

Other models of post-fracture osteoporosis care

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 (FLS) are to identify fracture patients, conduct investigations to diagnose osteoporosis and assess future fracture risk and, where appropriate, initiate osteoporosis treatment. Type A and Type B models have been considered in Appendix C. **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.

This Appendix considers Type C (1 i) models and Type D ('Zero i') models of post-fracture care, which have the following characteristics:

- **Type C models:** Fracture patients receive education about osteoporosis and receive lifestyle advice including falls prevention. A key feature of this model is that the patient is recommended to seek further assessment because they are at increased risk of osteoporosis and repeat fractures, and the primary care provider (PCP) is alerted that his/her patient has suffered a fracture and that further assessment is needed. This model does not itself undertake BMD testing or assessment of need for osteoporosis treatment.
- **Type D models:** Only provides osteoporosis education to the fracture patient. Type D models do not educate or alert the primary care provider.

Descriptions of service models and key clinical outcomes follow for Type C and Type D models from Canada. 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 described second.

- For the intervention group in Type C models, the process for identification is described.
- Results for the various groups evaluated are tabulated for comparison in a standardised format.

A clear message is evident from these studies; despite the fact that education-based or information-based interventions reduce the post-fracture osteoporosis care gap somewhat, they are considerably less effective than more intensive Type A and Type B models. This observation is echoed by the findings of a systematic review conducted by Canadian investigators on interventions to improve post-fracture care²:

'Comparing various types of interventions, and demonstrating the superiority of system level coordination of care is a key finding of this review. The low performance of educational, general awareness, and medication coverage programs underscores the ineffectiveness of these commonly mentioned, less disruptive interventions in achieving high performance.'

Type C models

Alberta:
Capital Health, Edmonton

Post-wrist fracture care

Post-fracture osteoporosis care was evaluated in a controlled trial for patients presenting with wrist fracture to hospitals in the Capital Health system in Edmonton, Alberta³. Care differed between the intervention and control groups as follows:

- **Usual care group:** Usual care in Canada at the time consisted of notifying the primary care physician (PCP) that the patient was seen and treated for a wrist fracture (with surgery and/or cast), and details of any follow-up plans were conveyed. Importantly, the PCP was not informed that the wrist fracture was suggestive of underlying osteoporosis. Usual care

was enhanced for the control group by provision of educational materials and telephone counselling on falls prevention and home safety, but not about osteoporosis. Patients were encouraged to visit their PCP for more detailed advice and a medication review. This is a **Type D (Zero i) model**.

- **Intervention group:** Patients were identified when they presented with a wrist fracture to either of the 2 largest emergency departments in the region. The intervention consisted of 3 components:
 - **Patient education:** Written materials were supported by a brief telephone conversation regarding osteoporosis. Patients were encouraged to seek further information and counselling from their PCP.
 - **Physician reminders:** The PCP was informed that the patient had suffered a wrist fracture and was now considered at increased risk for osteoporosis.
 - **Treatment guidelines:** A reminder was sent to the PCP, including brief evidence-based treatment recommendations which emphasised that (i) the patient should have a BMD test if not done in the previous year, that (ii) without treatment repeat fractures may occur within a year, and that (iii) bisphosphonate treatment will reduce fracture risk by about a half (second line agents were also mentioned). Local ‘opinion leaders’ signed these guidelines.

This is a **Type C (1i) model**.

The results 6 months after wrist fracture are shown in table 1.

Table 1. Outcomes 6 months after wrist fracture

Outcome	Usual care Zero i model (%)	Intervention 1i model (%)
BMD Testing	17	62 ^a
Physician diagnosed osteoporosis	13	36 ^b
Osteoporosis treatment	10	40 ^c

a. P<0.001 versus usual care

b. P=0.006 versus usual care

c. P=0.002 versus usual care

The authors speculated why in the Type C (1i) model, roughly 40% of intervention group patients did not undergo BMD testing which was readily available and at no cost to the patients in the region. While some patients’ PCP may have based a treatment decision on a BMD test done in the preceding year or two, 20% to 30% of intervention patients who were eligible for testing still did not have a BMD test. The fact that 60% of intervention patients did not receive treatment for osteoporosis illustrates that secondary fracture prevention was not viewed as standard practice by the PCPs.

