Nutritional assessment and intervention in patients admitted with a femoral neck fracture: a chronicle of missed opportunities

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Abstract  The aim of this study was to document current practice in the nutritional assessment and intervention and treatment of osteoporosis for patients admitted to an Australian teaching hospital with a femoral neck fracture and compare this to established guidelines. We prospectively collected descriptive data on a consecutive sample of 183 femoral neck fracture patients aged 60 years and above. We documented whether a dietetic assessment had been sought and, when relevant, nutritional intervention was recommended. We searched case records and databases for pre-operative measurements of albumin, total lymphocyte count and vitamin D. We noted requests for bone densitometry and medications prescribed on discharge, particularly those used to treat osteoporosis. Pre-operative albumin concentrations were measured in 111 patients and total lymphocytes were measured in 180 patients. These were low in 42 and 130 respectively. Both albumin and total lymphocytes were low in 31 of 111 patients in whom both were measured. Referral for dietetic assessment was made for 47 subjects and 27 received dietary protein-energy supplementation. One subject had vitamin D status measured and another was referred for bone densitometry. On discharge, seven subjects were taking calcium supplements, one was taking hormone replacement therapy and another was taking a bisphosphate. This audit of current practice at our institution revealed that the care of older adults presenting with femoral neck fracture focuses on the fracture rather than modifiable risk factors for subsequent fractures. We are now working with clinicians to improve implementation of evidence-based practice for treatment and rehabilitation of femoral neck fracture patients. (Aust J Nutr Diet 2001;58:86-91)

Key words: fractured hip, femoral neck fracture, nutritional status, nutrition assessment, nutrition intervention, osteoporosis, evidence-based guidelines

Introduction

Fractured neck of femur is a major cause of morbidity and mortality in older people (1) and the associated disease burden is expected to climb dramatically as the population ages (2). In Australia, patients with osteoporotic fractures are the fourth most frequent users of hospital beds and in 1994 to 1995, acute hospital care resulting from femoral neck fracture cost $46 million in New South Wales alone, with rehabilitation costing an additional $20 million (3).

Recently, Australian evidence-based guidelines for the management of patients with femoral neck fracture have been published (4). These guidelines are based on a systematic review of randomised controlled trials and meta-analyses of studies involving patients aged more than 50 years with femoral neck fracture. In the peri-operative period, the use of prophylactic anticoagulants, prophylactic antibiotics, regional anaesthesia, pressure-relieving mattresses, and internal surgical fixation were all supported by National Health and Medical Research Council (NHMRC) level I evidence (evidence obtained from a systematic review of all relevant randomised controlled trials).

Amongst those treatment strategies supported by NHMRC level II evidence (evidence obtained from at least one properly designed randomised controlled trial) was the importance of routine nutritional assessment and, where appropriate, dietary intervention using protein supplementation. Undernutrition is an independent risk factor for osteoporosis and hip fracture (5) and nutrition supplementation trials have evaluated a variety of nutritional supplements administered as oral sip feeds (6-9) or by nasogastric tube (10-13) and report on the effect of reversal of undernutrition and improvement in clinical outcomes. Although the quality of trial methodology has been variable, clinical outcomes were shown to improve in those patients receiving oral nutrition supplementation (7) and to a lesser degree, nasogastric feeding (10).

Strategies to treat osteoporosis, and thus lower the risk of osteoporotic femoral neck fractures, have also been proposed. A consensus development conference in 1996 (14) promoted the prevention and treatment of bone loss using methods such as hormone replacement therapy in women and bisphosphonates (inhibitor of bone reabsorption). This forum also endorsed measurement of bone density in conjunction with pharmacological treatment options (15). As part of the complete management of osteoporosis, attention to an adequate dietary intake of calcium and vitamin D and overall nutrition is considered important for optimal recovery from fracture and in the prevention of subsequent fractures.

Currently, there are few data regarding the clinical approach to prevention and treatment in elderly Australians with a recent femoral neck fracture. Dietary interventions have been explored in two small pilot studies conducted in NSW during the 1990s but these results have not yet been published (16,17). Published studies con-
conducted overseas which have investigated nutritional status and outcomes for patients with femoral neck fracture have included patients admitted only from the community or those who were cognitively intact (7,18–21). Therefore patients from residential care with dementia who are most likely to be at risk (22,23) have been systematically excluded.

