

# Using dietetic assistants to improve the outcome of hip fracture: a randomised controlled trial of nutritional support in an acute trauma ward

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## Abstract

**Objective:** to examine how improved attention to nutritional status and dietary intake, achieved through the employment of dietetic assistants (DAs), will affect postoperative clinical outcome among elderly women with hip fracture.

**Design:** open prospective randomised controlled trial, comparing conventional nursing care with the additional nutritional support provided by DA.

**Setting:** thirty-eight bedded acute trauma ward in a teaching hospital.

**Participants:** all but 11 of 344 consecutive admissions with acute nonpathological hip fracture were approached. Three hundred and eighteen (93%) agreed to inclusion. Sixteen were ineligible as they were immediately transferred to another acute ward, were managed conservatively or died preoperatively.

**Primary outcome measure:** postoperative mortality in the acute trauma unit.

**Secondary outcome measures:** postoperative mortality at 4 months after fracture, length of stay, energy intake and nutritional status.

**Results:** DA-supported participants were less likely to die in the acute ward (4.1 versus 10.1%,  $P = 0.048$ ). This effect was still apparent at 4 month follow-up (13.1 versus 22.9%,  $P = 0.036$ ). DA-supported subjects had significantly better mean daily energy intake (1,105 kcal versus 756 kcal/24 h, 95% CI 259–440 kcal/24 h,  $P < 0.001$ ), significantly smaller reduction in mid-arm circumference during their inpatient stay (0.39 cm,  $P = 0.002$ ) and nonsignificantly favourable results for other anthropometric and laboratory measurements.

**Conclusion:** dietetic or nutrition assistants are being introduced in units across the UK. This, the largest ever study of nutritional support after hip fracture, shows that their employment significantly reduced patients' risk of dying in the acute trauma unit; an effect that persisted at 4 month follow-up.

**Keywords:** aged, dietetic assistants, elderly, hip fracture, nutritional support

## Introduction

Over 230,000 people suffer osteoporotic fractures each year in the UK [1]. Hip fracture accounts for 70,000 of these, and the advanced age and frailty of patients with this injury is reflected in the outcome of the injury. Up to 10% of people die in hospital within a month of their fracture, and over one-third of people will die during the year after frac-

ture. Length of stay (LOS) in the orthopaedic ward averages between 2 and 3 weeks, and overall hospital stay may average as much as 5 weeks [2]. This leads to a cost of operation and hospital care of around £7,000 per case. The long-term cost of complex home and institutional care for those individuals who make a poor recovery is very high, contributing to an annual cost of hip fracture of £1.4 billion in England and Wales [3]. The reasons for poor recovery are complex, but

poor nutrition is an important factor. In our own unit, we have shown that the result of Mini Nutritional Assessment [4, 5] is an important predictor of poor outcome [6]. Some patients will need complex nutritional support, but most simply need encouragement and assistance to enable them to eat properly [7, 8]. Specialist nurses in busy trauma wards may find it difficult to spend adequate time with patients who need such help at mealtimes.

Several approaches to nutritional support following hip fracture have been studied, and a Cochrane Systematic Review [9] concluded that oral multinutrient feeds may reduce unfavourable outcome. However, patients with cognitive impairment were excluded from these nutritional studies, despite the fact that 40% of this population are cognitively impaired, and that a poor Abbreviated Mental Test (AMT) score [10] is recognised as a crucial determinant of mortality and functional outcome after hip fracture [11–13].

Intensive feeding support [14, 15] is particularly suited to patients with cognitive impairment, as individual patients can be closely supervised and encouraged to take oral nutritional support. In this randomised controlled trial (RCT), we assess the clinical effectiveness of using DAs.

## Methods

### Participants

We approached all women over the age of 65 presenting to a single trauma ward with acute nonpathological hip fracture, between May 2000 and August 2003.

### Intervention

Subjects were randomised either to receive the conventional pattern of nurse- and dietitian-led care, normally provided on the trauma unit (which included the routine provision of oral nutritional supplements to all patients) or to receive the additional personal attention of the DAs.

Two part-time DAs were appointed. They had no previous formal nutrition education, but both had some experience of working in the National Health Service (NHS). They were given a 14 day period of orientation and training, and thereafter worked closely with the specialist dietitian. Their duties were organised so that one DA was present on the ward 6 h per day, 7 days a week. Provision of DA cover to a total of 42 h per week led to an annual cost of £13,000 in the first year.

