

Development of Osteoporosis Canada's key indicators for FLSs

Osteoporosis Canada's key FLS indicators were developed to provide a standardized overview of an FLS's effectiveness for each of the individual 3i's (identification, investigation and initiation of treatment). The FLS indicators highlight the relative strengths and weaknesses of the FLS for the purpose of continuous quality improvement through a Plan-Do-Study-Act (PDSA) process. The individual FLSs will be able to compare their patient outcomes with similar FLSs from within Canada after each national FLS audit.

The OC FLS indicators are intended to be used by any Canadian FLS meeting the 8 *Essential elements*, even if such FLSs are not associated with an academic or research center. It should be appreciated that OC's FLS indicators were not developed with any intention that they should be used as a standardized common dataset for research purposes.

Osteoporosis Canada aims to close the post-fracture care gap and to see that no fragility fracture patients are ever "left behind". Clearly, that is also the intention of all FLSs. The denominators for the FLS indicators were therefore purposefully selected to be very inclusive (e.g. include patients lost to follow up, etc.). The FLS indicators will reflect the full impact on the healthcare system from patients being "left behind" by the FLS, no matter the logical cause or reason. The very inclusive denominators also ensure that all Canadian FLSs will be measured by the exact same tough standards.

The challenge of Canada's under-resourced FLSs:

Recognizing that most FLSs in Canada are significantly under-resourced, only a very small number of core indicators were selected so as to minimize as much as possible the burden imposed on FLS staff's time in collecting and recording the data required to measure and monitor such outcomes. The core indicators are deemed the most critical ones to help ensure an FLS's success and are in keeping with Osteoporosis Canada's Clinical Practice Guidelines¹ and *Essential elements of FLSs*

(<http://www.osteoporosis.ca/fls/wp-content/uploads/Osteoporosis-Canada-Essential-Elements-of-an-FLS.pdf>).

The core indicators are complemented by a more comprehensive list of supplementary indicators which are also strongly recommended for FLSs with sufficient resources. For the

time being, OC's focus will be mostly on the core indicators. It is anticipated that the first few national Canadian FLS audits will be looking exclusively at the core indicators.

Special challenges in the development of the denominator for the first i:

The denominator for the first i underpins the entire evaluation of an FLS's effectiveness at the system level. A patient that is "left behind" at the identification stage will never have the opportunity to receive the osteoporosis care they need. Unfortunately, this denominator is also by far the single most problematic one to determine. In Canada, as in other countries, there is relatively easy access to reliable hip fracture data, but there is very poor access to data for other fracture types.

In the UK² and New Zealand³ FLS Clinical Standards documents, the denominator for the first i is anchored to the number of hip fractures, which is then multiplied by a factor (or "multiplier"). Their multiplier is based on proportions/ratios of fracture types seen in well-established and respected FLSs within the UK with comprehensive inpatient and outpatient coverage. The recommended denominator in the UK and NZ is the "number of hip fractures multiplied by a factor of 5"^{2,3}.

There are many issues with using a multiplier of "5" for Canadian FLSs:

- The fracture types enrolled in the FLSs used to determine the multiplier for the UK and NZ FLS indicators include all fracture types, including those of hands, feet and ankles. The 2010 OC Guidelines technical report⁴ states that fragility fractures of the hands, feet and ankles should be excluded from the list osteoporotic fractures.
- The Canadian Chronic Disease Surveillance System (CCDSS) Osteoporosis Working Group of the Public Health Agency of Canada (PHAC) has recommended the following fracture types for surveillance in persons over the age of 50: hip, wrist, shoulder, pelvis and spine⁵.
- The Major Osteoporotic Fractures (MOF) typically refer to fractures of the hip, clinical spine, distal forearm and proximal humerus. These fracture types are among the most common of fragility fractures and are also known to have a high risk for future fractures⁶. In an environment where FLSs are under-resourced, it seems logical to focus the insufficient FLS resources on these commonly seen and highest risk/highest yield fracture types.
- Pelvic fractures constitute only a very small proportion of all fragility fractures (~1-3%), hence the differences between PHAC fractures and MOF is negligible in terms of absolute numbers and would require only a minor adjustment.
- There are very few comprehensive inpatient/outpatient FLSs in Canada (see the Osteoporosis Canada FLS Registry: <http://www.osteoporosis.ca/fls/canadian-fls-registry/>). The overwhelming majority of Canadian FLSs (> 80%) are restricted to inpatient-only or outpatient-only.

