



Osteoporosis
Society
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osteoporosis

update

a practical guide
for Canadian physicians

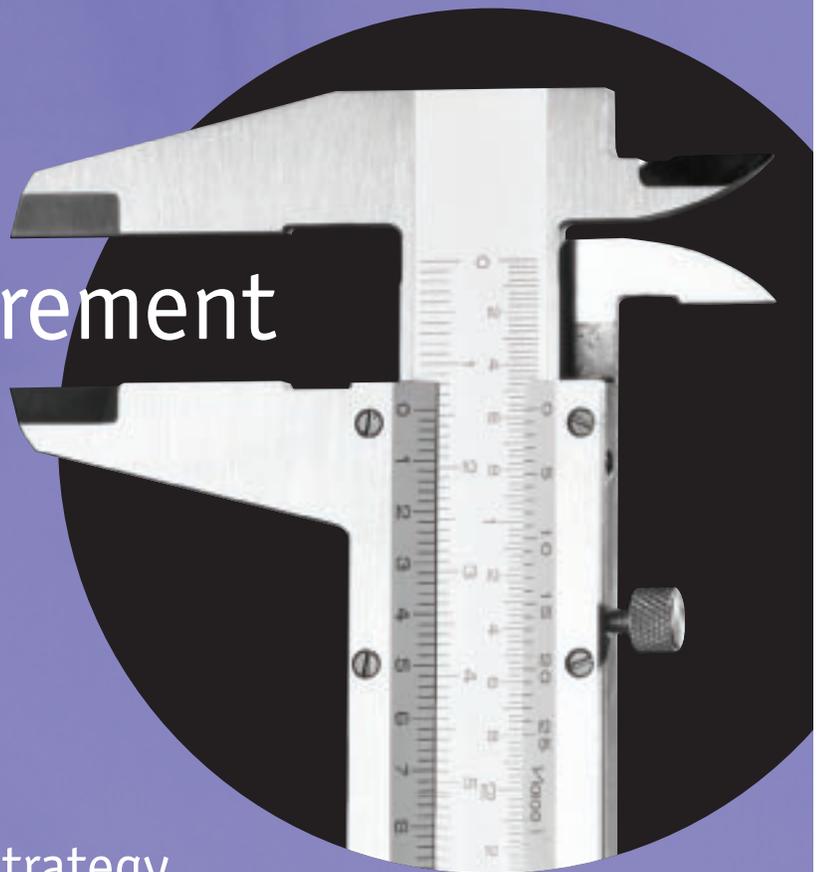
Height measurement Precision is key

questions & answers

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Commitment to care



Robert Josse, MB, BS, FRCP(UK), FRCP, is with the Division of Endocrinology and Metabolism at St. Michael's Hospital, and is Professor of Medicine at the University of Toronto in Ontario.

In the last issue of *Osteoporosis Update*, the feature article by Dr. Kerry Siminoski presented results from his team's research on some simple physical manoeuvres physicians can perform in their offices to quickly assess height loss and postural changes that may point to vertebral compression fractures. While often undetected, these are the most common type of fractures in osteoporosis patients. As a sequel in this issue, Dr. Siminoski focuses on the importance of measuring current height as accurately as possible and once again offers practical tips to help bring undiagnosed fractures to clinical attention.

Physicians dealing with patients who have, or are at risk of developing, osteoporosis may be interested in finding out about the best tools and techniques to use to measure height precisely, and the latest Osteoporosis Society of Canada (OSC) recommendations on height loss as an indication for spinal x-rays. Since nurses or other office staff often carry out the height assessments, it may be useful to copy the information provided and keep it handy by the measuring device for easy consultation.

The Q&A section features an update on the role of the trace nutrients vitamin K and boron and a discussion on how to advise your patients of different ages about the best types of exercise to prevent or manage osteoporosis. In addition, Dr. Anthony Hodsmann presents the latest evidence for strontium ranelate, a potential new therapy (not yet available in Canada, but recently licensed in Europe) that may help reduce fragility fractures in postmenopausal women.

In this issue, we also highlight the new osteoporosis strategy announced recently by the Ontario Minister of Health. The ambitious program, which the OSC has been extensively involved in developing over the past several years, will allocate millions of dollars to increasing public awareness, promoting practice standards and guideline use, implementing a fracture clinic follow-up program, creating educational tools for health professionals and expanding research. Ontario's commitment to osteoporosis care is commendable, and will hopefully serve as a model and impetus to other provinces to develop and expand their initiatives and programs. By allocating resources to heighten awareness and improve treatment of osteoporosis, the Ontario strategy and others like it will provide a great service to the 1.4 million Canadians who have this debilitating disease and the more than 2 million people at risk.

