

Improving diagnosis and treatment of osteoporosis: evaluation of a clinical pathway for low trauma fractures

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Abstract

Summary Diagnosis and treatment of osteoporosis in hospitals is poor. We compared patient outcomes before and after implementation of a clinical protocol for low-trauma fractures. Patients in the pathway were more likely to receive information about osteoporosis or osteoporosis medications. Therefore our clinical pathway is effective in improving osteoporosis information and treatment.

Introduction Effective therapies for reducing fracture risk are available, yet under-utilised in hospital settings. We aimed to increase rates of initiation of osteoporosis investigations, pharmacological treatment, treatment continuation, and follow-up general practitioner (GP) visits.

Methods Comparison of patient outcomes before and after implementation of a clinical pathway in patients admitted

for low-trauma fractures to the Department of Orthopaedics and Trauma at The Queen Elizabeth Hospital, Adelaide.

Results Patients enrolled in the osteoporosis clinical pathway (n=28) were more likely than patients receiving usual care (n=28) to have received information about (54% vs. 29%; $p<0.05$), or a prescription for osteoporosis medication (53% vs. 25%, $p<0.05$). Differences in proportions of patients visiting their GP post fracture and in osteoporosis investigations suggested or undertaken were not significant. At the later audit, the high proportion of patients receiving information about osteoporosis medication had been maintained (51%). Prescription of osteoporosis medications increased to 83% ($p<0.01$), and more patients saw their GP post fracture (87%; $p<0.01$). High rates of medication adherence were reported in patients in all groups receiving prescriptions.

Conclusion A clinical pathway for improving hospital management of osteoporosis is effective in improving education about, prescription for, and uptake of osteoporosis medications.

Keywords Osteoporosis · Clinical protocols · Bone density · Fractures

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Introduction

Osteoporosis is a common, yet under-diagnosed and under-treated form of musculoskeletal disease [1] which is associated with bone fractures. Approximately one third of men and half of women aged over 60 will sustain a fracture in their lifetime [2]. Experiencing a fragility fracture is associated with significant rates of morbidity and mortality, particularly in the case of hip fractures [3, 4], and places the individual at increased risk of further fractures [5–7]. Osteoporosis is expensive, costing Austra-

lian taxpayers an estimated A\$7.4 billion per annum, with over 25,000 healthy lives lost in the financial year 2000–01 [8]. Despite evidence that further fractures may be prevented through patient education and initiation of pharmacological treatment [9–11], self-reported prevalence of osteoporosis is low [12], and many patients who sustain a fracture do not receive any diagnosis, treatment or information regarding osteoporosis [13, 14]; and patients leave hospital with their fracture treated but with osteoporosis uninvestigated, undiagnosed and untreated [13–19]. Therefore, targeting patients who sustain fractures to receive assessment and treatment may reduce refracture rates and subsequently the personal, social and economic burden of osteoporosis.

The study had the following objectives:

- to evaluate the efficacy of an osteoporosis clinical pathway designed to increase rates of follow-up, investigation and treatment for osteoporosis administered in a hospital setting,
- to determine the rates of follow-up by a general practitioner (GP) post-fracture, and subsequent rates of investigation and treatment for osteoporosis,
- to examine the prevalence and source of patient education regarding osteoporosis and osteoporosis-related services,
- to investigate long-term pharmacological osteoporosis prophylaxis use in patients enrolled in the clinical pathway,
- to determine re-fracture rates in these patients,
- to investigate general practitioners compliance with suggested investigations and treatment plans for these patients post-discharge from acute care.

Materials and methods

Phase 1: Comparison of patients before and after pathway introduction

Setting and participants

Participants were patients, aged ≥ 45 years who had been admitted to the Department of Orthopaedics and Trauma at The Queen Elizabeth Hospital (TQEH), South Australia, between 1 May 2003 and 31 January 2004 for treatment of a fracture sustained with a minimal degree of trauma or subsequent to a fall from standing height or less. The first 48 patients who were admitted after 1 May 2003 received standard care under existing protocols and were treated as the control group, while the 'pathway group' were the first 49 patients enrolled in the osteoporosis clinical pathway after July 2003. Patients were excluded ($N=7$) if they had

insufficient contact details or were deceased when matched to mortality data. Next of kin were approached if patients had memory loss or dementia. Participants provided written informed consent in accordance with the Declaration of Helsinki (1996). The study was approved by the North Western Adelaide Health Service Ethics of Human Research Committee. Fifty-six patients or next-of-kin (62%, 56/90) consented to participate and completed a questionnaire. The final sample included 28 subjects in each of the control and pathway groups.

