

Best practices for post-fracture osteoporosis care: Fracture Liaison Services

The systematic review of models of care for the secondary prevention of osteoporotic fractures by Ganda and colleagues provides a useful framework for classification¹. Models are classified as Type A to D, with Type A being the most intensive and Type D the least intensive. The main objectives of a Fracture Liaison Service are to **identify** fracture patients, conduct **investigations** to diagnose osteoporosis and assess future fracture risk and, where appropriate, **initiate** osteoporosis treatment.

This Appendix considers Type A (3 i) models and Type B (2 i) models which have the following characteristics:

- **Type A model:** Identifies, investigates and initiates treatment, where appropriate, for fragility fracture patients.
- **Type B model:** Identifies and investigates but leaves the initiation of treatment to the primary care provider.

Osteoporosis Canada recommends Type A models as the most effective model of care which should be the model implemented across Canada. However, we recognise that Type B models also represent a significant improvement in post fracture care. In addition, a Type B model can relatively easily be expanded to a Type A model within the same infrastructure. The FLS will employ dedicated personnel, usually a nurse practitioner (NP) or a registered nurse (RN), to coordinate the fracture patient's care. The NP can provide all 3 i's* whereas the RN can provide only the first 2 (leaving the initiation of treatment to the primary care provider). The FLS nurse(s) will work to pre-agreed protocols within the particular institution, with input from a physician with expertise in osteoporosis.

Descriptions of service models and key clinical outcomes follow for Type A and Type B models from Canadian and leading international models. Type C and Type D models are considered in Appendix D. For published studies of models which included a control/usual care group, the descriptions adhere to a standard format:

- The control/usual care group is described first, the intervention group(s) is(are) described second.
- For the intervention group, the process for identification is described first, followed by investigation and, finally, initiation.
- Results for the various groups evaluated are tabulated for comparison in a standardised format.

Type A models from Canada

Alberta:
Capital Health, Edmonton

Post-hip fracture care

Post-fracture osteoporosis care was evaluated in a randomized controlled trial (RCT) for patients presenting with hip fracture to hospitals in the Capital Health system in Edmonton, Alberta². Care differed between the intervention and control groups as follows:

- **Usual care group:** Usual care is defined as receiving counselling about fall prevention, the need for additional intake of calcium and vitamin D, and educational materials from Osteoporosis Canada. Patients and caregivers were asked to discuss this material with their primary care physician. This is a Type D (Zero i) model.

*At the time of publishing, Ontario nurse practitioners can prescribe osteoporosis medications but cannot requisition spine x-rays or BMDs independently. This is likely to change in the near future as a result of recent legislative changes.

- **Case management intervention group:** In addition to usual care, these patients were assigned an osteoporosis case manager (**identification**). The case manager (CM) provided additional one-to-one counselling on bone mineral density (BMD) testing and treatments that can reduce fracture incidence. The CM also arranged for an outpatient BMD test to be done as soon as the patient had recovered from the fracture and returned to the community (**investigation**). The results of the BMD test determined whether treatment was required. If so, the CM arranged for a study physician to write a prescription for a weekly oral bisphosphonate (**initiation**) which would be dispensed by local community pharmacists. This is a **Type A (3i) model**.

The results 6 months after hip fracture are shown in table 1. All treated patients received the oral bisphosphonate drugs alendronate or risedronate. Appropriate care was defined as a BMD test performed and osteoporosis treatment provided to those with low bone mass. The definition of low bone mass was in accordance with Canadian guidelines at the time of study design³.

Table 1. Outcomes 6 months after hip fracture

Outcome	Usual care Zero i model (%)	Intervention 3i model (%)
BMD Testing	29	80 ^a
Osteoporosis treatment	22	51 ^a
Appropriate care	26	67 ^a

a. P<0.001 versus usual care

The case manager spent a median of 70 minutes per patient which cost \$56 (Canadian dollars in year 2006 values). A subsequent cost-effectiveness analysis⁴ concluded that for every 100 patients case managed, 6 fractures (including 4 hip fractures) were prevented, 4 quality-adjusted life years were gained, and \$260,000 was saved by the health care system. The intervention reached a breakeven threshold within 2 years.