The Osteoporosis Society of Canada and the Editorial Board are committed to providing reliable, current information to support health professionals involved in the daily clinical management of osteoporosis. In order to better address your needs and concerns, the Scientific Advisory Council welcomes your questions or comments.

Please send all correspondence to mackinnon@parkpub.com

q.

What role do vitamin K and boron play in osteoporosis?

Dr. Susan Barr explains: Recently, there has been interest in whether vitamin K and boron play a role in bone health. Here is an overview of the evidence for these trace nutrients.

Vitamin K Vitamin K is found in leafy greens (as K₁) and in meat, cheese and fermented products (as K₂). It is also synthesized by gut bacteria. The recommended intake for adult men is 120 mcg/day (0.12 mg) and for women, 90 mcg/day (0.09 mg). In addition to its well-established role in synthesizing blood clotting factors, vitamin K functions as a cofactor in the posttranslational carboxylation of several bone matrix proteins, notably osteocalcin.

In 2002, the committee preparing the Osteoporosis Society of Canada's clinical practice guidelines (Brown JP, Josse RG. *Can Med Assoc J* 2002) reviewed the evidence for the role of vitamin K in preventing and treating osteoporosis. At that time, the available studies reported the following findings:

- Circulating blood vitamin K levels were lower in patients with hip fractures than in controls.
- Higher blood levels of vitamin K were associated with lower risk of hip fracture.
- Vitamin K₂ supplementation resulted in lower bone mineral density (BMD) loss and fracture risk.

The studies were limited by the fact that the doses of vitamin K₂ used were extremely large (e.g. 45 mg) and that the calcium and vitamin D intakes of participants were unknown. At that time, the Society did not recommend vitamin K for prevention or treatment of postmenopausal osteoporosis, or for use in men or premenopausal women.

Since then, several additional studies have been published. The most convincing one is a three-year, double-blind, placebo-controlled trial completed by 155 healthy postmenopausal Dutch women who did not use hormone replacement therapy, bisphosphonates or vitamin/mineral supplements (Braam LA et al. *Calcif Tissue Int* 2003). The women were randomized to receive either a placebo, a daily supplement containing calcium (500 mg), magnesium (150 mg), zinc (10 mg) and vitamin D (8 mcg), or the same supplement plus vitamin K₁ (1 mg/day). All groups lost bone during the study, but the women receiving vitamin K had significantly reduced bone loss at the femoral neck (~3.5%) compared to both the placebo group (~5.2%) and the patients receiving the supplement without vitamin K (~4.7%). No differences occurred at the lumbar spine.

Susan I. Barr, PhD, RD, is Professor of Nutrition at the University of British Columbia in Vancouver.

Sonia Bibershtein, PT, is a physiotherapist with the Multidisciplinary Osteoporosis Program, Sunnybrook and Women's College Health Sciences Centre, Toronto, Ontario.

Dr. Anthony Hodsman is Medical Director of the London Regional Osteoporosis Program and Professor in the Department of Medicine, Division of Nephrology at the University of Western Ontario.

Another trial at the University of Toronto is assessing the effect of vitamin K in postmenopausal women with osteopenia, but will not be completed until 2006.

Vitamin K is not included in multiple vitamin supplements sold in Canada.

Boron The biologic function of boron in humans remains unclear. Boron may interact with vitamin D, calcium and estrogen metabolism, which raises the possibility that it could play a role in human nutrition and bone health. Studies in animals fed purified diets extremely low in boron have provided supportive evidence for this role; however, when animal diets were composed of natural foods (which provide some boron), no effects were observed (Armstrong TA et al. *J Nutr* 2000). At this time, there are no human studies supporting the use of boron supplements in the prevention or management of osteoporosis.

q.

What are the best types of exercise to prevent osteoporosis, or for people who have the condition?

Sonia Bibershtein responds: Bone requires the mechanical challenge of physical activity to remain strong and healthy. An active lifestyle plays an important part in both preventing and treating osteoporosis. Here are some guidelines to follow in advising your patients at various stages throughout their lives.