Intervention

Patients meeting inclusion criteria were identified by the clinical pharmacist from computerised hospital lists and case notes. Treatment consisted of oral triple therapy of a bisphosphonate (risedronate 35 mg weekly), calcium supplement (600 mg twice daily) and a Vitamin D supplement (ergocalciferol 1000 units daily). Contraindications to risedronate were gastric ulceration, previous intolerance to a bisphosphonate, or inability to sit upright for 30 minutes after administration. The pharmacist recommended prescription of triple pack therapy by junior medical officers both during admission and on discharge with backup and reinforcement by the orthopaedic physician.

Patients commencing therapy received individual counselling from the clinical pharmacist and were provided with a standard osteoporosis pack. Interpreters were used, and next of kin were contacted in patients with dementia. Each pack contained patient information about osteoporosis and the drugs prescribed, a letter to the general practitioner (GP), an information leaflet for a physiotherapy self-management course, a list of local community falls prevention services, and support products for risedronate. This was presented in a bright orange bag and labelled "Osteoporosis Pack". Patients were offered the opportunity to enrol in the Aventis ACTNOW support programme.

The letter to the patients' GP stated that the patient had been identified as having an osteoporotic fracture and had been provided with an osteoporosis pack. Also included were the date of the X-ray that confirmed the fracture, medications prescribed and suggestions as to the investigation of secondary causes of osteoporosis. It was clearly stated that although the patient had been started on refracture prevention therapy NO investigations of osteoporosis or secondary causes had been undertaken.

Procedure

Participants completed follow-up questionnaires by home interview or mail 6–12 months following hospital admission for the fracture (mean 44 ± 13 weeks). Information

collected in the questionnaire included the following: demographic information, osteoporosis lifestyle factors, falls and fracture history, family history of fractures or osteoporosis, treatments taken before or initiated following the fracture, osteoporosis-related investigations suggested or undertaken (e.g., bone density test by DXA (dual emission X-ray absorptiometry) serum calcium and vitamin D), follow-up visits to a GP, and whether any information about osteoporosis or osteoporosis-related services had been provided to the patient, as well as the source of the information.

Phase 2: Evaluation of the osteoporosis clinical pathway and General Practitioner feedback

This phase incorporated patients enrolled in the osteoporosis care pathway from February–October 2004. Participants or their proxy (next of kin or nursing home staff member) were interviewed by telephone. Information collected was identical to that collected in phase 1 of the study.

In addition to collecting patient information, a single page questionnaire was sent to all GP's in the catchment area of TQEH by the Western Adelaide Division of General Practice. This requested information about whether individual patients had been seen by the GP post-discharge, and whether investigations and prophylactic medications suggested under the protocol had been arranged.

Statistical analyses

Chi-square and student t-tests were used to examine sample characteristics. Significance levels of 10% were used in phase 1 due to the small sample size. Conventional significance levels of 5% were used in phase 2. Analyses were conducted using SPSS version 12.0.1 (phase 1) and SPSS version 13.0 (phase 2).

Results

Patient characteristics

Table 1 shows that in phase 1 of the study patients in the pathway group were significantly older than the control group, less likely to have completed high school, more likely to have had their questionnaire completed by next-of-kin, and, by study design, had shorter time to interview. There were no significant differences between the two groups in regard to gender, place of residence or osteoporosis risk factors. Table 1 also shows that patients in phase 2 of the study were similar to the control group in phase 1 in relation to gender, place of residence and survey respondent.

The most common site of fracture was the hip (See Fig. 1). There were no significant differences in fracture types between pathway and control patients (phase 1) or between patients in phase 1 and phase 2. In phase 2 of the study, two participants presented with a more than one fracture at time of admission.

Osteoporosis investigations

Table 2 shows that in phase 1 of the study there were no significant differences between patients enrolled in the pathway and control patients in relation to recommendations for or initiation of osteoporosis investigations.

Osteoporosis medication

Table 3 shows that in phase 1 of the study significantly more patients enrolled in the care pathway recalled receiving information about medication that could improve bone density or may help in preventing future fractures. Table 3 also shows that this level of recall was maintained in phase 2 of the study. Information about osteoporosis medication was most often provided by the patient's GP;

Table 1 Characteristics of participating patients

	Phase 1 Usual Care n=28	Phase 1 Pathway n=28	Phase 2 Pathway n=65
Demographics			
Age, mean±SD (yrs) ^{a***}	71.3±13.7	79.2±8.4	76.17
Female (%) ^{a***}	71.4	78.6	70.8
Did not complete high school (%) ^{a*}	57.1	78.6	Not collected
Resident of nursing home (%)	14.3	32.1	15.4
Time to interview, mean ± SD (wks)	55.3±4.4	32.7±7.1	Not collected
Next-of-kin as respondent (%) ^{a***}	10.7	39.3	20.0
Osteoporosis risk factors			
Current smoking (%) ^{b**}	25.0	14.3	4.6
Previous adult fracture (%)	53.6	42.9	33.8
Family history of fracture (%)	35.7	17.9	32.3

*p≤0.1, **p≤0.05.