DAs were asked to try to ensure that patients allocated to them received appropriate help in meeting their nutritional needs. They did this in many ways, including:

- checking personal and cultural food preferences,
- co-ordinating appropriate meal orders with catering staff,
- ordering nutritional supplements when necessary,
- provision of appropriate feeding aids,
- assisting with food choice, portion size and positioning at mealtimes,
- sitting with, encouraging and feeding the frailest patients at mealtimes and
- collecting information to aid nutritional assessment by the dietitian.

Primary outcome measure was postoperative mortality in the acute trauma unit. Secondary outcome measures were inpatient and 4 month mortality, LOS, acute ward complication rate, energy intake and nutritional status as assessed by anthropometric measurements.

### Outcome assessment

Assessments were based on the protocol of the Standardised Audit of Hip Fractures in Europe (SAHFE) [16] and performed on admission, at discharge from the acute trauma ward and at 4-month follow-up. This allowed a member of the trial team, blind to patient allocation and independent of the dietitian and DAs, to profile subjects' progress through rehabilitation.

We supplemented inpatient assessments with Waterlow score of pressure sore risk [17], and Abbreviated Mental Test score [10], with records of all medical and surgical complications and a patient satisfaction questionnaire. (See Appendices 3 and 4 available as supplementary data on the journal website [www.ageing.oxfordjournals.org](http://www.ageing.oxfordjournals.org).)

We approached the 4 month follow-up assessment using a postal questionnaire. If no response was received, the participant or their carer was telephoned. Date of death was confirmed with medical records or the audit department.

### Nutritional assessments

As cognitive impairment is common in this patient population, a quantitative assessment of habitual food intake was complex. On the third postoperative day, the nurses and DAs kept an un-weighted semiquantitative dietary intake record. Food and drink consumed was documented using descriptions of portion sizes. To validate portion sizes used in this approach, we performed a 3 day weighed food intake on days 3–6 after operation in a subset of 27 consecutive admissions over a 4 month period [18]. A further (unpublished) weighed food intake was undertaken in 24 women, during the second year of the trial.

Mini Nutritional Assessment [4, 5], anthropometric measurements (weight, supine total arm length [19] to estimate height, mid-arm circumference and triceps skin-fold thickness), handgrip strength and biochemical markers of nutritional status (haemoglobin, lymphocyte count and serum albumin) were all recorded on admission. The serum albumin measurement was repeated in the third week after admission or at discharge from the unit if sooner. All other measurements were repeated at discharge.

### Sample size

Our trial was originally designed to look at LOS. Previous published studies showed median hospital LOS reductions of over a week, from 38 to 29 days [20] and from 40 to 24 days [21]. This would imply that recruitment of 174 patients would be sufficient to achieve a power of 80% at  $P < 0.05$  for the detection of a 4 day reduction in LOS.

We subsequently obtained additional funding to permit a larger-scale project that could look at mortality. Interim analyses showed the postoperative mortality in the control group to be 14% [22]. The sample size was reassessed to look for a 9% reduction in mortality in the DA arm. At 80%

power with a 5% significance level, this gave a new total sample size of 330.

Randomisation was by sequentially numbered, opaque, sealed envelope method in blocks of 10, prepared by a member of staff not directly involved in the trial. The DAs or the dietitian would approach those suitable for inclusion, and if consent or assent was obtained would open the next numbered envelope.

Analysis was performed on an intention to treat basis. Mortality was compared between the two groups using Fisher's exact test. Differences between the two groups are described with confidence intervals calculated using methods appropriate for proportions close to zero [23]. LOS and

nutritional outcomes were compared between the two groups using parametric and nonparametric statistics where appropriate. Analyses were conducted using SPSS (version 11).

## Results

During the recruitment period, a total of 344 women aged over 65 were admitted with a new nonpathological hip fracture. Nine were not approached for inclusion because DAs were not available and two because they were 'nil by mouth' due to dysphagia. All of the remaining 333 were approached, and 318 (93%) agreed to participate in the study (Figure 1).