Currently in our hospital, as in many others, the clinical pathways and protocols for treatment following femoral neck fracture do not include routine nutritional assessment. Instead, referrals are made from medical or nursing staff on a case-by-case basis. Similarly, whilst osteoporosis management is widely discussed, it is not systematically addressed. Realising that messages from research do not always translate into practice, we were interested in exploring the gap between current practice in our hospital and what the evidence base is suggesting in terms of nutrition and osteoporosis management. The aim of this study was to document current clinical practice in the nutritional assessment, intervention and treatment of osteoporosis for patients admitted to an Australian teaching hospital with a femoral neck fracture. Current practice in this hospital was compared to established guidelines for nutritional management (4) and osteoporosis with a view to identifying areas for further intervention (15).

Methods

The study was conducted at Flinders Medical Centre, a 430-bed university teaching hospital and the major public hospital in the southern region of Adelaide, South Australia. The region has a population of 255 000, of whom 42 000 (16%) are aged over 65 years. Flinders Medical Centre is the major trauma centre for the southern region of Adelaide and its hinterland and the majority of people from the region with femoral neck fracture are treated surgically there. At Flinders Medical Centre all patients with femoral neck fracture are admitted under the care of the orthopaedic surgery service following initial assessment in the hospital’s emergency department.

We sought to include in the study all patients aged over 60 years admitted to Flinders Medical Centre with a femoral neck fracture between August 1998 and June 1999. Patients were excluded if their fracture was pathological or if they did not undergo surgery. Patients were approached between three and five days post-operatively and invited to participate in the study. A research assistant discussed the study, provided an information sheet and obtained written consent from the eligible patients. Where patients were unable to provide consent due to communication or cognitive impairments, surrogate consent was sought from their carer or family. The study was approved by the Flinders Medical Centre Committee of Clinical Investigations.

After receiving consent we collected information on age, gender, usual place of residence, social living situation, marital status, type of surgical procedure and number of co-morbid medical conditions from medical case records. Upon discharge from hospital we determined whether the patient had been referred to a dietitian and, where relevant, the type of nutritional intervention that was recommended was determined by auditing the medical case records. We searched the case records and relevant laboratory databases for any measurements of serum albumin, or total lymphocyte count taken during the admission but prior to surgery and of serum vitamin D at any time during the admission. Figure 1 shows the data collection process for the audit. We chose the serum albumin concentration and total lymphocyte count as markers of nutritional status because they have predictive value in this population (18), tend to be routinely collected on admission to hospital, and are relatively inexpensive when compared with other laboratory markers such as prealbumin and retinol binding protein. We used a cut-off of less than 35 g/L for serum albumin (24) and less than 1.5x10^9/L for total lymphocyte count (25) as an indication of poor nutritional health. Body mass index and weight change were not measured as body weight and height were not routinely measured in all patients. We sought evidence of vitamin D deficiency because of its association with osteoporosis and risk of fracture and because of its prevalence in elderly people, particularly among those living in residential care (26,27). Following discharge from hospital we noted from laboratory databases any requests for bone density measurement during the hospital stay and recorded medications used to treat osteoporosis being prescribed on discharge.

All descriptive analyses were conducted using the SPSS statistical package (SPSS for Windows, version 9.0, 1999, SPSS Inc, Chicago).

Results

Two hundred and fifteen people were admitted with a fractured hip. Four patients died before surgery, thus 211 patients were included in the study. Four patients died before surgery and their case records were not included.