Early prevention Achieving a high peak bone mass during childhood and adolescence provides a good foundation for skeletal health in later life. Impact activities such as walking, jogging, soccer, tennis, skipping and dancing help to build a strong skeleton.

BMD preservation in adults In early and middle adulthood, the main objective is to maintain bone mineral density. Integrating seasonal and leisure activities into an exercise routine will help to keep up an active lifestyle. In impact weight-bearing exercises (e.g. jumping, running, racquet sports, step classes), the effect of gravity creates a force that loads and challenges the bones, thus helping to build BMD and prevent osteoporosis. Likewise, muscle strengthening (resistance) exercise has a beneficial effect: when a muscle contracts, it stimulates the bone to which it is attached. Two sets of eight to 12 repetitions of each exercise twice a week are enough.

Post menopause Women experience significant bone loss immediately after menopause. But research has shown that doing specific exercises (impact weight-bearing and muscle strengthening), especially when combined with appropriate pharmacologic and dietary interventions, can slow down the rate of loss. If bone loss in the spine is minimal and the risk of spinal fracture is low, Pilates and/or yoga can strengthen the back muscles and help maintain good posture.

In the later postmenopausal years, the osteogenic response of bone to exercise is diminished because first,

Continued on page 7

Tools and techniques

Accurate height assessment to detect hidden vertebral fractures

Kerry Siminoski, MD, FRCPC, Department of Radiology and Diagnostic Imaging and the Division of Endocrinology and Metabolism, Department of Medicine, University of Alberta, Edmonton.

While vertebral compression fractures are the most common type of fractures that occur in osteoporosis patients, two-thirds of cases fail to come to clinical attention. The last issue of *Osteoporosis Update* gave an overview of some simple physical examination manoeuvres, including assessment of historical height loss, wall-occiput distance and rib-pelvis distance, which are useful in detecting prevalent vertebral fractures (those present at the time of initial evaluation). Height loss has also been studied prospectively as a tool for finding incident vertebral fractures (i.e. that develop over time). This article will present practical recommendations on techniques that can help to ensure the most accurate height measurements possible.

Since nurses or other office staff may often be the ones to carry out the height measurements, it might be useful to copy this information and keep it by the scale for easy consultation.

When vertebrae fracture, the vertebral body compresses. This causes loss of vertebral body height, leading to diminishment of total body stature. Careful measurement of total body height to ascertain whether height loss has occurred allows us to detect some hidden fractures. The reality, however, is that very few medical professionals have ever received training in height measurement. Like any medical technique, it has sources of error and variability, and its accuracy and precision can be enhanced by careful consideration of a few basic issues.

Quality control

The quality of height loss evaluation depends on the measurement device that is used (Table 1), the method and care in positioning the patient (Table 2), and the number of times the measurement is repeated at each visit (Table 3).

There are two versions of height loss to consider in patients with osteoporosis.

- Historical height loss (HHL) is the amount of height that an individual has lost over his or her lifetime. It is calculated as the difference between the person's tallest recalled height and the current measured height. $HHL > 6$ cm in people over age 60 and $HHL > 4$ cm in those under age 60 suggest that vertebral fractures are present.

- Prospective height loss (PHL) is estimated as the difference between two height measurements taken over the time the patient is being followed. $PHL > 2$ cm (over any timeframe up to three years) raises the possibility of a new vertebral fracture.

In instances where the values exceed these thresholds, spine radiographs should be done. These values have been derived in women, but can reasonably be applied to men until male data becomes available.

Height measurement is a recommended part of monitoring patients with osteoporosis or at risk of osteoporosis. Attention to the way in which measures are taken will improve their accuracy, reliability and performance in helping to detect vertebral fractures. ●

Resources

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1. What is the BEST TOOL for measuring height?

The best type of device for gauging height is a wall-mounted system where the horizontal arm is securely affixed and remains at a 90° angle.

A variety of wall-mounted units are available through medical supply companies or via the Internet. Prices range from \$50 to \$1500.

The most commonly used instrument is the sliding measurement rod on the office platform weight scale. This method appears to be adequate for determining HHL and BMI (body mass index), but there is concern that it is not precise enough for prospective monitoring and determination of PHL.

The performance of the measuring rod on the platform weight scale can be enhanced in two ways: by attaching a small carpenter's level to the horizontal arm to make sure it remains in the desired position (Figure 1) or measuring something of known height, such as a tape measure, to verify that the rod was set up correctly. The attachment of the horizontal arm should be secure enough to ensure that a 90° angle is maintained.