Post-wrist fracture care

The same group subsequently evaluated the clinical and cost-effectiveness of case management for wrist fracture patients. An RCT⁵ compared a nurse case manager with a previously evaluated multifaceted intervention⁶ to improve osteoporosis care after wrist fracture. Patients for this study were recruited from the usual care group of the multifaceted intervention study⁶ one year after the wrist fracture occurred. This was an active-comparator controlled trial, and so does not have a usual care group. Care differed between the two intervention groups as follows:

- **Multifaceted intervention group:** Patients were identified by virtue of having participated in the control-usual care group of the previous study (**identification**). The objective was to convey three key messages to this group of patients and to their primary care provider (PCP) which were:
 - The patient is at high risk of osteoporosis and a BMD test is needed
 - Without osteoporosis treatment, the patient may be at risk of further fractures within a year
 - Bisphosphonate treatment can reduce the risk of future fracture by a half

Patients received a package which included information on cast care, information about the study and an educational pamphlet from Osteoporosis Canada. This intervention is a **Type C (1i) model** (identification only) which consisted of 3 components:

- A brief counselling session by telephone to reiterate the messages in the printed material
 - A patient-specific reminder to the PCP that the fracture indicated the patient was at risk of osteoporosis
 - An actionable summary of evidence-based osteoporosis guidelines was also sent to the PCP
- **Case management intervention group:** Similar to the study of hip fracture patients described above², these patients were assigned an osteoporosis case manager. The case manager (CM) contacted patients, made clinic appointments for in-person visits and undertook several other activities (**identification**):
 - Education and counselling of patients about osteoporosis
 - Arranged and interpreted BMD tests (**investigation**)
 - Determined suitability for bisphosphonate treatment and provided counselling on the

- treatments
- With oversight from a physician, initiated treatment with bisphosphonate drugs alendronate or risedronate (**initiation**)
- Communicated all results and treatment plans to the PCP

This is a **Type A (3i) model**.

The results 6 months after randomization are shown in table 2.

Table 2. Outcomes 6 months after randomization

Outcome	Multifaceted management 1i model (%)	Case management intervention 3i model (%)
BMD Testing	52	81 ^a
Osteoporosis treatment	12	43 ^b
Appropriate care	28	57 ^c

- a. P=0.042 versus multifaceted intervention
- b. P=0.019 versus multifaceted intervention
- c. P=0.048 versus multifaceted intervention

The case manager spent an average of 53 minutes per patient which cost \$44, compared to 10 minutes spent on each patient for the multifaceted intervention group at a total direct cost of \$12 (Canadian dollars in year 2006 values).

Ontario:

St. Michael's Hospital, Osteoporosis Exemplary Care Program (OECF), Toronto

In 2002, the orthopaedic unit at a university teaching hospital in Toronto hired an osteoporosis coordinator to identify patients with a fragility fracture and to coordinate their education, assessment, referral, and treatment of underlying osteoporosis⁷. The OECF has not been evaluated in an RCT with a control/usual care group. The processes the OECF used to deliver care are as follows:

- **Identification:** All women ≥40 years of age and men ≥50 years of age who attended the fracture clinic as outpatients, or who were inpatients admitted to

the orthopaedic unit, and had sustained a fragility fracture were recruited into the OECF. The OECF coordinator screened all fracture clinic outpatients and orthopaedic inpatients daily (Monday to Friday).

- **Investigation:** For outpatients, the coordinator would arrange a BMD test for patients who had not undergone one in the previous 12 months and arranged an appointment at the Metabolic Bone Disease Clinic (MBDC). Patients who declined a referral to the MBDC were referred to their PCP or treating specialist, with an explanatory letter, for intervention. For inpatients, during the first year of the program, inpatient investigations were modified. Those with a hip fracture did not require confirmation of the diagnosis of osteoporosis by a bone mineral density test for inclusion in the OECF; they were immediately referred for treatment. However, the coordinator did advocate for BMD testing of those aged <75 years to confirm a diagnosis of osteoporosis, so that the patient could qualify for treatment covered by the provincial pharmaceutical benefit program.
- **Initiation:** Four hundred and thirty fracture patients were evaluated during the first year of operations (276 out-patients and 154 in-patients). Almost all (96%) of these patients received appropriate osteoporosis care:
 - 80 out-patients (36%) were treated for osteoporosis prior to assessment by the OECF
 - 124 out-patients (56%) were referred to their PCP (27) or the MBDC (97) for osteoporosis treatment
 - 31% of the 128 in-patients were treated for osteoporosis prior to assessment by the OECF
 - Treatment was initiated for a further 24% of in-patients and another 34% were referred to their PCP or the MBDC

A subsequent cost-effectiveness analysis⁸ of the OECF concluded that a hospital that hired an osteoporosis coordinator who manages 500 patients with fragility fractures annually could reduce the number of subsequent hip fractures from 34 to 31 in the first year, with a net hospital cost savings of \$48,950 (Canadian dollars in year 2004 values), with use of conservative assumptions.