Figure 1. Flow diagram indicating the progress of data collection for the study

Day 1
Patient admitted to hospital with femoral neck fracture. Routine bloods taken in accident and emergency ward

Day 3 Post-operative
Informed consent obtained

Day 3-4 Post-operative
Baseline data collected from medical case records

Day 2-111
Patient discharged from hospital

Following discharge

Medical case record reviewed and referral and intervention by dietitians documented

Pathology, radiology and pharmacy databases reviewed and pre-operative biochemistry, bone densitometry and discharge medications documented

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were eligible for inclusion in the study and 183 agreed to participate. The mean age of patients was 82.5 years (sd ± 7.6; range 60–103) and 121 (66%) were female. The mean age of females (81.9 ± 7.8) was slightly greater than that of males (81.9 ± 7.8). The median length of hospital stay (acute and rehabilitation) for those patients admitted from the community was 20 days (range 2–111 days), from a hostel was 17.5 days (range 2–28 days) and from a nursing home was six days (range 2–18 days). Other demographic features of the study group are summarised in Table 1.

Data on the biochemical markers of nutritional status are summarised in Table 1. Pre-operative serum albumin concentrations were available for 111 patients (61%). Serum albumin was below the usually accepted cut-off value for good nutritional health of 35 g/L (24) in 49% of males and 33% of females. Fifty-nine per cent of patients admitted from a nursing home who had a pre-operative serum albumin measured had a level less than 35 g/L. Pre-operative total lymphocyte count was available for 180 patients (98%) and this was lower than the usually accepted reference value for good nutritional health of greater than 1.5x10⁹/L (25) in 72%. In all, 31 (28%) patients had both a low pre-operative serum albumin concentration and low total lymphocyte count.

Forty-seven patients (26%) were referred to a dietitian for nutritional assessment, and of these 27 (56%) received nutritional support through nutrient-dense meals and/or oral sip feeds. The dietetic interventions undertaken are summarised in Table 2. No patients received enteral or parenteral feeding.

Although 13 of the 22 nursing home patients, with albumin concentration measured, had a low pre-operative albumin level, only five were referred to a dietitian and three received protein-energy supplementation through nutrient-dense meals or oral sip feeds. Only one patient had bone densitometry measurement and another had vitamin D status measured. On discharge from hospital, four patients were taking calcium supplements, five were taking vitamin D supplements (calcitriol), one patient was taking a bisphosphonate and one patient was taking hormone replacement therapy. Four patients were taking oral corticosteroids at the time of their discharge.

<table>
<thead>
<tr>
<th>Table 1. Characteristics of patients admitted to hospital with a femoral neck fracture. Values are n (%) unless otherwise stated</th>
</tr>
</thead>
</table>
| Subject characteristics | Admitted from home  
 | (n = 119) | Admitted from lodge or hostel (n = 26) | Admitted from nursing home (n = 38) | Total study group (n = 183) |
| Age | | | | |
| Mean ± sd (years) | 81.1 ± 6.8 | 84.5 ± 6.2 | 86.3 ± 8.0 | 82.5 ± 7.6 |
| 60–69 years | 5 (4) | 0 (0) | 1 (2) | 6 (3) |
| 70–79 years | 37 (31) | 5 (19) | 5 (13) | 47 (26) |
| 80–89 years | 66 (56) | 12 (46) | 20 (53) | 98 (54) |
| 90 years and over | 11 (9) | 9 (35) | 12 (32) | 32 (17) |
| Gender | | | | |
| Female | 82 (69) | 18 (69) | 21 (55) | 120 (66) |
| Marital status | | | | |
| Single or divorced | 12 (10) | 7 (27) | 5 (13) | 24 (13) |
| Married or de facto | 40 (34) | 2 (8) | 11 (29) | 53 (29) |
| Widowed | 67 (56) | 17 (65) | 22 (58) | 106 (58) |
| Number of co-morbidities | | | | |
| 0 | 18 (15) | 4 (15) | 7 (18) | 29 (16) |
| 1 | 44 (37) | 3 (12) | 12 (32) | 59 (32) |
| 2 | 29 (24) | 8 (31) | 11 (29) | 48 (26) |
| 3 | 19 (16) | 7 (27) | 6 (16) | 32 (18) |
| 4 or more | 9 (8) | 4 (15) | 2 (5) | 15 (8) |
| Pre-operative serum albumin | n | 74 | 15 | 22 | 111 |
| Mean ± sd (range) | 36.2 ± 5.0 (20–49) | 35.1 ± 6.8 (19–42) | 33.3 ± 3.2 (28–39) | 35.5 ± 5.0 (19–49) |
| < 35 g/L | 23 (31) | 6 (40) | 13 (59) | 42 (38) |
| Pre-operative total lymphocytes | n | 119 | 25 | 36 | 180 |
| Mean ± sd (range) | 1.2 ± 0.6 (0.16–3.28) | 1.2 ± 0.7 (0.47–3.36) | 1.2 ± 0.6 (0.53–2.76) | 1.2 ± 0.6 (0.16–3.36) |
| < 1.5x10⁹/L | 86 (72) | 18 (72) | 26 (72) | 130 (72) |
| Pre-operative serum albumin < 35 g/L and total lymphocyte count < 1.5x10⁹/L | n (%) | 17 (23) | 4 (27) | 10 (45) | 31 (28) |
Discussion

