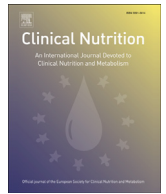




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## Original article

Multidisciplinary, multi-modal nutritional care in acute hip fracture inpatients – Results of a pragmatic intervention<sup>☆</sup>Jack J. Bell<sup>a,b,\*</sup>, Judith D. Bauer<sup>b</sup>, Sandra Capra<sup>b</sup>, Ranjeev Chrys Pulle<sup>a</sup><sup>a</sup>The Prince Charles Hospital, Queensland Health, Brisbane, Australia<sup>b</sup>Centre for Dietetic Research, School of Human Movement Studies, University of Queensland, Brisbane 4072, Australia

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## SUMMARY

**Background & aims:** Malnutrition is highly prevalent and resistant to intervention following hip fracture. This study investigated the impact of individualised versus multidisciplinary nutritional care on nutrition intake and outcomes in patients admitted to a metropolitan hospital acute hip fracture unit.

**Methods:** A prospective, controlled before and after comparative interventional study aligning to the CONSORT guidelines for pragmatic clinical trials. Randomly selected patients receiving individualised nutritional care (baseline) were compared with post-interventional patients receiving a new model of nutritional care promoting nutrition as a medicine, multidisciplinary nutritional care, foodservice enhancements, and improved nutrition knowledge and awareness. Malnutrition was diagnosed using the Academy of Nutrition and Dietetics criteria.

**Results:** Fifty-eight weighed food records were available for each group across a total of 82 patients ( $n = 44$ ,  $n = 38$ ). Group demographics were not significantly different with predominantly community dwelling (72%), elderly (82.2 years), female (70%), malnourished (51.0%) patients prone to co-morbidities (median 5) receiving early surgical intervention (median D1). Multidisciplinary nutritional care reduced intake barriers and increased total 24-h energy (6224 vs. 2957 kJ;  $p < 0.001$ ) and protein (69.0 vs. 33.8 g;  $p < 0.001$ ) intakes, reduced nutritional deterioration over admission (5.4 vs. 20.5%;  $p = 0.049$ ), and increased discharge directly back to the community setting (48.0 vs. 17.6%;  $p = 0.012$ ). Trends suggested a reduction in median length of stay (D13 vs. D14). Inpatient mortality remained low across groups (5.2%, 2.3%).

**Conclusions:** Multidisciplinary nutritional care improves nutrition intake and outcomes in acute hip fracture inpatients. Similar pragmatic study designs should be considered in other elderly inpatient populations perceived resistant to nutritional intervention.

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## 1. Introduction

## 1.1. Cost of malnutrition

Hip fracture patients are predominantly female, thin, elderly, traumatised, and prone to multiple co-morbidities, post-operative

*Non-standard abbreviations:* ABW, adjusted body weight; MMNC, multi-disciplinary and multi-modal nutritional care; INC, individualised nutritional care.

<sup>☆</sup> **Conference presentation** Preliminary findings from this study have been accepted as an abstract for presentation at the ESPEN Congress on Clinical Nutrition and Metabolism, Leipzig, Germany, 2013.

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complications, and protein-energy malnutrition.<sup>1–3</sup> Patient, healthcare, and community costs of malnutrition are substantial and malnutrition is now recognised as the most costly co-morbidity associated with this patient group.<sup>4,5</sup> Malnutrition identified on admission appears primarily related to chronic illness, social, or environmental issues.<sup>6</sup> Post-operative intakes in this group routinely fail to meet energy and protein requirements over extended admissions; wasting and cachexia contribute to further deterioration in post-surgical nutritional status and patient and healthcare outcomes.<sup>3,6–10</sup>

## 1.2. Barriers to nutritional care

Meeting the nutrition requirements of hip fracture patients is challenging.<sup>2,6,10</sup> Poor oral intakes in elderly hospital inpatients result from a combination of medical, psychosocial, environmental barriers, in addition to misguided patient and staff perceptions.<sup>6,11</sup>

A recent Cochrane review concluded that there is at best weak evidence for the use of clinical nutritional supplementation and called for further trials to substantiate the potential benefit of dietetic assistants and peripheral venous feeding.<sup>2,7</sup> However, it remains unclear whether nutritional care improves outcomes in a typical sample of hip fracture patients due to the limitations of reviewed studies.<sup>2</sup>

### 1.3. Pragmatic trials and action research

Trial design may contribute to this lack of evidence.<sup>2,6,10</sup> Nutritional studies in hip fracture routinely focus on tightly controlled, limited interventions,<sup>2,8,12,13</sup> yet these patients are complex, require comprehensive care and have multiple nutritional barriers.<sup>3,6,14</sup> Trials routinely exclude a majority of participants resulting in younger, less morbid, and less nutritionally vulnerable patient cohorts.<sup>2,3,5,8,15</sup> Pragmatic study designs, in contrast to those with highly explanatory attitudes, can be conducted as part of routine clinical practice. They minimise selection bias rather than highly selecting participants and do not routinely exclude those who may dilute the effect of the intervention. Pragmatically focussed studies also allow flexible delivery of multiple interventions, rather than prescribing tightly controlled and strictly enforced protocols. Outcomes of action research are considered more relevant to patients and healthcare service providers, and are highly applicable to routine clinical practice.<sup>16,17</sup> Action research supports progressive development and evaluation of new models of clinical care, allows pragmatic intervention and outcomes measurement in complex healthcare environments, is associated with lasting changes to improving nutritional care, and is associated with high translation validity.<sup>18–20</sup>

In this study, a pragmatic, action research based approach was targeted to investigate whether multi-disciplinary and multi-modal nutritional care (MMNC) impacts on energy and protein intakes, nutritional status, and nutrition related outcomes in acute hip fracture inpatients.