Similar to the UK and NZ, the denominator for the first i in Canada will be anchored to the FLS hospital's hip fracture numbers. However, the multipliers have been adjusted to take into account the 2010 OC Guidelines^{1,4} and the PHAC recommendations⁵. Indeed, only fractures of the hip, wrist, shoulder, pelvis and spine have been kept in the denominator for the first i, in keeping with the PHAC recommendations; fractures of hands, feet and ankles have been removed from the denominator in keeping with the OC Guidelines.

Osteoporosis Canada has elected to base the hip fracture multipliers for the various FLS types (inpatient-only, outpatient-only or combined inpatient/outpatient) on the 11-year data from the Osteoporosis Exemplary Care Program (OECF) of St. Michael's hospital⁷. As the published data from the OECF is limited to the MOF, a small arbitrary adjustment (rounding each multiplier slightly upward) was made to incorporate the additional pelvic fractures.

Special case for outpatient- only FLSs: There is no published data on the proportion of admitted hip fracture patients who are eventually seen in follow up in the orthopaedic outpatient clinics. It appears likely that proportion could be very variable depending on the circumstances (e.g. urban vs rural setting). To eliminate this uncertainty altogether, the hip fracture patients are removed from the denominator for the first i for outpatient-only FLSs. The hip fractures are also correspondingly removed from the numerator for the first i. It is assumed that the capture/identification rate for hip fractures in the outpatient setting will be identical to the capture/identification rate for other fracture types. Hence the proportion of all wrist, shoulder, pelvic and spine fractures that are captured/identified by the FLS will be a good indicator of the effectiveness of that FLS for the first i. The hip fracture patients for the outpatient-only FLSs are re-incorporated into the indicators starting at the second i.

Timing of the identification: Osteoporosis Canada is allowing 6 weeks for the identification of most fragility fracture patients. However, it is recognized that a delay may occur in the identification of hip fracture patients for outpatient-only FLSs. Osteoporosis Canada is allowing 6 months in the latter instance, in recognition of the very high importance of enrolling such patients in the FLS (hip fractures have the worst prognosis in terms of future fracture risk).

IMPORTANT NEXT STEPS:

Each denominator was carefully selected and adapted, based on best available evidence at this time, in order to allow for comparison between similar types of FLS models (e.g. inpatient-only, outpatient-only or combined inpatient/outpatient). But the key FLS indicators that are being presented by Osteoporosis Canada in this document are to be considered only a first iteration. It is anticipated that improvements in the definition of the numerators and denominators (particularly in regard to the denominator for the first i) will be made after the first national FLS audit and once better evidence is available.

It is acknowledged that the denominator for the first i has limitations:

- Although the multipliers were selected making many conservative assumptions, some cannot be ascertained due to limited access to Canadian fracture data.
- In many cities, hip fracture surgery for an entire region is concentrated in one select hospital, hence the number of hip fractures for that hospital may not be representative of the number of fracture patients seen within that hospital's outpatient department. Osteoporosis Canada will work with such hospitals to help determine the most appropriate denominator for their first i.

More research is needed to help improve the methods of determining the very critical denominator for the first i. Osteoporosis Canada will revise/update this denominator as new evidence is obtained.

Current FLSs' (and also key FLS indicators') main limitation: vertebral fractures

Vertebral fractures are the single most common osteoporotic fracture type. However, they are by far the most challenging to identify/capture. Very few vertebral fracture patients are ever referred to orthopaedic services hence would be missed by most FLSs. The majority of clinical (acute symptomatic) vertebral fractures typically present in the family physician's office, in the Emergency Department or in an internal medicine/osteoporosis clinic.

In contrast, over half of the vertebral fractures are asymptomatic. The latter may be discovered as an incidental finding on diagnostic imaging studies done for other purposes, e.g. diagnosing a T12 fracture on a chest x-ray done to rule out pneumonia. Unfortunately, less than half of the vertebral fractures present on chest radiographs are ever mentioned in the diagnostic imaging reports^{8,9}.

Compounding the problem, there are different methods for diagnosing vertebral fractures on radiographs, possibly leading to some confusion. It is becoming increasingly recognized that there are occasional cases where vertebral fractures are over-diagnosed (e.g. diagnosing a vertebral wedge fracture when the degree of wedging is only 10%)¹⁰. Mild spinal deformities (<25% height loss without definite end-plate fracture) are **not** strong predictors of future osteoporotic fractures or low bone density¹¹. This type of situation can make the work of an FLS even more complex.

Given the many barriers, systematic and pro-active case finding of primary vertebral fractures is very complex and currently very few FLSs world-wide are engaged in this work. Osteoporosis Canada will address vertebral fractures in a future iteration of this document, once better evidence is available.

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