To our knowledge, this is the largest Australian study of nutritional assessment and management in people hospitalised with a femoral neck fracture. Our laboratory data suggest that this elderly and predominantly female group were of poor nutritional health as 38% had a low serum albumin concentration on admission and 72% had a low lymphocyte count. Referral rates to dietitians for nutritional assessment and intervention with protein supplements were low.

Our results are consistent with smaller studies in NSW suggesting that patients with femoral neck fracture are likely to be undernourished. One pilot study was a randomised controlled trial of 30 patients designed to explore nutritional supplementation and its effect on biochemical parameters (serum albumin concentration, total lymphocyte count) and clinical outcomes (16). The mean serum albumin concentration was less than 35 g/L on admission for one of the three groups but this did not reach significance and all three groups had a low total lymphocyte count. The other Sydney pilot study of 34 elderly femoral neck fracture patients assessed nutritional status upon admission to hospital using mid-arm circumference, serum albumin concentration, haemoglobin and total lymphocyte count (17). In this study the investigators found that 12 of the 34 patients had a mid-upper-arm circumference below the 5th percentile and 31 had one or more biochemistry values below normal.

A recently published US study of elderly patients hospitalised following femoral neck fracture found that 18% had a low serum albumin concentration at the time of admission and 57% had a low lymphocyte count (18). However, this study excluded patients who were previously non-ambulant, cognitively impaired or from residential care. A New Zealand study of 39 consecutive patients with a hip fracture reported that one-third had a low serum albumin concentration on admission (28) whilst a similar study also in New Zealand found that 42% of recruited femoral neck fracture patients had at least two, and 9% had three, indicators of protein-energy malnutrition present on admission (29).

Table 2. Dietetic referrals and type of dietetic intervention by usual place of residence. Values are n (%) 

<table>
<thead>
<tr>
<th>referrals to dietitian</th>
<th>Home (n = 119)</th>
<th>Hostel (n = 26)</th>
<th>Nursing study group (n = 38)</th>
<th>Total (n = 183)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High energy or protein supplements</td>
<td>9 (8%)</td>
<td>5 (19%)</td>
<td>7 (18%)</td>
<td>21 (45%)</td>
</tr>
<tr>
<td>High energy or protein meals</td>
<td>5 (4%)</td>
<td>6 (23%)</td>
<td>5 (13%)</td>
<td>16 (34%)</td>
</tr>
<tr>
<td>Altered consistency diet</td>
<td>4 (3%)</td>
<td>4 (15%)</td>
<td>7 (18%)</td>
<td>15 (32%)</td>
</tr>
<tr>
<td>Other diet intervention</td>
<td>2 (2%)</td>
<td>1 (4%)</td>
<td>1 (3%)</td>
<td>4 (9%)</td>
</tr>
</tbody>
</table>

(a) A patient could be included in more than one type of dietetic intervention.

Alternative indices of protein-energy malnutrition have been reported in previous studies, including mid upper-arm circumference and/or tricep skinfold thickness (16, 17, 29, 30) yet despite the different parameters used to define malnutrition, the results are similar, that is femoral neck fracture patients are often admitted to hospital with poor nutritional health. Identifying those at risk at admission is important because nutritional health of femoral neck fracture patients may decline during hospital admission, with one British study demonstrating mid upper-arm circumference and tricep skinfold thickness decreased over the 60-day study period while resting energy expenditure remained higher than normal values (30).