Figure 1

Attachment of carpenter's level to the horizontal arm of the height measurement device on a platform weight scale



2. What is the BEST TECHNIQUE to measure height?

The patient should stand straight with heels together, feet angled at about 60°, in bare or stockinged feet. If using a wall-mounted device, the heels should touch the heel plate (if there is one) or the wall (this may require removing a section of baseboard), and the buttocks or back should touch the wall or the unit. With a freestanding device, the person's back should be toward the measuring rod (as the horizontal arm may not reach the head from the front in the case of a large person).

The subject should look straight ahead. For those being measured against a wall or wall-mounted unit, the back of the head should not touch the wall or the unit if this takes the head out of position. To enhance reproducibility of head positioning, it is best to place the head in the "Frankfort plane" (Figure 2), i.e. where the inferior border of the bony orbit is in line with the groove at the top of the tragus of the ear. There is no consensus as to what point in respiration the height measurement should be done. My own approach is to measure during quiet breathing.

Some methods suggest that the examiner pull up on the angles of the jaw to prompt the subject to stretch to maximal height (countering gravitational and postural effects on the spine). I think this technique is best reserved for children, and I ask my adult patients to actively stretch to a fully erect position while keeping their feet flat on the floor, which accomplishes the same thing.

The horizontal arm of the measuring unit should compress the hair as much as possible, and remain at a rigid right angle to the measuring scale.

Height should be recorded to the closest mm.

The measurement should be repeated three times, and the average used to determine the height at that time to the closest mm. The subject should step away from the device and be repositioned between measurements.

3. Why should the measurement be REPEATED?

All measurements have intrinsic variability when repeated, sometimes called the precision error.

The precision error in height measurement is surprisingly large.

Measurements done a year or more apart can differ by up to 3.0 cm simply due to precision error (at a 95% level of confidence).

To reduce precision error to less than 2 cm (the clinically relevant threshold), height measurements need to be repeated three times, and the average used as the height.

While precision error can be minimized by always measuring height at the same time of day, this is not practical. Diurnal effects can be minimized by attention to positioning.



New recommendations

The 2002 OSC clinical practice guidelines recommended the use of height loss as an indication for spine radiographs.

The recommended HHL threshold in the 2002 guidelines was 4 cm. New evidence maintains this value for people under age 60, but suggests that for older individuals, HHL > 6 cm is more appropriate.

The 2002 OSC guidelines recommended PHL > 2 cm as a threshold for clinical use. Current data confirms this standard.

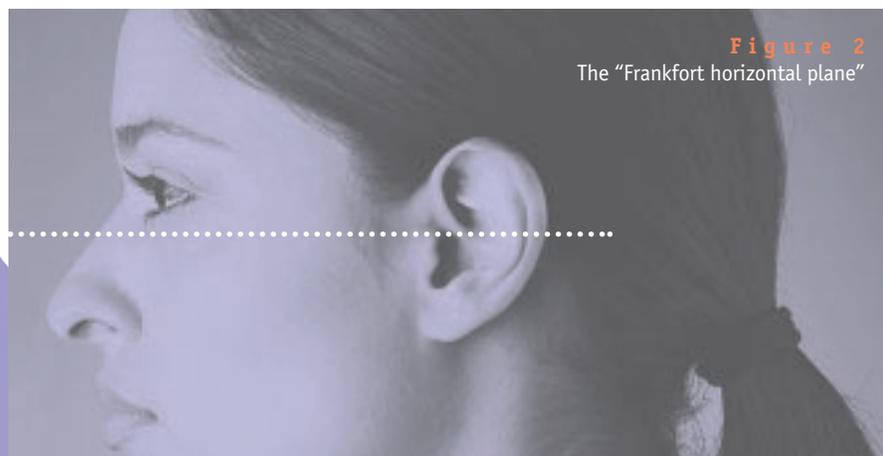


Figure 2

The "Frankfort horizontal plane"

Ontario's strategy paves the way for better care across Canada

From left to right:
Karen Ormerod, Society President & CEO;
Dr. Robert Buckman, osteoporosis patient and guest speaker at the event;
Jane Pepino, Chairperson of the Ontario Women's Health Council;
George Smitherman, Minister of Health and Long-Term Care;
Dr. Earl Bogoch, orthopedic surgeon, consultant with the Society's Scientific Advisory Council and guest speaker.