The model was subject to both deterministic and probabilistic sensitivity analyses to establish its robustness. The deterministic sensitivity analysis found that the coordinator led to cost savings in comparison to

no coordinator when four conservative conditions were applied:

1. If the cost per hip fracture was as low as \$8,000 (the mean cost per hip fracture treated in this hospital at the time was \$21,800)
2. If only 60% of the patients initiated treatment and only 40% complied (96% of OECF patients received appropriate attention for osteoporosis and 59% complied)
3. If treatment efficacy reduced the incidence of future hip fractures by $\leq 10\%$ (Based on RCTs and meta-analysis the calculated efficacy was 29%)
4. If as few as 350 patients were seen annually

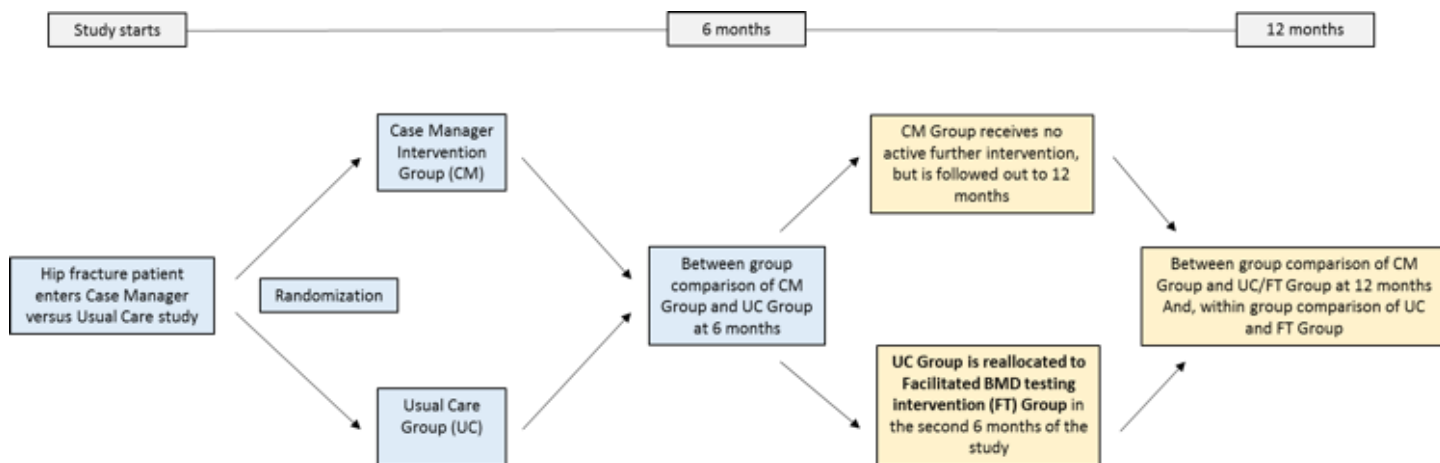
Probabilistic sensitivity analysis showed that most simulations resulted in the coordinator strategy being more effective and less costly than the no coordinator strategy. There was a 90% probability that hiring a coordinator costs less than \$25,000 per hip fracture avoided. Greater savings were anticipated after the first year and when additional costs such as rehabilitation and dependency costs are taken into consideration.

Type B models from Canada

Alberta: Capital Health, Edmonton

In addition to the Type A model for post-hip fracture care described above², the Capital Health team sought to evaluate the relative effectiveness of facilitated BMD testing pursuant to usual care⁹. As illustrated in figure 1, hip fracture patients recruited to the usual care group of the original study² (highlighted in blue) were reallocated to receive facilitated BMD testing (FT group) at 6 months. Accordingly, the second stage of the study (highlighted in yellow) is another example of an active comparator study which did not have a control/ usual care group. This study compared outcomes for the original case management group with the facilitated BMD testing group after 12 months. However, a within-group comparison was also made which contrasted outcomes for the usual care group during the first 6 months of the study with outcomes for this group for the second 6 months, after facilitated BMD testing had been arranged.

