Factors associated with receiving anti-osteoporosis treatment among older persons with minimal trauma hip fracture presenting to an acute orthogeriatric service

R. Gunathilake[a,b,*], E. Epstein[a], S. McNeill[c], B. Walsh[a,d]

[a] Staff Specialist in Geriatric Medicine, Department of Geriatric Medicine, John Hunter Hospital, Newcastle, NSW, Australia
[b] Conjoint Fellow, School of Medicine and Public Health, University of Newcastle, Callaghan, NSW, Australia
[c] Clinical Nurse Specialist, Department of Orthopaedics, John Hunter Hospital, Newcastle, NSW, Australia
[d] Conjoint Senior Lecturer, School of Medicine and Public Health, University of Newcastle, Callaghan, NSW, Australia

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ABSTRACT

Background/Aim: The aim of this study was to investigate factors that were associated with receiving anti-osteoporosis treatment (AOT) among patients with minimal trauma hip fracture admitted to an Australian tertiary trauma centre under the Acute Orthogeriatric Service (AOS) over a 6 month period.
Design: Observational study using prospectively collected data.
Methods: Demographic and clinical characteristics of 211 patients were extracted from the local hip fracture registry and electronic medical records. The outcome measure was receipt of AOT before separation from the AOS. Binary logistic regression was used to identify factors independently associated with treatment.
Results: 91 (45%) patients received AOT, including 51 (25.2%) treatment-naive patients. Factors significantly associated with receiving treatment included higher serum vitamin D level (OR 1.44, 95% CI 1.23–1.70, p < 0.001) and trochanteric vs. cervical fracture (OR 2.67, 95% CI 1.30–5.49, p = 0.007). Living in a residential aged care facility (RACF) prior to the index fracture (OR 0.2, 95% CI 0.08–0.54, p = 0.001) and higher American Society of Anaesthesiologists (ASA) physical status score (OR 0.5, 95% CI 0.25–0.98, p = 0.04) significantly lowered the likelihood of treatment. Age, gender, cognitive impairment, premorbid walking ability, previous fragility fracture and renal impairment did not correlate with treatment.
Conclusion: A significant proportion (55%) of hip fracture patients did not receive AOT in hospital. The probability of receiving treatment appears to be significantly associated with serum vitamin D level, fracture type, place of residence and comorbidity burden.

Introduction

Advancing age is associated with increased prevalence of osteoporosis and a propensity to fall [1,2] (JGMS). As a result, older persons are at increased risk of fragility fracture, defined as a fracture occurring from low energy trauma, such as falling from the standing height or less, or in the absence of any obvious trauma [3]. Hip fractures are one of the most feared complications of osteoporosis in older persons, and are strongly associated with adverse outcomes, including higher mortality rates and increased functional decline and dependence [4–6]. Patients with hip fracture are 3.2 times more likely to suffer another fragility fracture [7]. Eight percent of hip fracture sufferers experience a second hip fracture within 5 years [8]. The mortality and morbidity associated with a second fragility fracture is even higher than with the initial fracture [9,10].

The armamentarium for treatment of osteoporosis is growing. Approved treatment options include antiresorptive agents such as bisphosphonates, denosumab, oestrogens, selective oestrogen receptor modulators, and calcitonin; and bone forming agents, strontium ranelate and teriparatide [11]. Randomised controlled trials provide strong evidence for the efficacy of anti-osteoporosis treatments (AOT) in preventing subsequent fractures following first fragility fracture [12]. Further, bisphosphonates in particular have been shown to reduce mortality [12,13]. Hospitalisation for fragility fracture must be viewed as an opportunity for intervention [14]. Newer parenteral antiresorptive agents such as

* Corresponding author at: Staff Specialist in Geriatric Medicine & General Medicine, Department of Geriatric Medicine, Rankin Park Campus, John Hunter Hospital, New Lambton, NSW 2305, Australia.
E-mail address: roshangun@yahoo.com (R. Gunathilake).

zolendronic acid and denosumab do not require patients to remain upright and are better tolerated and therefore can be given in the post-operative period [15]. These agents are also administered less frequently (annually and 6-monthly, respectively) potentially aiding future adherence. However, many patients leave hospital with their osteoporosis untreated [15] and a large proportion of patients do not receive treatment within 12 months of index fracture [16,17]. In the United Kingdom and some part of the United States, orthogeriatric and fracture liaison service models incorporating a multidisciplinary approach to patient care have been shown to improve clinical outcomes in patients with hip fracture, including secondary fracture prevention [18,19].

Few studies have investigated factors that determine whether hip fracture sufferers receive AOT. No previous publication to our knowledge has explicitly studied correlates of AOT among hospitalised hip fracture patients in the setting of orthogeriatric care. The aim of the present study was to examine factors associated with receiving AOT among a group of patients with hip fracture admitted to an Australian tertiary trauma centre under an Acute Orthogeriatric Service (AOS).