A second Type C model was evaluated by these investigators in a randomized controlled trial (RCT) in 2008⁴. Patients with wrist fractures all received a package which included information on cast care, information about the study and an educational pamphlet from Osteoporosis Canada. The patients were then randomized to two groups:

- **Control/usual group:** A second copy of the Osteoporosis Canada pamphlet was mailed to these patients, with recommendations to read it and discuss it with their PCP. As per usual care in Canada, PCPs were informed that their patient had suffered a wrist fracture, with details of follow-up plans and appointments. Importantly, the PCP was not informed of wrist fracture being potentially suggestive of osteoporosis.

This is a **Type D (Zero i) model**.

- **Intervention group:** An experienced registered nurse who had additional training and expertise in the diagnosis and treatment of osteoporosis interacted with the intervention group patients. The nurse did not interact directly with the PCP. The objective was to convey 3 key messages to this group of patients and their PCP which were:
 - The fracture 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.

The intervention consisted of 3 components:

- **Patient education:** A brief counselling session by telephone to reiterate the messages in the printed material.
- **Physician reminders:** A patient-specific reminder to the PCP that the fracture indicated the patient

was at risk of osteoporosis.

- **Treatment guidelines:** An actionable summary of evidence-based osteoporosis guidelines was also sent to the PCP.

This is a **Type C (1i) model**.

The results 6 months after wrist fracture are shown in table 2.

Table 2. Outcomes 6 months after wrist fracture

Outcome	Control Zero i model (%)	Intervention 1i model (%)
BMD Testing	18	52 ^a
Osteoporosis treatment	7	22 ^b
Appropriate care*	11	38 ^a

a. P<0.001 versus control group

b. P=0.008 versus control group

* appropriate care in this study was defined as having undergone BMD test and receiving bisphosphonate treatment if bone mass was low (T-score < -1).

The authors concluded that additional strategies should be explored because more than half of patients in the intervention group had not received appropriate care 6 months after their fracture.

Vertebral fracture case-finding

The overwhelming majority of non-vertebral fragility fractures result in the patient presenting to urgent care services. This creates the opportunity for established FLS to respond to the first fracture to prevent the second and subsequent fractures. However, the majority of vertebral (spine) fractures do not come to clinical attention, or when they do, they are not recognised and acted upon in terms of osteoporosis assessment and treatment⁵⁻⁷. This is important because all vertebral fractures – including those that do not cause acute symptoms – are associated with a 2- to 5-fold increase in future fracture risk and a range of other adverse effects including physical deformity, height loss, chronic pain, reduced quality of life and increased morbidity and mortality⁸⁻¹⁰. In an innovative attempt to improve case-finding of vertebral fractures, the Edmonton group sought to improve quality of osteoporosis care for older patients who had vertebral fractures identified incidentally on chest radiographs,

which were taken for clinical reasons other than osteoporosis¹¹.

Patients were recruited to the study from 2 sites in Edmonton which had computerized information systems with electronic triage, patient tracking, electronic health records and digital radiograph archives. Patients who had a chest radiograph done for any reason were included in the study if they were aged 60 years and over and had a vertebral fracture reported by a board-certified radiologist. The aims of the study were to first define rates of usual osteoporosis care following a vertebral fracture and secondly, using a pragmatic controlled trial design, to compare usual care to a PCP only intervention and a PCP and patient intervention. Patients were initially allocated to the usual care group or PCP intervention group based on the PCP intervention being ‘on’ or ‘off’ during alternate weeks. The care delivered to the 3 groups was as follows:

- **Usual care:** Study staff ensured that within 1 week of the Emergency Department (ED) visit the PCP received all documentation about the visit, any planned follow-up and a copy of the official chest radiograph report. Radiologists were not aware of the study and the reports they generated were part of usual clinical care. These patients received usual care for 3 months. This is a Type D (Zero i) model.
- **PCP intervention group:** In addition to patients receiving usual care, the PCP was sent a patient-specific reminder with a summary of evidence endorsed by local ‘opinion leaders’ which emphasized 3 key points:
 - Patients with a vertebral fracture and osteoporosis are at 20-fold increased risk of future fracture



compared with those with no vertebral fracture and normal bones

- This patient's risk of another fracture is as high as 20% over the next year
- Evidence-based treatments can reduce risk of fracture by 50%

This is a **Type C (1i) model**.

Table 3. Outcomes at 3 months for usual care and 3 months after exposure to interventions

Outcome	Usual care Zero i model (%)	PCP intervention 1i model (%)	PCP and patient intervention 1i model (%)
BMD Testing	4	44 ^a	57 ^b
Osteoporosis treatment	2	17 ^a	22 ^c
BMD Testing or treatment	6	49 ^a	65 ^d

a. P<0.001 versus usual care group

b. P=0.038 versus PCP intervention group

c. P=0.39 versus PCP intervention group

d. P=0.01 versus PCP intervention group

intervention took 42 minutes per patient at a cost of \$42. The results of this study were subject to a subsequent formal cost-effectiveness analysis¹². The findings for the 2 interventions were as follows:

- **PCP and patient intervention group:** Three months after the ED visit, patients from the usual care group that were still not receiving osteoporosis treatment were re-allocated to this group (n.b. only 2 usual care patients received an effective prescription osteoporosis treatment within the first 3 months, so 98% of the usual care group were re-allocated). These patients received usual care plus the PCP intervention described above and a 'patient activation strategy'. This included provision of Osteoporosis Canada educational materials by mail and telephone-based counselling by a nurse practitioner to reinforce the content of the printed materials and suggest a visit to their PCP.
This is a **Type C (1i) model**.

- **PCP intervention group:** Compared to usual care, for every 1,000 patients who received the PCP intervention there were:
 - 4 fewer fractures
 - 8 quality-adjusted life years (QALYs) gained
 - \$282,000 saved
- **PCP and patient intervention group:** Compared to the PCP only intervention group, for every 1,000 patients who received the PCP and patient intervention there were:
 - 6 fewer fractures
 - 6 QALYs gained
 - \$339,000 saved

Outcomes for the PCP intervention group were compared to those of the usual care group at 3 months. Three months after exposure to the combined PCP and patient intervention, this 're-allocated usual care group' was compared to the PCP only intervention group. The results are shown in table 3.

Accordingly, the PCP and patient intervention was more cost-effective than the slightly less expensive PCP only intervention. As has been demonstrated in other studies for patients presenting with non-vertebral fractures, these studies demonstrate the significant cost savings that could be achieved by pragmatic and inexpensive interventions to improve osteoporosis care of patients who have vertebral fractures.

Notably, 58% of patients in the study had clinically recognized fractures before their chest radiographs were taken, highlighting the post-fracture osteoporosis care gap and the fact that this was already a very high-risk population. For patients in whom a vertebral fracture was identified, the number-needed-to-treat (NNT) to improve osteoporosis testing or treatment was only 2.