Figure 1. Design for facilitated BMD testing study⁹



(Adapted from Arthritis Rheum 2009;61(2):209-215 with kind permission from Dr. S.R. Majumdar)

For clarity, care differed between the two intervention groups as follows:

- **Facilitated BMD Testing Group:** Study personnel contacted all original usual care patients at 6 months after their hip fracture (**identification**). If BMD testing or prescription of osteoporosis therapy had not yet occurred, the case manager arranged for BMD testing (**investigation**) and the results were sent to the PCP for further management. This is a **Type B (2i) model**.
- **Case management intervention group:** In addition to usual care as per the original study² (defined as receiving counselling about fall prevention, the need for additional intake of calcium and vitamin D, and educational materials from Osteoporosis Canada), these patients were assigned an osteoporosis case manager (**identification**). The case manager (CM) provided additional one-to-one counselling on bone mineral density (BMD) testing and treatments that can reduce fracture incidence. The CM also arranged for an outpatient BMD test to be done as soon as the patient had recovered from the fracture and returned to the community (**investigation**). The results of the BMD test determined whether treatment was required. If so, the CM arranged for a study physician to write a prescription for a weekly oral bisphosphonate which would be dispensed by local community pharmacists (**initiation**). This is a **Type A (3i) model**. Note that no further active intervention was provided to this group during the second 6 months of the study.

The results at 12 months after the original hip fracture are shown in table 3.

A clear message came from this study; compared to usual care, both the case management model (Type A - 3i model) and the facilitated BMD testing model (Type B - 2 i's) were superior. However, the intensity of the intervention determined the magnitude of the improvement. The small absolute cost difference per patient for provision of the Type A model compared to the Type B model (\$56 versus \$24), in light of the superior performance for the Type A model, support Osteoporosis Canada's position that Type A models are preferred.

Table 3. Outcomes 12 months after hip fracture

Outcome	(Historical) Usual care Zero i model (%)	Facilitated BMD testing 2i model (%)	Case management intervention 3i model (%)
BMD Testing	29	68 ^a	80 ^b
Osteoporosis treatment	22	38 ^a	54 ^c
Appropriate care	26	45 ^a	71 ^d

- a. P<0.001 versus (historical) usual care
- b. P=0.06 versus facilitated BMD testing
- c. P=0.03 versus facilitated BMD testing
- d. P<0.001 versus facilitated BMD testing

Ontario:
Ontario Osteoporosis Strategy, Fracture Clinic Screening Program

The Ontario Government has demonstrated great leadership in osteoporosis care with its commitment to develop and support the Ontario Osteoporosis Strategy (OOS)¹⁰. The OOS began in 2005 with funding from the Ministry of Health and Long-Term Care to aid in the reduction of hip fractures and other fragility fractures in Ontario. Crucially, OOS has provided a platform to learn what works and what does not work in the delivery of secondary fracture prevention in the Canadian context. The Fracture Clinic Screening Program (FCSP) of the OOS is delivered by Osteoporosis Screening Coordinators (OSCs) in 38 high volume fracture clinics across the province. By March 2013, >40,000 patients aged ≥50 years who had suffered a fragility fracture had met with an OSC to discuss bone health and future fracture risk.

Recently, an enhancement of the FCSP has occurred with the introduction of the Fast-Track BMD model. Nine of the 38 sites have expanded the original Type C (1i) model of delivery to include BMD testing and completion of fracture risk assessment, thereby reclassifying these FCSPs as Type B (2i) models. An evaluation of the comparative performance of the Fast-Track BMD model was published in June 2013¹¹, the findings of which are shown in table 4.

Table 4. Ontario Osteoporosis Strategy BMD fast-track Type B (2i) model outcomes

Outcome	non-BMD Fast-Track FCSP 1i model (%)	BMD Fast-Track FCSP 2i model (%)
BMD Testing	63	96
Osteoporosis treatment	21	33

The significant improvement in all measured outcomes for the Fast-Track BMD model illustrates how the OOS can evolve to provide a world-leading FLS model for a population of 13.5 million people.