^a statistically significant difference between phase 1 usual care and phase 1 pathway

^b statistically significant difference between phase 1 usual care and phase 2 pathway

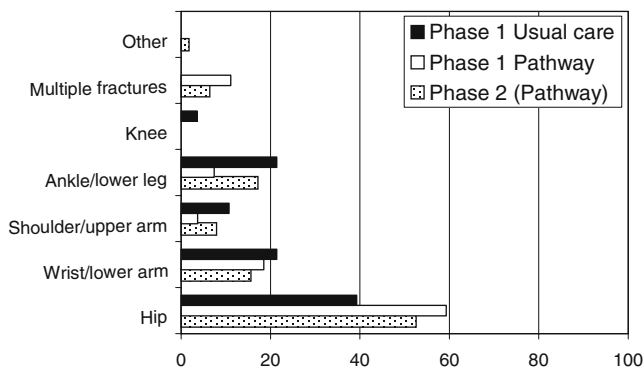


Fig. 1 Site of bone fracture

however, information was also provided by hospital pharmacy staff, an orthopaedic surgeon or from other sources. Patients in the pathway group in phase 1 were more likely than controls to have had osteoporosis medication (bisphosphonate, calcium, vitamin D or hormone replacement therapy) prescribed but this difference was not statistically significant. The majority of patients for whom osteoporosis medication was prescribed, commenced and continued prescribed medications; these numbers were not significantly different between pathway and control groups. The majority of patients in phase 2 were also prescribed osteoporosis medication; most of these patients commenced and continued the medication. Reasons for ceasing medication included the patient not understanding why the medication was needed, the patient reporting experiencing side effects, being unwilling to take the medication or not having a prescription renewed by a GP.

General practitioner follow-up

The majority of patients consulted a GP following their fracture (See Table 4). Most of these consultations occurred within one month of the patient sustaining the fracture. There was no significant difference between the pathway and usual care groups in to the proportion who visited a GP for follow-up, although patients in phase 2 were more likely to have seen a GP than patients in phase 1. Reasons

provided for not seeing a GP post fracture included: patient being discharged to a rehabilitation centre (35%), patient was a resident of a nursing home (15%) and patient belief that they did not need to visit a GP because the fracture had been “fixed” (25%)

GP responses to emailed questionnaire

No responses to the emailed questionnaire were received from GPs in the hospital catchment area.

Discussion

The results of this study demonstrate that a clinical pathway administered in a hospital setting is an effective means of increasing rates of treatment and follow-up for osteoporosis in this patient group. The increase in the prescription of osteoporosis medications following pathway introduction seen in phase 1 of the current study is similar to results of an audit of a fracture protocol in Tasmania, Australia [20]. However, we have also demonstrated that this increase in prescription of osteoporosis medications is sustained over time, and that initiating pharmacological treatment in a hospital environment appears to influence the rate that patients fill their scripts and continue to take the medication after discharge. To maintain this level of adherence also requires that the medical practitioners who see the patients after discharge from hospital continue to prescribe these medications. We found that individuals who were enrolled in the osteoporosis clinical pathway were no more likely than controls to receive osteoporosis investigations (e.g., DXA, serum calcium and Vitamin D), but were significantly more likely to have received information about pharmaceutical interventions, and more likely to have actually been prescribed pharmacological osteoporosis prophylaxis. Regardless of whether patients were enrolled in the pathway, adherence to prescribed medications was still high at the follow-up audit.

The results of this study provide support for those of Majumdar et al. [15] who found that treatment delivered via an osteoporosis pathway was associated with an increase in the rates of BMD testing and prescription of osteoporosis treatment. The results also support those of Sidwell et al. [16], who found that there was improvement in the management and treatment of osteoporosis in patients enrolled in a clinical pathway.

The inclusion of patients with dementia through proxy interviewing is a strength of this study. This group is at significant risk of falls and fractures [21], yet are often excluded from research due to the difficulties associated with obtaining consent and collecting information. Face-to-face home interviews in phase 1 of the study assisted in a

Table 2 Osteoporosis investigations

	Phase 1 Usual Care n=28	Phase 1 Pathway n=28	Phase 2 Pathway n=65
Investigation suggested	32.1	39.3	29.2
Investigation initiated	32.1	35.7	26.1
DXA ^a suggested	25.0	28.6	27.7
DXA conducted	25.0	21.4	29.2
Vitamin D/calcium test suggested	17.9	35.7	29.2
Vitamin D/calcium checked	14.3	28.6	29.2