Manitoba

A population-based RCT evaluated the impact of a mailed notification to PCPs, and patients and PCPs, on post-fracture osteoporosis care¹³. Women and men aged 50 years or over who had suffered a fracture of the hip, spine, humerus or forearm were identified

The PCP intervention took an average of 34 minutes per patient at a cost of \$34. The PCP and patient

from administrative data collected by Manitoba Health. Patients were randomized to 3 groups:

- **Usual care group:** Neither physicians nor patients received any targeted notification. **This is a Type D (Zero i) model.**
- **PCP intervention group:** A letter was sent to patients' PCP notifying him or her of the fracture, directing the PCP to provincial guidelines on BMD testing and information on the management of osteoporosis. In addition, a requisition for BMD testing was provided and a flowchart showing the management of care. **This is a Type C (1i) model.**
- **PCP and patient intervention group:** In addition to the letter to the PCP, patients received a letter as well. The patient letter stated that fractures in older people may suggest osteoporosis and patients were encouraged to see their PCP to discuss the need for osteoporosis testing and potential treatment options. Those without a PCP were provided alternative support options. **This is a Type C (1i) model.**

For the >4,000 people who participated in the study, the key findings after 12 months are shown in table 4.

The low rates of post-fracture care in the usual care group, particularly for men, serve to highlight the scale of the current post-fracture osteoporosis care gap in routine practice in Manitoba. The lack of difference between the results for the PCP group and the PCP and patient group suggests there is no additional benefit in notifying patients in addition to their PCP. The authors

conclude that this simple notification approach reduces, but does not close, the post-fracture osteoporosis care gap; still >60% of patients in the most intensive intervention group did not receive appropriate care (BMD Testing or treatment).

The results of this study were subject to a subsequent formal cost-effectiveness analysis¹⁴. The PCP intervention cost was \$7.12 per patient and the PCP and patient intervention \$8.45 per patient. The findings for the 2 interventions were as follows:

- **PCP intervention group:** Compared to usual care, for every 1,000 patients who received the PCP intervention there were:
 - 2 fewer fractures
 - 2 QALYs gained
 - \$22,000 saved
- **PCP and patient intervention group:** Compared to the PCP only intervention, for every 1,000 patients who received the PCP and patient intervention there were:
 - 1 fewer fractures
 - 1 QALYs gained
 - \$18,000 saved

Accordingly, the PCP and patient intervention was more cost-effective than the slightly less expensive PCP only intervention. The authors concluded that these pragmatic interventions were highly cost-effective and both superior to usual care. However, these interventions still left a huge care gap with >60% of fracture patients not receiving appropriate osteoporosis care.

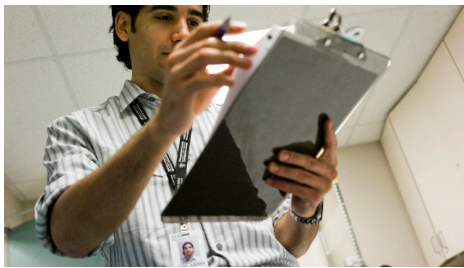
Table 4. Post-fracture care among women and men for 3 groups studied

Outcome	Usual care Zero i model (%)	PCP intervention 1i model (%)	PCP and patient intervention 1i model (%)
Women only			
BMD Testing	5.7	18.6	21.9
Osteoporosis treatment	12.2	17	19.4
BMD Testing or treatment	15.8	30.3	34
Men only			
BMD Testing	0.4	11.9	11
Osteoporosis treatment	7.3	9.9	10.8
BMD Testing or treatment	7.6	19	19.8

Ontario:

Small Community Hospitals in the Ontario Telemedicine Network

A cluster randomized trial evaluated the impact of a centralized osteoporosis coordinator (CC) on post-fracture management of patients presenting with fractures to small community hospitals in Ontario¹⁵. The study involved hospitals without a dedicated osteoporosis screening coordinator that treated more than 60 fracture patients per year in their Emergency Department (ED) who were members of the Ontario Telemedicine Network. Hospitals that agreed to participate were randomized to intervention or



‘attention’ control groups as follows:

- **‘Attention’ control group:** Within 3 months of the ED visit for fracture, patients from control hospitals received educational materials and telephone counselling on fall prevention and home safety from the centralized coordinator. Patients were encouraged to visit their PCP for further advice but did not receive counselling or educational materials relating to osteoporosis. This is a **Type D (Zero i) model**.
- **Intervention group:** The CC followed-up with fracture patients and their physicians to provide recommendations about fracture risk and osteoporosis treatment, and assist with arranging a telehealth consultation to the Multidisciplinary Osteoporosis Program (MOP)¹⁶ for complex patients if required. Specifically, the patient and PCP components of the intervention were as follows:
 - Patient component: The CC telephoned fracture patients to counsel them about fracture risk, recommend follow-up with their PCP to discuss osteoporosis and the need for a BMD test and provided patients with information about osteoporosis management. A reminder telephone call was made at 3 months.

- PCP component: The CC sent the PCP a letter informing them that their patient had suffered a fracture. The letter was tailored to each patient and highlighted:
 - The patient’s high risk for osteoporosis and the need for a BMD test if not already done in the previous 6 months.
 - A high 1 year fracture risk if treatment was not offered to those with T-Scores \leq minus 1.5.
 - The efficacy of first-line treatment with bisphosphonates on fracture risk reduction.
 - The availability of specialist consultation through the MOP if required.

This is a **Type C (1i) model**.

The results 6 months after fracture are shown in table 5. Appropriate care was defined as taking an osteoporosis medication or having normal BMD and receiving prevention advice.

Table 5. Outcomes 6 months after fracture

Outcome	Control Zero i model (%)	Intervention 1i model (%)
Osteoporosis discussion with PCP	55	82 ^a
BMD Test scheduled or done	21	57 ^b
Appropriate care	26	45 ^c

a. $P < 0.0001$ versus control group

b. $P < 0.0001$ versus control group

c. $P = 0.003$ versus control group

Ontario:

Community Hospitals, Greater Toronto

A before and after study evaluated the impact of a simple fracture clinic intervention on diagnosis and treatment of patients presenting to community fracture clinics in the Greater Toronto area¹⁷. This program has not been evaluated in an RCT with a concurrent control/usual care group. The control group used was a historical control comprised of fracture clinic attendees in the 6-9 months preceding the intervention [a **Type D (Zero i)**

model]. The intervention group was identified by a study coordinator from fracture clinic charts of women and men aged over 40 years. An orthopaedic surgeon ensured that the patients met the study criteria. For those patients not receiving osteoporosis interventions at the time of their fracture, the orthopaedic surgeon informed them of their risk of osteoporosis and future fractures. Patients were encouraged to discuss investigation and treatment for possible osteoporosis with their PCP. The orthopaedic surgeon also provided the patient with a standardized letter addressed to their PCP which noted the patient's fracture risk and recommending further assessment. This is a **Type C (1i) model**.

The impact of the intervention was assessed by a telephone interview 3 months after the fracture. The results are shown in table 6.

Table 6. Outcomes 3 months after fracture

Outcome	(Historical) Usual care Zero i model (%)	Intervention 1i model (%)
Follow-up with a physician ^a	50	65
BMD Test ordered ^b	22	67
BMD Test conducted ^c	92	82
Osteoporosis treatment	16	17

a. The patient followed-up with a non-fracture clinic physician (n.b. Among those who followed-up with a physician >90%, in both groups, followed-up with their PCP)

b. Of those who followed-up with a physician

c. Of those who had a BMD test ordered

Accordingly, while the intervention resulted in more patients seeking follow-up with their PCP and a doubling of the proportion for whom BMD tests were ordered, there was **no difference** in the proportion of patients being recommended osteoporosis treatment.