Québec:

Centre Hospitalier Universitaire de Sherbrooke, OPTIMUS program

The OPTIMUS program is focused on engaging primary care physicians to deliver post-fracture osteoporosis care¹². The program has evaluated 2 standards of care, designated minimal (MIN) or intensive (INT) interventions, and compared these to usual care (UC). Interaction with patients in the 3 groups was as follows:

- **Usual care:** Patients were informed that they were participating in a fracture outcome study, that their primary care provider (PCP) would not be contacted by the coordinator and no information linking the patient’s fracture to osteoporosis was provided. Patients were followed-up by telephone at 6 and 12 months. This is a **Type D (Zero i) model**.
- **Minimal intervention (MIN):** Patients were informed by the coordinator of the details of the intervention to which they had been assigned (**identification**). The coordinator explained the link between fracture and osteoporosis verbally and in writing. A letter was sent to the PCP explaining the importance of assessment for osteoporosis and treatment where appropriate. Follow-up calls were made to the patient at 6 and 12 months post-fracture which stressed the importance of osteoporosis treatment and adherence to that treatment. This is a **Type C (1i) model**.

- **Intensive intervention (INT):** In addition to the information provided to the MIN group, blood tests were ordered and a BMD test arranged for the patient (**investigation**). A letter to the PCP included the findings of these tests and a statement that osteoporosis treatment was usually indicated for fragility fracture patients. Also, individual recommendations were made based on the reported test findings and the PCP was invited to contact the consultant rheumatologist to discuss management further, if required. Telephone follow-up was done as for the MIN group, but at 4, 8 and 12 months. If patients had not been treated by the 4 and/or 8 month follow-up call, PCPs were advised in writing to treat bone fragility. This is a **Type B (2i) model**.

Twenty two percent of patients had suffered other fracture(s) prior to the current fracture and 74% of patients were not treated for osteoporosis when they presented with the current fracture. Key findings at 12 months are shown in table 5. It is noteworthy that usual care results in less than a half of patients who have suffered at least 2 fragility fractures – a group that are at very high risk of suffering future fractures – receiving treatment for osteoporosis. As was demonstrated previously with the studies from Edmonton, the OPTIMUS program demonstrates a stepwise improvement in outcomes with more intensive models of care.

Table 5. Outcomes at 12 months

Outcome	Usual care Zero i model (%)	Minimal intervention 1i model (%)	Intensive intervention 2i model (%)
BMD Testing ^a	34 ^b	34 ^b	66 ^b
Osteoporosis treatment (all patients)	36 ^b	55 ^b	62 ^b
Osteoporosis treatment (untreated at baseline)	19 ^b	40 ^c	53 ^{c,d}
Osteoporosis treatment (≥2 fragility fractures)	48 ^b	64	80 ^e

- a. Self-reported BMD testing
- b. P<0.0001 versus usual care
- c. P<0.0001 versus usual care
- d. P<0.05 versus minimal intervention
- e. P<0.05 versus usual care

Leading international models

International task forces established by the International Osteoporosis Foundation (IOF)^{13,14} and the American Society for Bone and Mineral Research¹⁵ have reported that the FLS model has been shown to work effectively in many differently structured healthcare systems throughout the world. This supports Osteoporosis Canada's position that FLS can be implemented in every province in Canada. Several leading examples from elsewhere follow from investigators who have published on the clinical effectiveness and cost-effectiveness of their models of care.

Australia:

Concord Repatriation General Hospital Sydney, Minimal Trauma FLS

The Minimal Trauma Fracture Liaison (MTFL) service¹⁶ (a Type A model) was established in 2005 at this large tertiary referral centre in Sydney. The MTFL service provides a good illustration of effective collaboration between a physician-led FLS and the hospital's Orthogeriatrics Service; the MTFL provides care for non-frail patients with fragility fractures whilst the Orthogeriatrics Service¹⁷ focuses on frail patients, including the majority of hip fractures. The MTFL is delivered by an advanced trainee (i.e. a physician in his/her 4th-6th year of post-graduate training) which required a 0.4-0.5 FTE (Full Time Equivalent)