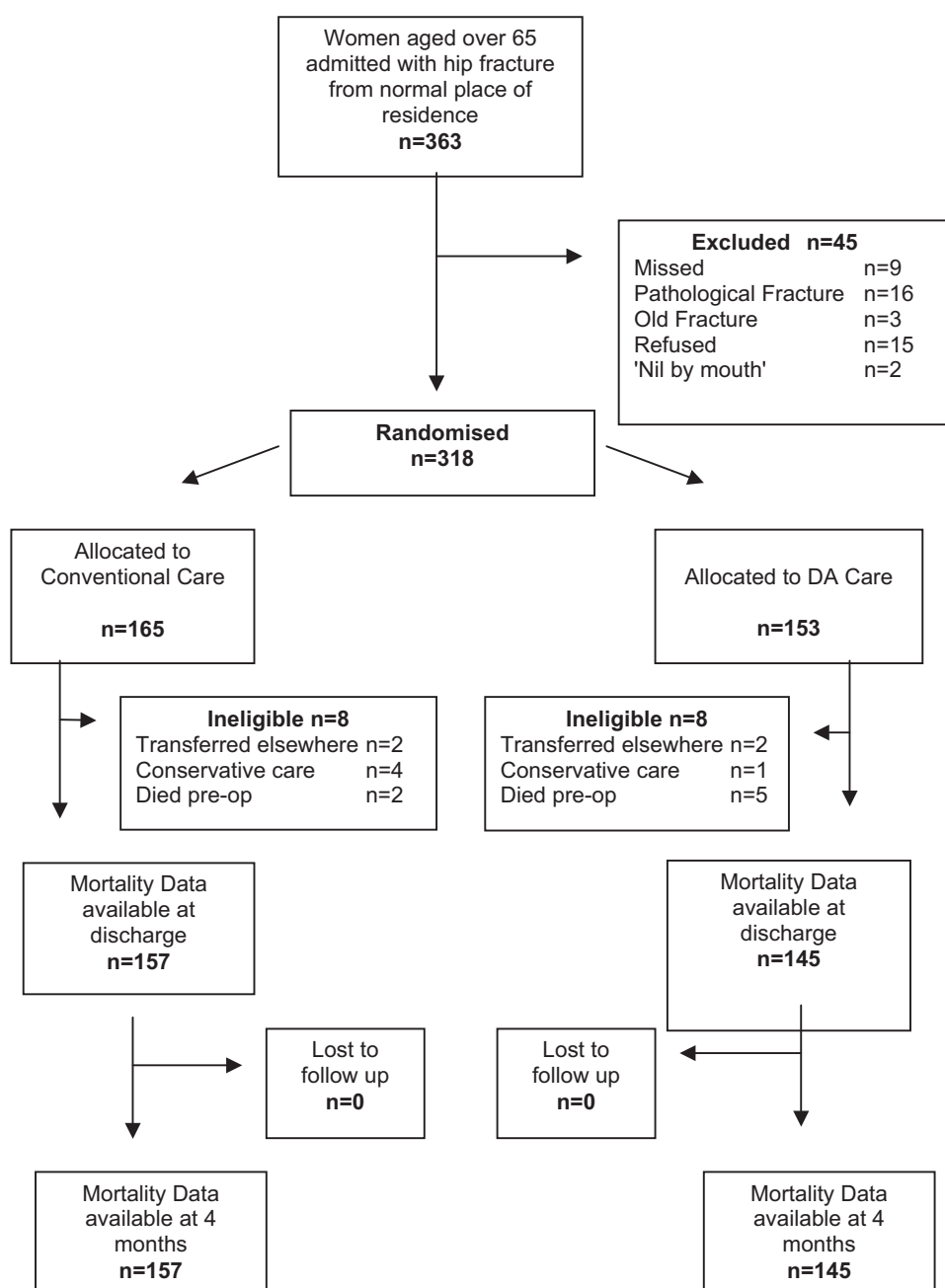


Figure 1. Trial profile.

Four participants were moved out of the base trauma ward, prior to theatre, to a high-dependency unit, and since this precluded their receiving DA support were ineligible for inclusion in the study. A further seven patients were excluded as they died preoperatively, and five because they were treated conservatively.

Patients in the two arms of the trial were comparable in respect of age, and the presence of medical, nutritional and psychiatric factors known to be predictive of poor outcome. 56.9% of participants had AMT <8, suggestive of cognitive impairment (54.2% of the DA support arm and 59.2% of the conventional care arm). See Appendix 1 in the supplementary data.

### Mortality rate

The death rate among participants who were being supported by the DAs was lower at each time point than in the routine care arm of the study. These results achieved significance for outcome of stay on the trauma unit ( $P = 0.048$ ). This benefit was still apparent at 4 month follow-up ( $P = 0.036$ ). This gives a 6% absolute reduction of trauma ward mortality and 9.8% reduction at 4 month follow-up, with relative risk reductions of 60 and 43%, respectively.