^a DXA=dual emission X-ray absorptiometry

Table 3 Osteoporosis treatment, medications and services

	Phase 1 Usual care		Phase 1 Pathway		Phase 2 Pathway	
	n=28		n=28		n=65	
	n	%	n	%	n	%
Received information about osteoporosis medication ^{d***c***}	8	28.6	15	53.6	33	50.8
Source of information about osteoporosis medication ^a						
General practitioner ^c			9	39.0	12	36.4
Hospital pharmacy staff			6	26.0	6	18.1
Orthopaedic surgeon			3	13.0	6	18.1
Other sources			3	13.0	2	6.1
Could not remember			2	9.0	7	21.3
Total			23	100.0	33	100.0
Any osteoporosis medication prescribed ^{d***c***f***}	7	25.0	15	53.6	54	83.1
Medication commenced ^{b,d**}	7	100.0	13	86.7	48	88.9
Medication continued ^b	6	85.7	10	76.9	46	95.8

^a Pooled data from pathway and control groups in phase 1

^b Denominator is N in column immediately above

^c Fisher's exact test used due to small cell sizes

** $p \leq 0.05$, *** $p \leq 0.01$.

^d statistically significant difference between phase 1 usual care and phase 1 pathway

^e statistically significant difference between phase 1 usual care and phase 2 pathway

^f statistically significant difference between phase 1 pathway and phase 2 pathway

reasonable response rate (62%) and ensured that patients with hearing difficulties or those too frail to travel were able to participate in the study.

However the study does have several limitations. Due to time and funding restrictions, the sample size in phase 1 proved insufficient to achieve statistically significant differences between groups for some parameters recorded. The retrospective study design relied on participant recall and it is therefore difficult to ascertain the accuracy with which participants may have recalled events that had occurred some time previously. phase 1 participants in both the control and pathway groups anecdotally reported that they were distressed and confused whilst in hospital and had difficulty in recalling any information that they received during their admission. It is also possible that patient's next-of-kin or nursing home staff were unaware of the osteoporosis information provided to fragility fracture patients whilst in

hospital. Validity of the study could be improved by comparing participant responses from hospital, GP, or pharmacy records.

The Queen Elizabeth Hospital is located in a low socio-economic area within Adelaide [22]; therefore these findings may be generalisable to hospital populations with similar socio-economic status and education levels but not necessarily to the wider South Australian population.

Despite efforts to examine the contribution of GPs to the success of the osteoporosis clinical pathway, no responses were received for this section of the study.

In conclusion, despite the number of studies advocating the need for greater efforts in diagnosing and treating osteoporosis in fragility fracture patients, there have not been efficient clinical pathways developed in South Australia to assist in the provision of appropriate investigation and treatment. Evidence suggests that clinical path-

Table 4 General practitioner follow-up

	Phase 1 Usual Care		Phase 1 Pathway		Phase 2 Pathway	
	n=28		n=28		n=65	
	n	%	n	%	n	%
Saw GP following fracture ^{b***}	20	71.4	16	57.1	57	87.6
Reasons for not seeing GP ^{a,c}						
Discharge to rehab hospital			7	28.6		
Nursing home resident			3	19.0		
Fracture fixed			5	52.4		
Other			5	28.6		
Total			20	100.0		

^a Pooled data from pathway and control groups in phase 1
*** $p \leq 0.01$.

^b statistically significant difference between phase 1 pathway and phase 2 pathway

^c Not multiple response

ways may be an effective means with which these issues can be addressed; however, there is still a significant problem with failure to adequately follow up patients to ensure that recommendations for investigation and treatment are heeded.

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Conflict of interest statement Dr. Gibb has received honoraria from Sanofi Aventis and Pfizer.

Appendix

The Osteoporosis SA Refracture Prevention Pathway Steering Committee consisted of: Ms Gillian Leach, Ms Pauline Kelly (Osteoporosis South Australia), Associate Professor Nick Fazzalari (Division of Tissue Pathology, Institute of Medical and Veterinary Science), Ms Anna Fergusson, Ms Valerie Williams (South Australian Divisions of General Practice), Dr Linda Ferris (Department of Orthopaedics, Modbury Public Hospital), Ms Anne Taylor, Ms Tiffany Gill (Population Research and Outcome Studies Unit, Department of Health), Professor Trevor Hearn, Ms Vanessa Wells (Department of Surgery, Orthopaedic Unit, Repatriation General Hospital), Associate Professor Julian McNeil, Ms Laura Laslett (The University of Adelaide Discipline of Medicine, Modbury Public Hospital), Dr Alice McLennan (Reproductive Medicine Unit (Repromed), The University of Adelaide), Dr Pat Phillips (Endocrinology Unit, The Queen Elizabeth Hospital and Health Service), Professor Malcolm Smith (Department of Medicine, Rheumatology Unit, Repatriation General Hospital).

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