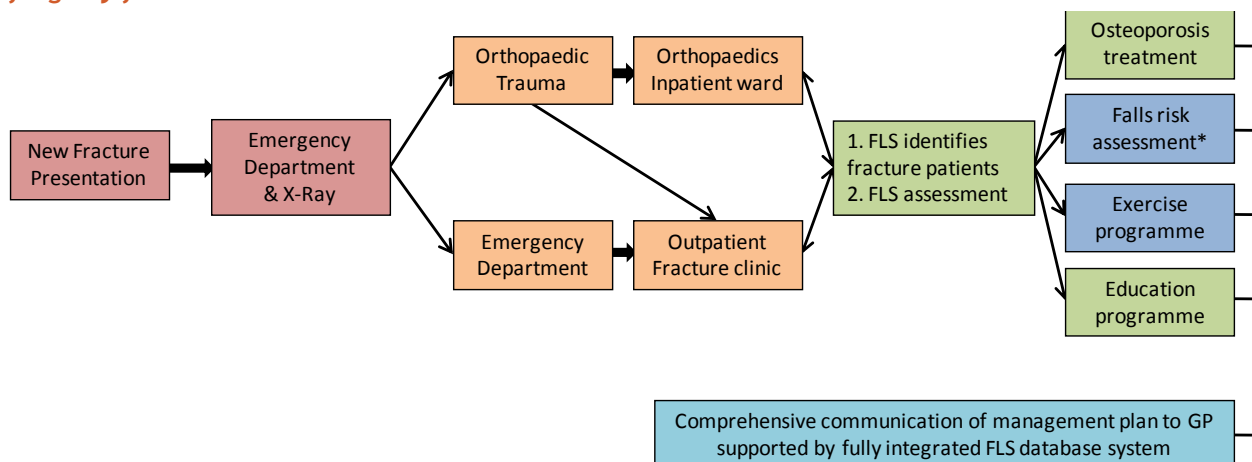
appointment. This is a Type A (3i) model of post-fracture care.

The impact of the MTFL service was evaluated after 4 years. Fracture patients who chose to decline the consultation freely offered by the service, in favour of follow-up with their primary care physician, were considered as a control group for statistical comparison. Refracture incidence for those patients managed by the MTFL service was 80% lower than the control group.

A cost-effectiveness analysis¹⁸ of the MTFL service reported:

- A mean improvement in discounted quality-adjusted life expectancy per patient of 0.089 quality-adjusted life year (QALY) gained
- Partial offset of the higher costs of the MTFL service by a decrease in subsequent fractures, which led to an overall discounted cost increase of AU\$1,486 (CN\$1,460) per patient over the 10-year simulation period
- The incremental costs per QALY gained (incremental cost-effectiveness ratio - ICER) were AU\$17,291 (CN\$16,772), which is well below the Australian accepted maximum willingness to pay for one QALY gained of AU\$50,000 (CN\$48,500)

Figure 2. The structure of the Glasgow Fracture Liaison Service adapted from *The care of patients with fragility fracture*²⁰



* Older patients, where appropriate, are identified and referred for falls assessment

United Kingdom:

The Glasgow Fracture Liaison Service, Scotland

First developed in 1999, the Glasgow FLS is a system that ensures fracture risk assessment, and treatment where appropriate, is delivered to all patients with fragility fractures¹⁹. The Glasgow FLS is a ‘doctor light’ service and is primarily delivered by clinical nurse specialists, who work to pre-agreed protocols to case-find and assess fracture patients. The service is a Type A (3i) model for patients admitted to hospital and Type B (2i) model for those managed in the outpatient setting. Consultant endocrinologists provide medical leadership for the Glasgow FLS. A critical success factor in development of the Glasgow FLS was establishment of a multi-disciplinary stakeholder group from the project’s outset, with representation from all relevant hospital specialities, local primary care and regional health authority and administrative groups.

