Implementation of fracture liaison service in a New Zealand public hospital: Waitemata district health board experience

David Kim, Denise Mackenzie, Rick Cutfield

ABSTRACT

AIM: To analyse the performance of a Fracture Liaison Service (FLS) at Waitemata District Health Board (WDHB), and to detail how systematic secondary fracture prevention can be delivered in a secondary healthcare setting in New Zealand.

METHOD: Clinical details of patients supervised by the WDHB FLS during the calendar year 2014 were reviewed and analysed. Additional information including treatment compliance and re-fracture rates were sought a year after initial intervention.

RESULTS: During the 12-month period, 301 patients with fragility fracture were seen by the WDHB FLS. All patients had clinical and laboratory assessment, one-to-one education by the FLS co-ordinator. One hundred and twenty-one patients had dual energy x-ray absorptiometry (DEXA) performed. One hundred and thirty-four of 226 treatment naive patients were started or recommended to be started on a bone protection therapy, bisphosphonate in almost all cases, and another 25 of 75 patients had adjustment made to their current therapy. Of those who were started or continued on treatment, adherence rate was 70% at a mean follow-up of 12 months.

CONCLUSION: An effective secondary fracture prevention programme, such as a FLS, can be successfully implemented in a New Zealand district hospital setting.

Secondary fracture prevention is a well-recognised care gap globally. Fracture liaison service (FLS) is a growing and popular concept for systematic secondary fracture prevention, and has been reported to be cost-effective in a number of studies. FLS exists and operates in various forms throughout the world but the core essence of FLS is having a FLS co-ordinator. This co-ordinator role is to systematically identify patients with a fragility fracture, complete patient assessment and appropriate investigations, and to initiate treatment or provide recommendations to GPs to initiate appropriate bone protection treatment.

Waitemata District Health Board (WDHB) is the largest district health board in New Zealand, serving a population of over half a million in Auckland. The WDHB FLS was established in 2012 as one of the first secondary fracture prevention services in New Zealand. As well as FLS co-ordinator, the service has two FLS clinicians (endocrinologists) who provide regular clinical oversight. On the basis of its 2013 work, WDHB FLS has attained ‘bronze’ status on the International Osteoporosis Federation’s ‘FLS Map of Excellence’.

After encountering various short-comings in the first two years of its service delivery, a number of significant amendments were made to our FLS protocol, and this new protocol was implemented from January 2014. We present results of the 12 months’ work for the calendar year 2014.
Method

FLS study population
As an initial step, we sought to identify those patients over the age of 50 years who presented to a WDHB hospital (inpatient or outpatient) with a fragility fracture—defined as a fracture sustained from falling from standing height or less. Those patients with fracture of the rib, sternum, clavicle, any bone of head and neck, hands or feet were excluded.

FLS personnel
We had a dedicated 0.5 full-time equivalent (FTE) FLS nurse co-ordinator who actively screened for and identified relevant cases and implemented appropriate care. Regular weekly meetings took place with FLS co-ordinator and FLS clinician discussing each case and making management decisions.

Case detection, assessment and record keeping
The FLS co-ordinator identified cases through screening outpatient fracture clinic lists and orthopaedic inpatient lists. Relevant demographic and clinical details of identified patients were prospectively kept in an electronic database and included type of fracture, past fracture history and current or previous bone-protection treatment. Adequate ‘bone-protection treatment’ was considered to be one or more of the following: current bisphosphonate treatment or being on ‘bisphosphonate drug holiday’ for less than two years, teriparatide, hormone replacement therapy (HRT), raloxifene or an osteoporosis clinical trial drug. Calcium and/or vitamin D supplements were not considered ‘bone-protection treatment’ in this analysis. The medical history, including current medications, smoking status and alcohol consumption was routinely reviewed.

Investigation protocol
All patients routinely had serum calcium and renal function test. Those found to have raised serum calcium had serum PTH measured. Those under the age of 60 were also screened for C-reactive protein, TSH and coeliac antibodies. Men under the age of 70 had morning serum total testosterone levels measured. Dual energy x-ray absorptiometry (DEXA) was routinely performed in those under the age of 75 years and in some patients over 75 years where the DEXA result might alter a management decision or patient compliance with recommended treatment. All DEXA scans were performed by a private DEXA provider contracted by WDHB, at no cost to the patient. All DEXA scans were performed on General Electric Lunar Prodigy densitometers.