The Osteoporosis Society of Canada was extremely pleased by the announcement on February 22, 2005 by Ontario's Health Minister, George Smitherman, that funding of \$5 million per year will be invested in the province's osteoporosis strategy. The funds are tied to specific projects and deliverables, which will ensure appropriate spending and provide maximum benefits to people with osteoporosis or at risk for developing it.

The Society has been heavily involved in nurturing this strategy. It took several years to develop the framework for defining deliverables, and it is hoped that these, along with associated tools, will be useful to develop initiatives in other provinces. Much of the groundwork was laid by the Ontario Women's Health Council report, "A Framework and Strategy for the Prevention and Management of Osteoporosis." In addition to Society staff and volunteers, a number of healthcare and research professionals from across the province, as well as other stakeholders, worked with Ministry staff to develop the strategy.

Elements to receive funding

The strategy aims to prevent the condition and improve the lives of those affected through improved treatment. Its five components include:

- Increased awareness and better health promotion: public education, especially for seniors and school-children, will aim to improve early recognition of osteoporosis and emphasize the importance of physical activity, calcium and vitamin D for bone health;
- Standards to promote appropriate use of bone density testing and improve the rate of early diagnosis;
- Tools to help healthcare professionals use clinical practice guidelines;
- More research to expand the knowledge base about osteoporosis;
- Integration of services throughout the healthcare system and across the province to improve quality of care for people at all stages of treatment — primary care, post-fracture and rehabilitation.

A specific initiative for integrating services is the establishment of a province-wide fracture clinic intervention program to improve patient referrals for diagnosis, care, treatment and prevention of future fractures. Further, the formation of interdisciplinary teams in academic health science centres across the province will provide better care for complex osteoporosis cases. Finally, self-management programs and resources to help patients manage their disease and prevent its progression will be developed.



While the Society is only one partner in the implementation of the strategy, it will play a key role. In Phase 1 (until April 2006), a project manager at the Society is being funded, and several previously defined programs have already started receiving funds in the areas of enhancing osteoporosis education for seniors, developing consensus standards for BMD testing and reporting, and elaborating BMD guidelines for perimenopausal women and for men.

Future rewards and challenges

Currently, about 530,000 Ontarians — one in four women and at least one in eight men over the age of 50 — are affected by osteoporosis. An estimated 57,000 osteoporosis-related fractures occur every year in Ontario, costing the province approximately \$500 million in hospitalization and long-term care expenses.

The strategy should help reduce the number of fractures and re-fractures, shorten wait-times for services such as hip and knee replacements and lessen the need for emergency room visits, hospitalization, rehabilitation and long-term care. Most important, it will decrease disability, improve quality of life, and diminish pain and suffering for thousands of Ontarians. Hopefully, adaptation by other provinces and regions of the strategy's framework, programs and tools to local circumstances will expand its benefit to more Canadians. ●

Continued from page 3

older women are frequently unable to participate in exercise that is vigorous enough to stimulate bone, and second, the response to exercise is not as robust as in premenopausal females. Weight-bearing exercises remain important, although more to minimize bone loss than to increase BMD.

The primary goal of exercise in this age group is to prevent falls and fractures. The specifics of the exercise program need to be based on overall health status (e.g. presence of arthritis, CVD or other medical conditions), balance and the degree of bone loss. Routines that incorporate balance and coordination (such as tai chi and dancing) can be helpful in preventing falls and fractures.

Muscle strengthening exercises (large muscle groups, including back extensors) are also important to improve posture. These can help maintain function and independence and minimize height loss and rounding of the back (kyphosis) caused by compression fractures.

Advanced osteoporosis People who have advanced osteoporosis (especially if there is a previous history of spinal fracture) should avoid activities that load the spine during positions of flexion and/or rotation, since these increase the risk of sustaining a vertebral compression fracture. The following movements should be avoided or done with caution:

- forward bending of the spine, e.g. toe touches
- traditional abdominal sit-ups
- twisting movements (e.g. golf swing)
- heavy lifting (especially using incorrect techniques such as bending at the waist instead of the knees)
- yoga positions requiring extremes of spinal flexion

It is always advisable for your patients with osteoporosis to consult a healthcare professional with an expertise in this area (e.g. physical therapist), to help them establish an appropriate routine based on the degree of bone loss and their individual needs.

q.

Recent reports have suggested that treatment with strontium ranelate can lead to improved BMD and reduced incidence of fractures in postmenopausal women with osteoporosis. Is this a promising therapy?