During the first 18 months of operations¹⁹:

- More than 4,600 patients with fractures of the hip, wrist, upper arm, ankle, foot, hand and other sites were seen by Fracture Liaison Nurse Specialists
- Nearly three-quarters were considered for BMD testing and treatment was recommended for approximately 20% of patients without the need for BMD testing
- 82% of patients tested were found to be osteopenic or osteoporotic at the hip or spine

During the period 2000-2010, 50,000 consecutive fracture patients were assessed by the Glasgow FLS. During this period, hip fracture rates in Glasgow declined by 7.3% compared to an almost 17% increase in England²¹, where only 37% of localities operated an FLS by late 2010²². A Scottish national audit compared case ascertainment for hip and wrist fractures in Glasgow versus 5 other centres operating less systematic models of care²³. Ninety-seven percent of hip fracture and 95% of wrist fracture patients were assessed by the Glasgow FLS whereas less than 30% of fracture patients were assessed by any other service configuration. In May 2011, a formal cost-effectiveness analysis of the Glasgow FLS was published²⁴. This study concluded that 18 fractures were prevented, including 11 hip fractures, and £21,000 (CN\$33,600) was saved per 1,000 patients managed by the Glasgow FLS versus ‘usual care’ in the UK. For clarity, the cost-effectiveness analysis took into account all costs pertaining to delivery of the FLS, including

drug treatment. Accordingly, this study demonstrates that a locality which implements an FLS will save money compared to a locality which chooses not to implement FLS. Put simply, this provides formal health economic evidence that the Glasgow FLS saves money.

United States of America:

The Kaiser Permanente Healthy Bones Program, Southern California

In the late 1990s, Kaiser Permanente in Southern California resolved to close the secondary fracture prevention gap for patients presenting to hospital with hip fractures. Subsequently, the program was expanded to include all older patients presenting with fragility fractures at any site. As time and resources permitted, the Kaiser team undertook a systematic approach to delivering primary fracture prevention to patients at a high risk of suffering their first fragility fracture. The Healthy Bones Program is underpinned by effective case-finding made possible by the state-of-the-art HealthConnect® electronic medical record²⁵. The program is primarily delivered by Care Managers and Nurse Practitioners, who serve as co-ordinators and disease managers. This is a Type A (3i) model.

In 2008, a 37% reduction in the expected hip fracture rate was reported for the population served by the Kaiser Permanente Southern California system (KP-SCal)²⁶. This corresponds to the prevention of 935 hip fractures in the year 2006 (2,510 hip fractures were predicted by actuarial analysis, and 1,575 fractures were actually observed). The cost of treating a hip fracture was approximately US\$33,000 (CN\$34,650). On that basis, it was estimated that the program avoided expenditure of more than US\$30.8 million (CN\$32.3 million) on hip fracture care for KP-SCal in the year 2006. Given that the population served by KP-SCal at the time was 3.1 million members, cost avoidance of this magnitude is very significant. This economic benefit contributed to the Healthy Bones Program being recognised by leading healthcare Chief Executives in the United States as a key strategy for reducing costs and waste, while improving outcomes in a patient-centred fashion²⁷.