Intervention and its implementation
All identified patients received either ‘face-to-face’ or ‘over-the-phone’ education from the FLS co-ordinator regarding what osteoporosis is and its implications. Those over the age of 75 were routinely recommended to start on a bisphosphonate therapy. Those under the age of 75 whose fracture risk, after incorporating the DEXA result, was assessed to be high (>3% hip fracture risk in 10 years using FRAX and/or Garvan fracture risk calculator) were recommended to commence on bisphosphonate therapy. Alternative therapy and/or specialist clinic follow-up was arranged for those already on bisphosphonate therapy, with multiple or recurrent fractures or with secondary causes of osteoporosis needing specialist review, or patients with severe osteoporosis at the discretion of the FLS clinician. Assessment results, treatment and follow-up recommendations were communicated directly to the patient, and a formal letter detailing these was routinely sent to the patients’ general practitioner (GP). Whenever feasible and deemed appropriate, zoledronic acid infusion was delivered either while inpatient or arranged to be delivered as outpatient at one of WDHB hospitals.

Follow-up: compliance review
Electronic medication dispensing records (TestSafe) were reviewed to ascertain adherence to treatment in those who were recommended to start or were started on treatment by the WDHB FLS. If dispensing of the relevant treatment agent was not evident on the electronic system, the patient’s general practice was called to ascertain current treatment. This compliance screening was performed at a mean of 12 months after the treatment initiation (range 6–18 months).
Re-fracture detection
Patients were screened for re-fracture at a mean of 14 months (range 8–20 months) after the initial FLS input by screening electronic records for new fracture encounters at WDHB.

Ethical approval
Ethical approval was not sought because assessment, treatment and follow-up, as outlined above, is delivery of standard clinical care for FLS.

Results

Patient demographics
Three hundred and one patients were identified and reviewed. The general characteristics at the time of patient identification are summarised in Table 1. Mean age was 72 years with 86 patients between the age 50 and 65 years. The majority of patients were female of European descent.

Past history
At the time of initial assessment, 37% (112) of patients had history of at least one fragility fracture [i.e. fracture(s) preceding index fracture], and only 53 of these 112 patients were on pre-existing bone protection treatment. An additional 22 patients were on pre-existing bone protection treatment without a past history of fragility fracture(s). The majority (63/75) of the pre-existing bone protection treatment used was alendronate or zoledronic acid. There were a small number of patients on a ‘drug holiday’ after a course of bisphosphonate, while a similar number were on HRT or a clinical trial drug, and one patient was on teriparatide (Table 1).

Types of index fractures
One hundred and thirty-eight (46%) of our cohort had a wrist fracture as their index event, with another 79 (26%) with a fractured femur, 34 (11%) humerus, and the remaining 50 (17%) with a mixture of fracture sites, mostly pelvis and ankle.

DEXA scan
One hundred and twenty-four (41%) patients were offered a DEXA scan performed, and three patients either refused or did not attend the DEXA appointment. Of 121 patients who had DEXA, 36 (30%) patients were found to have osteoporosis (lowest T score -2.5 or below) and 56 (46%) had osteopenia (lowest T score between -1.0 and -2.5). The remaining 29 (24%) patients had normal DEXA indices.

Intervention/treatment
Of 226 treatment-naive patients, 131 (58%) were either treated with zoledronic acid or recommended to start zoledronic acid or an oral bisphosphonate. Seventy-six patients had education with or without vitamin D supplementation only, and the remaining 19 patients either declined FLS, DEXA and/or the treatment or died prior to treatment recommendation (Figure 1).

Of 75 patients who were on bone protection treatment prior to the index

<table>
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<tr>
<th>Characteristic</th>
<th>(n=301)</th>
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<tr>
<td>Gender (female)</td>
<td>271</td>
<td>(90)</td>
</tr>
<tr>
<td>Mean age (+/- SD)</td>
<td>72</td>
<td>(+/- 11)</td>
</tr>
<tr>
<td>Ethnicity (Pakeha/other European)</td>
<td>267</td>
<td>(89)</td>
</tr>
<tr>
<td>Past history of fracture</td>
<td>112</td>
<td>(37)</td>
</tr>
<tr>
<td>Pre-existing treatment with past fracture</td>
<td>53</td>
<td>(25)</td>
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<table>
<thead>
<tr>
<th>Pre-existing treatment used (n=75)</th>
<th>(%)</th>
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<tbody>
<tr>
<td>Bisphosphonate</td>
<td>63</td>
</tr>
<tr>
<td>Bisphosphonate drug holiday</td>
<td>4</td>
</tr>
<tr>
<td>HRT</td>
<td>4</td>
</tr>
<tr>
<td>Trial drug</td>
<td>3</td>
</tr>
<tr>
<td>Teriparatide</td>
<td>1</td>
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Fracture, 25 (33%) had their treatment changed by the FLS. Two died and the remaining 48 had no change to their pre-existing treatment.

