanofi Aventis, Roche, Wyeth, and Bristol-Myers Squibb. The other authors have no competing interests to declare.

### Correspondence

**Dr Anna M. Sawka**, Division of Endocrinology and Metabolism, Department of Medicine, Toronto General Hospital, 200 Elizabeth St, 12 EN-212, Toronto, ON M5G 2C4; telephone 416 340-3678; e-mail [sawkaam@yahoo.com](mailto:sawkaam@yahoo.com)

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