References

1. Ganda K, Puech M, Chen JS, et al. Models of care for the secondary prevention of osteoporotic fractures: a systematic review and meta-analysis. *Osteoporos Int*. Feb 2013;24(2):393-406.
2. Majumdar SR, Beupre LA, Harley CH, et al. Use of a case manager to improve osteoporosis treatment after hip fracture: results of a randomized controlled trial. *Arch Intern Med*. Oct 22 2007;167(19):2110-2115.
3. Brown JP, Josse RG, Scientific Advisory Council of the Osteoporosis Society of C. 2002 clinical practice guidelines for the diagnosis and management of osteoporosis in Canada. *CMAJ*. Nov 12 2002;167(10 Suppl):S1-34.
4. Majumdar SR, Lier DA, Beupre LA, et al. Osteoporosis case manager for patients with hip fractures: results of a cost-effectiveness analysis conducted alongside a randomized trial. *Arch Intern Med*. Jan 12 2009;169(1):25-31.
5. Majumdar SR, Johnson JA, Bellerose D, et al. Nurse case-manager vs multifaceted intervention to improve quality of osteoporosis care after wrist fracture: randomized controlled pilot study. *Osteoporos Int*. Jan 2011;22(1):223-230.
6. Majumdar SR, Johnson JA, McAlister FA, et al. Multifaceted intervention to improve diagnosis and treatment of osteoporosis in patients with recent wrist fracture: a randomized controlled trial. *CMAJ*. Feb 26 2008;178(5):569-575.
7. Bogoch ER, Elliot-Gibson V, Beaton DE, Jamal SA, Josse RG, Murray TM. Effective initiation of osteoporosis diagnosis and treatment for patients with a fragility fracture in an orthopaedic environment. *J Bone Joint Surg Am*. Jan 2006;88(1):25-34.
8. Sander B, Elliot-Gibson V, Beaton DE, Bogoch ER, Maetzel A. A coordinator program in post-fracture osteoporosis management improves outcomes and saves costs. *J Bone Joint Surg Am*. Jun 2008;90(6):1197-1205.
9. Morrish DW, Beupre LA, Bell NR, et al. Facilitated bone mineral density testing versus hospital-based case management to improve osteoporosis treatment for hip fracture patients: additional results from a randomized trial. *Arthritis Rheum*. Feb 15 2009;61(2):209-215.
10. Jaglal SB, Hawker G, Cameron C, et al. The Ontario Osteoporosis Strategy: implementation of a population-based osteoporosis action plan in Canada. *Osteoporos Int*. Jun 2010;21(6):903-908.
11. Ontario Osteoporosis Strategy. *Fracture Link: Newsletter - Ontario Osteoporosis Strategy - Vol 1*. June 2013. Toronto 2013.
12. Roux S, Beaulieu M, Beaulieu MC, Cabana F, Boire G. Priming primary care physicians to treat osteoporosis after a fragility fracture: an integrated multidisciplinary approach. *J Rheumatol*. May 2013;40(5):703-711.
13. Akesson K, Marsh D, Mitchell PJ, et al. Capture the Fracture: a Best Practice Framework and global campaign to break the fragility fracture cycle. *Osteoporos Int*. Apr 16 2013.
14. International Osteoporosis Foundation. *Capture the Fracture: A global campaign to break the fragility fracture cycle*. Nyon 2012.
15. Eisman JA, Bogoch ER, Dell R, et al. Making the first fracture the last fracture: ASBMR task force report on secondary fracture prevention. *J Bone Miner Res*. Oct 2012;27(10):2039-2046.
16. Lih A, Nandapalan H, Kim M, et al. Targeted intervention reduces refracture rates in patients with incident non-vertebral osteoporotic fractures: a 4-year prospective controlled study. *Osteoporos Int*. Mar 2011;22(3):849-858.
17. NSW Government Health. The Orthogeriatric Model of Care: Summary of Evidence 2010. In: New South Wales Agency for Clinical Innovation, ed. North Ryde; 2010.
18. Cooper MS, Palmer AJ, Seibel MJ. Cost-effectiveness of the Concord Minimal Trauma Fracture Liaison service, a prospective, controlled fracture prevention study. *Osteoporos Int*. Jan 2012;23(1):97-107.
19. McLellan AR, Gallacher SJ, Fraser M, McQuillan C. The fracture liaison service: success of a program for the evaluation and management of patients with osteoporotic fracture. *Osteoporos Int*. Dec 2003;14(12):1028-1034.
20. British Orthopaedic Association, British Geriatrics Society. *The care of patients with fragility fracture 2007*.
21. Skelton D NF. *NHS Greater Glasgow and Clyde Strategy for Osteoporosis and Falls Prevention 2006-2010: An evaluation 2007-2009 2009*.
22. Royal College of Physicians' Clinical Effectiveness and Evaluation Unit. *Falling standards, broken promises: Report of the national audit of falls and bone health in older people 2010*. 2011.
23. McLellan A, Reid D, Forbes K, et al. *Effectiveness of Strategies for the Secondary Prevention of Osteoporotic Fractures in Scotland (CEPS 99/03)*: NHS Quality Improvement Scotland; 2004.
24. McLellan AR, Wolowacz SE, Zimovetz EA, et al. Fracture liaison services for the evaluation and management of patients with osteoporotic fracture: a cost-effectiveness evaluation based on data collected over 8 years of service provision. *Osteoporos Int*. Jul 2011;22(7):2083-2098.
25. Kaiser Permanente. Kaiser Permanente HealthConnect® Electronic Health Record. <http://xnet.kp.org/newscenter/aboutkp/healthconnect/index.html>. Accessed 24 February, 2012.
26. Dell R, Greene D, Schelkun SR, Williams K. Osteoporosis disease management: the role of the orthopaedic surgeon. *J Bone Joint Surg Am*. Nov 2008;90 Suppl 4:188-194.
27. Cosgrove DM, Fisher M, Gabow P, et al. Ten strategies to lower costs, improve quality, and engage patients: the view from leading health system CEOs. *Health Aff (Millwood)*. Feb 2013;32(2):321-327.