Overall, of the 292 patients alive at the time of treatment recommendation, 205 were either on, or started or had been recommended to start bone protection treatment by the FLS.

Significantly abnormal laboratory test results were detected in only three patients. Thirteen patients were referred to bone/endocrine clinic either owing to these laboratory abnormalities or due to multiple and/or recurrent fractures while on treatment. One patient had treatment for hyperparathyroidism and another patient for hypogonadism. Two patients were initiated on teriparatide therapy.

Compliance
At a mean follow-up of 12 months, 136 of 193 (70%) patients who were alive and were expected to be on bone protection treatment were compliant with therapy.

Re-fracture
At a mean follow-up of 14 months, 22 of 282 (7.8%) patients who were alive were found to have had a re-fracture since the index fracture.

Discussion
Our study illustrates that a highly effective FLS can be implemented in a secondary healthcare setting in New Zealand. Even with 0.5 FTE FLS co-ordinator time, we have intervened in over 300 patients with fragility fractures in a 12-month period. 40% of these patients had a DEXA scan, and over 50% were either started or recommended to start on bone protection treatment or had an alteration to pre-existing therapy. Additionally, essentially all patients received one-to-one education about their condition and non-pharmacological intervention advice for fracture prevention. A clinical summary was routinely sent to the patient’s GP, detailing assessment results and management recommendations. This has the potential not only to improve patients’ care but to raise awareness about osteoporosis with the general practice.

A large proportion (37%) of our patients have had a past history of fragility fracture, with less than half of them having been established on adequate bone protection treatment, highlighting that both ‘fracture begets fracture’ and that there is a large unmet need for those suffering a fragility fracture. Significantly, more patients were osteopenic (46%) than osteoporotic (30%) on our DEXA assessment. This is consistent with the literature that more fragility fractures occur in the osteopenic group, although individual fracture risk is still substantially higher in those with osteoporosis. Significant laboratory abnormalities in our cohort were uncommon, indicating underlying conditions such as coeliac disease, hyperparathyroidism or thyrotoxicosis were uncommon. We have observed reasonable compliance rate of 70%
at 12 months. This compares favourably to previous compliance studies for bisphosphonate therapy,\(^8,9\) and is at least in part due to frequent use of zoledronic acid infusion in our cohort (50 of 193 treated cases).

However, our crude method of confirming ‘prescription fill-rate’ may have over-estimated compliance in those on oral agents. Our compliance rates are not dissimilar to those reported by other FLS.\(^10,11\) It is difficult to draw direct comparisons of re-fracture rates with other studies due to inherent differences in population characteristics as well as the short duration of our study. Additionally, a few re-fracture cases may have been missed, as we relied on WDHB hospital electronic records for detection. Nonetheless a re-fracture rate of 7.8% (22/282) at 14 months is in line with observed rates in other FLS studies.\(^4,11\)

We believe the most important success factor for a well-performing FLS is having a dedicated FLS co-ordinator. Oversight from a clinician with appropriate expertise and interest who is regularly available for discussion of patient management is equally important. These core components have been advocated by various international clinical standards guidelines,\(^6,12,13\) and adopted by most FLS around the world. Funding and logistical support at an operational level is equally important. Other success factors include having a systematic method of case identification and having a rational and practical FLS protocol for assessment, investigation and treatment, with ready access to DEXA scans.

Although the WDHB FLS has identified and intervened on over 300 patients in a year, this is estimated to represent less than a quarter of total number of fragility fracture cases presenting to WDHB hospitals in 2014. Limiting factor is the time needed for education, assessment and intervention by the FLS co-ordinator and not with difficulty in identifying appropriate fracture cases. To resolve this issue we are in the process of attaining extra funding from the DHB to increase FLS co-ordinator time. Clinical areas in our DHB where fragility fracture cases are currently potentially being largely missed by FLS include emergency departments and general medical wards. We are also aware that a large number of vertebral compression fractures are being detected on chest x-rays but without appropriate intervention and follow-up. Other challenges that our FLS initially encountered include finding reliable and less time-consuming ways to identify appropriate cases, and not having a clinic space for patient consultation. We also found face-to-face contact with patients and accurate database record keeping time-consuming. Another current care gap is the lack of a streamlined falls prevention programme for those at high risk of falls, though this vital aspect is being reviewed urgently.

In conclusion, we believe that nationwide implementation of a secondary fracture prevention programme, such as FLS, is feasible and timely in New Zealand. While individual district health boards may plan and fund their own programme, funding and strategic support at a government level would enable and expedite implementation of secondary fracture prevention programmes throughout New Zealand, which in-turn will reduce individual suffering and healthcare costs.

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**Competing interests:**
Nil.

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