A major finding of our study is that in our hospital, nutritional health at admission to hospital and beyond is largely ignored in this vulnerable group with haphazard testing of biochemical indices useful in nutritional assessments and few patients receiving referral for a formal dietary assessment and subsequent intervention. In our hospital, as in many others, a dietitian is the vital link in the provision of nourishing meals and nutritional supplements at the ward level. We believe that the lack of routine nutritional assessment on admission to hospital, represents a missed opportunity. If there was routine screening for deficiencies, appropriate treatment could then commence directly. Although a high prevalence of undernutrition in hospital patients was first demonstrated over 20 years ago (31), its prevalence has since remained unchanged or perhaps worsened (32), despite some evidence that intervention can improve nutritional status and clinical outcomes (33). Nutritional health is particularly important in those hospitalised patients with femoral neck fracture, as undernutrition has been shown to adversely effect the rate of post-operative complications and prolong length of hospital stay (18). Furthermore, there is some evidence that protein-energy supplementation prevents complications and shortens length of stay for patients with femoral neck fracture (7, 10). Poor nutritional health is also a risk factor for osteoporosis and further femoral neck fracture (5), and an adequate dietary intake is vital in maintaining bone strength (34) and in preventing the skeletal effects of vitamin D deficiency (35).

Another missed opportunity that we chronicled related to the detection and management of metabolic bone disease. Though vitamin D deficiency is common in people living in residential care (26), vitamin D concentrations were measured in only one patient in our study. Routine screening for vitamin D deficiency would allow for more rapid implementation of pharmacological management in the prevention of subsequent fracture. Patients who have sustained one osteoporotic fracture are at an increased risk of further osteoporotic fractures and it has been argued that these patients should be targeted for intervention (36). There is now evidence for the efficacy of bisphosphonates (37), hormone replacement therapy (38), vitamin D and calcitriol (39) in the management of osteoporosis and in secondary fracture prevention. However, these strategies were overlooked in the majority of patients in our study. Bone densitometry to assess osteoporosis was seldom requested.

There are some limitations that should be considered in the interpretation of our study including the possibility that the decreased serum albumin concentration was not
solely reflective of nutritional status but had been affected by other factors such as trauma, stress and co-morbidities. Furthermore, the biochemical parameters were collected on a subgroup of the total femoral neck fracture patients only. This study was designed as an audit of current practice only. It was not designed to define the nutritional status of the patients, only to comment on the routine management as it presently occurs. Anthropometric measurements including mid-upper arm circumference, tricep skinfold thickness or body weight were not routinely collected and neither were assessments of patients’ dietary calcium and vitamin D intake. It is possible that strategies for the secondary prevention of fractures which we are unaware of (e.g. osteoporosis treatment) were initiated following the patients’ discharge from hospital. However, most were referred back to their general practitioner without any formal recommendations for secondary prevention of fracture and did not have routine hospital outpatient follow-up.

We do not know whether clinical practice in other hospitals is similar to ours but there is an obvious need for other institutions to review their practice critically and if necessary to develop strategies to assist the implementation of evidence-based guidelines in patients with femoral neck fracture. Potential barriers to the implementation of guidelines may need to be identified and overcome. These may include a lack of awareness of available evidence or a reluctance to accept it, but it may also include lack of ownership of the issue and organisational barriers (40,41).

This audit of current practice revealed that the care of elderly people presenting with a femoral neck fracture focuses on the fracture and tends to overlook the importance of measuring deficiencies in order to intervene appropriately and thus to modify risk factors for further fractures. We are now working with clinicians on the ward to improve the implementation of evidence-based practice and clinical pathway protocols for the treatment and rehabilitation of patients with femoral neck fracture. Further research is urgently required to develop strategies for the implementation of evidence-based guidelines, to assess these strategies objectively and to evaluate the contributions of medical, nursing and allied health staff to the improvement of recovery for this important patient group.

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References