Methods

Subjects

Prospectively collected data of all patients presenting to the John Hunter Hospital (JHH), a major tertiary trauma centre in Newcastle, New South Wales (NSW), Australia, between August 2015 and January 2016 with proximal femur fracture were extracted from the Australia and New Zealand Hip Fracture Registry (ANZHFR) [20]. The ANZHFR records every consecutive proximal femur fracture patient admitted under the JHH AOS and contains a wide range of de-identified data including demographics, premorbid walking ability, pre-operative cognitive state, American Society of Anaesthesiologists (ASA) physical status score, type of fracture and surgery performed, details of osteoporosis treatment, and short-term clinical and functional outcome. Subjects with peri-prosthetic or high-trauma fracture, and those with fractures associated with malignancy are excluded from the local registry.

The orthogeriatric model of care

The JHH commenced reorganization of clinical care of acute hip fracture patients in 2013 in line with best available evidence and practice guidelines laid down by the Agency of Clinical Innovation, NSW [21]. The AOS was introduced in 2014 with acute proximal femur fracture patients aged ≥65 years admitted to a dedicated hip fracture ward under the joint care of an orthopedic surgeon and a geriatrician. Prior to reorganization, these patients had been admitted under an orthopedic surgeon with geriatric and medical consultation service available on request. The acute orthogeriatric team consisted of a specialist in Geriatric Medicine, one senior and one junior registrar, and one fracture liaison clinical nurse specialist. This team was also supported by a multidisciplinary team including a physiotherapist, occupational therapist, pharmacist, nutritionist and a social worker. The orthogeriatric care focused on perioperative medical optimization, joint planning of the surgical schedule with the orthopedic service, evaluation and management of pain, early mobilization, medication rationalization, comprehensive re-fracture prevention assessment including future falls and fracture risk assessment and investigation and management of osteoporosis, and discharge planning.

We primarily based any new diagnosis of osteoporosis on the presence of fragility fracture in this patient population. Although measurement of Bone Mineral Density (BMD) with dual x-ray absorptiometry is the gold standard for diagnosis of osteoporosis, several guidelines recommend that treatment can be started in patients with prior fragility fracture without the need of a BMD test [22]. In fact, focus on obtaining bone densitometry prior to initiation of AOT may result in missed opportunities for treatment [23]. Outpatient BMD measurement for eligible patients was arranged to further estimate severity as well as for treatment monitoring. We performed laboratory investigations including serum and urinary calcium, serum 25-hydroxy vitamin D, serum parathyroid hormone, thyroid-stimulating hormone, and liver and renal function tests to exclude secondary osteoporosis as clinically indicated.

Independant variables

A number of variables that may influence the outcome were examined, including age, gender, residential status and premorbid mobility. The ASA score was included as a summary comorbidity measure [24]. Patients were considered to have cognitive impairment if they had been diagnosed to have dementia prior to the hip fracture, or had scored <25 on Mini-Mental State Examination or <26 out of 30 on Montreal Cognitive Assessment [25]. We included type of fracture as a dependant variable given some evidence indicating that patients with intertrochanteric fracture are likely to have more severe osteoporosis than those with cervical fractures [26,27]. Fracture site was identified on plain radiographs by a specialist in radiology. If a fracture was suspected despite a negative radiograph, computed tomography was used to confirm the fracture and to identify the anatomical site. Previous fragility fracture was defined as above (see Introduction). Serum 25-hydroxy vitamin D level (normal ≥50 nmol/L) and estimated Glomerular Filtration Rate (eGFR, normal ≥60 ml/min/1.73 m^2) on post-operative day 1 were extracted from electronic medical records; these had been estimated by observers blinded to participants' clinical profile through a National Association of Testing Authorities (NATA)-accredited hospital pathology service.

Outcome (dependant) variable

The dependant variable was receipt of AOT by hip fracture patients before separation from the AOS. A patient was considered to have received AOT if appropriate AOT was initiated in hospital, or AOT that had been initiated prior to the admission was continued. The type and administration of AOT was verified by retrospective review of medical records.

Ethics approval

Ethics approval for the study was obtained from the Hunter New England Human Research Ethics Committee.

Statistical analysis

Data analysis was performed using IBM SPSS Statistics 20 software (IBM SPSS Inc., Armonk, New York). Bivariate analyses were used to display summaries of variable distributions, stratified by patients who had received osteoporosis treatment prior to separation from the AOS vs. those who had not. Difference between patients who had received vs. not received treatment was examined using the Chi Square test for categorical variables and the T-test for Independent Samples for continuous variables. Binary logistic regression was undertaken to determine which factors were independently associated with receiving AOT in hospital. Analyses resulting in values of $P < 0.05$ were considered significant. The Hosmer-Lemeshow goodness-of-fit test was performed to evaluate the adequacy of the models.