## 2. Materials and methods

This a controlled before and after comparative interventional study and represents the fourth phase of a multiphase mixed methods action research project aligning to the CONSORT guidelines for pragmatic clinical trials.<sup>16</sup> Ethics approvals were obtained from both The Prince Charles Hospital Human Ethics Research Committee (HREC12/QPCH/83) and the University of Queensland (HMS12/0904). Inclusion criteria were patients admitted to an orthogeriatric unit of a publically funded metropolitan hospital with a fractured neck of femur requiring surgical intervention. To ensure a representative patient cohort including multi-morbid or cognitively impaired patients, the study was designed as an observational evaluation of changes to routine clinical practice and there were no exclusion criteria. Verbal and written consents for multi-disciplinary interventions and treatments were obtained in line with routine clinical practice requirements; however ethics approval was obtained to waive research related written formal patient consent. Patient safety, privacy, and potential conflicts of interest were managed in line with clinical and ethical governance requirements. Three patients were randomly selected by applying a random number generator to beds occupied by eligible patients every fourth day with a target sample size of 60 subjects over a 10 week period for each group. Repeat subjects were included.

The orthogeriatric unit was established in 2010 and includes a shared model of care between orthopaedic surgeons and geriatricians focussed towards early surgical intervention and multidisciplinary rehabilitation of hip fracture patients in a dedicated 20 bed

**Table 1**

Moving from individualised nutritional therapy to multidisciplinary nutritional care in a hip fracture unit.

Individualised nutritional care	Multidisciplinary and multi-modal nutritional care <sup>a</sup>
On admission comprehensive dietitian nutritional assessment and appropriately textured high protein diet.	<b>Promoting nutrition as a medicine</b> Weekly dietitian attendance on orthogeriatric ward round. Ortho-geriatrician confirmation of nutritional diagnosis with patient. Medical nutrition education, scripting of supplements and rationale for use, and review of barriers to nutritional intake. Medical informed consent discussion regarding whether enteral tube feeding is 'in patients best interest' for all malnourished patients with intake less than 50% of requirements by day 5.
3 × week nutrition assistant meal audits/preference checks; all patients.	<b>Coordinated multi-disciplinary approach</b> Medical nutritional interventions as above + nursing nutrition rounds to administer supplements/encourage intake. On admission comprehensive dietitian assessment and day 3–5 dietitian review. All patients then delegated to nutrition assistant unless considered for enteral tube feeding. Protocol driven nutrition model of care delivered by nutrition assistant with twice weekly review:
2 × week dietitian reviews; 'at risk' or malnourished patients.	<ul style="list-style-type: none"> <li>• <i>assessment</i>: dietary intake adequacy, tolerance of current diet/ supplements;</li> <li>• <i>interventions</i>: preference checks, investigating dietary restrictions, co-ordination of multi-disciplinary nutritional care, case conference attendance, review of scripted supplements, food charts, mealtime assistance, texture preferences, high protein/energy educations; and</li> <li>• <i>monitoring and evaluation</i>; using standardised template including criteria for re-referral to dietitian.</li> </ul>
Dietitian/nutrition assistant ordered additional menu items/snacks/supplements.	<b>Enhanced foodservice system</b> Scripted supplements (tds 80 ml 2.0 cal/ml) and 'Off trolley' selective high energy/protein mid-meals for all patients. All restrictive diets requiring approval from orthogeriatric team following discussion with the patient. Clear identification of patients requiring mealtime assistance on clinical handover documentation Multidisciplinary mealtime assistance regularly encouraged by team leaders and nutrition champions.
High protein/energy diet education for 'at risk' or malnourished.	<b>Improving knowledge and awareness</b> Patients, carer, and MDT multimedia marketing strategy to promote: <ul style="list-style-type: none"> <li>• awareness of malnutrition &amp; inadequate oral intake prevalence post hip fracture;</li> <li>• impact on malnutrition on patient and healthcare outcomes; and</li> <li>• strategies to empower and engage patients, carers and the MDT to prioritise nutrition as a medicine.</li> </ul>
Routine swallow/dentition assessment.	
Protected mealtimes.	
Encouragement of external food sources and assistance.	
Multidisciplinary initiated food charts.	
On admission and weekly weights.	
Daily MDT board rounds and twice weekly case-conferencing	
Targeted early surgery and designated theatre lists.	
Daily orthogeriatric team review.	
Early MDT rehabilitation.	
Full diet 6 h post operatively	
Multidisciplinary delirium prevention strategies	
Multidisciplinary discharge summary	

<sup>a</sup> Standard care with changes as below.

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