Dr. Anthony Hodsman answers: Strontium ranelate, not yet approved in Canada for use in treating osteoporosis, is a mixed anti-catabolic and anabolic agent. It stimulates the action of osteoblasts and increases bone formation while at the same time suppressing osteoclast recruitment and decreasing bone resorption. The effect is present in trabecular bone and perhaps in periosteal bone forming the outer cortical envelope.

Results of the phase III clinical trial SOTI (Spinal Osteoporosis Therapeutic Intervention), which randomized 1,649 postmenopausal women with severe osteoporosis

to either strontium ranelate (as 1 g powdered drug BID) or placebo for three years, were recently published (Meunier PJ et al. *N Engl J Med* 2004). The women (average age 69 years) had very low BMD at the lumbar spine (average T-score < -3.6), and the mean number of vertebral compression fractures at baseline was 2.2. All received daily calcium supplements exceeding 1500 mg, and 400–800 IU/day vitamin D.

The primary endpoint was the incidence of new vertebral compression fractures. Assessment during the first year of treatment or at three years revealed a significant reduction in vertebral compression, with an overall relative risk of 0.59 (CI 0.48–0.73). In this high-risk population, one-third of the placebo patients vs 21% of the treated women suffered vertebral fractures, yielding a NNT of nine (i.e. nine patients need to be treated to prevent one new fracture). A reduction in the incidence of symptomatic clinical vertebral fractures was also observed in the first year for the treated patients (11.3% vs 17.4%). There was only a trend towards a significant difference in back pain between the groups (p = 0.07), and no reduction in nonvertebral fractures (16% vs 17%) in SOTI.

In the recently published TROPOS trial (Treatment of Peripheral Osteoporosis, *J Clin Endocrinol Metab* 2005), there was a small but significant reduction of all nonvertebral fractures. In a post-hoc subgroup analysis of women at high risk for hip fracture (age ≥ 74 and femoral neck T-score ≤ -3.0), the relative risk reduction for hip fracture was 36% (p < 0.046). This study also confirmed the benefit in decreasing vertebral fractures.

It will be difficult for clinicians to assess true changes in BMD in strontium-treated patients, since the drug is taken up in newly forming bone and contributes to the absorption of x-rays used to calculate the DEXA measurement (this can account for about 40% of the observed BMD increase over the lumbar spine). The SOTI trial participants experienced a significant increase in biochemical markers of bone formation (as bone specific alkaline phosphatase) and reductions in markers of bone resorption (as urinary N-telopeptide). Iliac crest biopsy in a small sample of the study population provided no evidence that this clinically chosen dose of strontium predisposes to mineralization defects. This is important: at higher dosages, strontium may cause osteomalacia in animals, and so should definitely not be considered for patients with impaired renal function. The drug was well tolerated, with over 80% of women completing the three-year trial. The most common side effect was mild diarrhea in the first three months, and there was a small measured increment of serum creatine kinase (CK) in some treated patients.

Strontium ranelate has been shown to reduce the risk for new vertebral (SOTI) and nonvertebral (TROPOS) fractures in postmenopausal women with severe osteoporosis. The precise place in osteoporosis management for this new therapeutic option remains to be determined. ●



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SYMPOSIA FOR HEALTH PROFESSIONALS

Wednesday, June 15, 2005

Sheraton Hotel
Winnipeg, Manitoba
6:30–9:30 pm

“Today’s Care Gaps in Osteoporosis”

Case-based presentations for the family physician:

New recommendations for BMD reporting

Osteoporosis in men

Secondary osteoporosis

Treatment failure

Pre- and perimenopausal patients

Forteo update

2 hours CFPC Mainpro-M1 accreditation

For more information and registration, see
the Health Professionals Calendar of Events
at www.osteoporosis.ca

Saturday, June 25, 2005

Michael deGroote Centre for Learning and
Discovery, McMaster University
Hamilton, Ontario

8:00–10:00 am (breakfast served 7:30–8:00)

In conjunction with International Society for Clinical
Densitometry (ISCD) course and certification exam
(open to those attending ISCD course and community
physicians)

“Osteoporosis: What’s now? What’s new?”

Case-based presentations for health professionals:

New recommendations for BMD reporting

Male osteoporosis: how to screen, assess and manage

Current and new treatments

Tips for the non-radiologist

2 hours CFPC Mainpro-M1 accreditation