Ontario:

Family practices, Kingston and South-eastern Ontario Region

A cluster randomized study evaluated a multifaceted intervention to improve treatment of osteoporosis for

Appendix D Version 1 – October 20, 2013

This appendix is a complement to Osteoporosis Canada's *Make the FIRST break the LAST with Fracture Liaison Services*, October 2013 – available online at osteoporosis.ca/FLS.

women who had presented with a wrist fracture to Emergency Departments of hospitals in south-eastern Ontario¹⁸. Family practices where the fracture patients' PCPs were based were randomized to intervention or control groups as follows:

- **Control group:** Correspondence was not sent to PCPs or patients during the study. This is a Type D (Zero i) model. (On study completion, all PCPs and patients were sent the same letters as the intervention group. This is known as a crossover group. It is good clinical practice at the end of a clinical trial that maintains a control group of patients – who did not receive any information about their fracture risk – to be given educational material to address that deficit).

- **Intervention group:** The intervention was directed at both the patient and the PCP:

- Patient component: A letter was sent at 2 weeks and 2 months to the woman. This recommended follow-up with their PCP, a checklist of risk for fracture that enabled the woman to calculate her 5 year fracture risk with her PCP and an educational booklet about osteoporosis.

- PCP component: The research coordinator sent a letter at 2 weeks and 2 months to the PCP. This notified the PCP that their patient had suffered a wrist fracture, highlighted the link with osteoporosis and recommended assessment be undertaken. An educational tool and a copy of the treatment algorithm from the Osteoporosis Canada clinical practice guidelines was included.

This is a **Type C (1i) model**.

The results 6 months after wrist fracture are shown in table 7.

Table 7. Outcomes 6 months after wrist fracture

Outcome	Control Zero i model (%)	Intervention 1i model (%)
Osteoporosis counselling from PCP	43	71 ^a
BMD Testing	26	54 ^b
Osteoporosis treatment	10	28 ^c

a. P<0.001 versus control group

b. P<0.0001 versus control group

c. P=0.002 versus control group

Notably, in addition to these findings, osteoporosis knowledge scores did not significantly differ between the intervention and control groups, as noted also by investigators from Alberta above⁴. The authors concluded that approximately 40% of women who were eligible for treatment did not receive it. It was also noted that the lack of impact on patient knowledge may suggest that patient-directed education does not play a significant role in initiation of osteoporosis therapies.

Type D models

Quebec

A population based RCT evaluated the impact of two educational interventions on post-fracture osteoporosis care six to eight months after women had suffered fragility fractures in Quebec¹⁹. Fracture patients were randomized into three groups; control, written material, and video cassette and written material:

- **Control group:** No intervention. This is a **Type D (Zero i) model**.
- **Written materials intervention group:** Women received written educational material on osteoporosis by mail based on information leaflets from Osteoporosis Canada and the 2002 Clinical Practice Guidelines for Diagnosis and Management

of Osteoporosis in Canada. Participants were invited to provide a summary of the 2002 Clinical Practice Guidelines to their PCP. In addition, PCPs were sent a letter detailing the objectives of the Recognizing Osteoporosis and its Consequences in Quebec study²⁰, of which this study was a part, and an invitation to consider investigation and treatment, if appropriate. This is a **Type D (Zero i) model**.

- **Videocassette and written materials intervention group:** Women received the written materials as above and a 15 minute educational video on osteoporosis. This is a **Type D (Zero i) model**.

At approximately 12 months after randomization, the key findings are shown in Table 8.

The authors concluded that these educational interventions did not meaningfully increase osteoporosis diagnosis or treatment in women with recent fractures.

Table 8. Post-fracture care among women 12 months after randomization

Outcome	Control Zero i model (%)	Written materials intervention group Zero i model (%)	Videocassette and written materials intervention group Zero model (%)
Women without diagnosis and treatment at randomization			
Osteoporosis diagnosis made	12	15 ^a	16 ^b
Osteoporosis treatment	8	12 ^c	11 ^d
Women without treatment at randomization			
Osteoporosis treatment initiated	10	13 ^e	13 ^f

- a. P=0.073 versus control group
 - b. P=0.036 versus control group
 - c. P=0.052 versus control group
 - d. P=0.157 versus control group
 - e. P=0.238 versus control group
 - f. P= 0.107 versus control group
- } Not statistically significant

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