### LOS and complication rate

Trauma unit LOS and total LOS in hospital were very similar for those discharged (rather than died) in both arms of the trial. The number of individuals having other complica-

tions (excluding mortality) was not significantly different in the DA arm of the trial (Table 1).

### Energy intake

Energy intakes were assessed from dietary intake records to the nearest 50 kcal (Appendix 2 in the supplementary data), but analysis of intakes of other nutrients was not undertaken, as their values would be too imprecise. These were assessed on 275 patients (91%).

Patients being supported by the DAs showed a mean energy intake of 349 kcal/24 h greater than the 756 kcal/24 h achieved by patients receiving conventional nursing care (95% CI for difference in means 259–440,  $P < 0.001$ ). Their consumption of hospital food was slightly but nonsignificantly higher. Their intake of the nutritionally complete supplements, prescribed to all patients as part of standard hip fracture care plan, was 286 kcal/24 h higher (95% CI for difference in means 232–339,  $P < 0.001$ ) than the 123 kcal/24 h of patients receiving conventional care.

### Nutritional status

We examined the effect of DA support on the change in markers of nutritional state between admission and discharge. Mid-arm circumference fell in both groups (Table 2), but there was a significantly smaller reduction in the DA group, even after correction for multiple comparisons ( $P = 0.002$ ). Handgrip strength rose in both groups and to a greater extent in the DA group, but the difference was not significant.

**Table 1.** Mortality on the trauma unit, in the Trust and at 4 months post-fracture, length of stay (LOS) and complication rate

	<i>n</i>	Routine nursing care ( <i>n</i> = 157)	<i>n</i>	Dietetic assistant support ( <i>n</i> = 145)	Significance ( <i>P</i> )	Percentage difference (95% CI)
Deaths in trauma unit	16	10.1%	6	4.1%	0.048	6.1 (0.08, 12.1)
Deaths in hospital	23	14.6%	12	8.2%	0.084	6.4 (–1.0, 13.6)
Deaths at 4 months	36	22.9%	19	13.1%	0.036	9.8 (1.1, 18.3)
LOS in acute unit (days) [median (IQR)]	141	17 (18)	139	16 (18)	0.44 <sup>a</sup>	
LOS in hospital (days) [median (IQR)]	134	32 (49)	133	34 (48)	0.81 <sup>a</sup>	
Trauma ward complications [median (IQR)]	125	84 (67)	130	79 (61)	0.29 <sup>b</sup>	

IQR, interquartile range.

<sup>a</sup>Mann–Whitney U test.

<sup>b</sup>Chi-square test.

**Table 2.** Mean change in markers of nutritional status between admission and follow-up

	Change over follow-up		
	Routine nursing care	Dietetic assistant support	Significance ( <i>P</i> )
Mid-arm circumference (cm)	–1.28	–0.89	0.002 <sup>a,b</sup>
Triceps skin fold thickness (mm)	–1.22	–0.88	0.087 <sup>a</sup>
Weight (kg)	–1.00	–0.35	0.16 <sup>c</sup>
Handgrip strength (Nm)	+0.16	+2.17	0.32 <sup>c</sup>
Serum albumin (g/l)	–3.72	–2.74	0.26 <sup>c</sup>
Haemoglobin (g/dl)	–1.36	–1.15	0.47 <sup>c</sup>
Lymphocyte count ( $\times 10^9/l$ )	–1.69	–0.26	0.39 <sup>a</sup>

<sup>a</sup>Mann–Whitney U test.

<sup>b</sup>Correction for multiple comparisons (Bonferroni) indicates a cut point of  $< 0.007$  for significance.

<sup>c</sup> $t$ -test.

There was a consistent pattern of benefit, with DA support leading to a slightly more favourable pattern of change over the follow-up period. Weight, triceps skin-fold thickness, albumin, haemoglobin and total lymphocyte values fell in both groups but to a smaller degree in patients receiving DA support. These differences did not achieve statistical significance.

## Discussion

We have shown that the support of DAs led to an improvement in trauma unit mortality that was still apparent at 4 month follow-up.

We have demonstrated significant improvements in intakes of energy and more favourable results for weight, anthropometric measurements, handgrip strength and laboratory indices (haemoglobin, albumin and lymphocyte count). The statistically significant effect of DA support on mid-arm circumference was consistent with this pattern.

Our failure to demonstrate a significant effect on LOS was disappointing. Nonclinical factors that delayed discharge may have played a part in this by diluting the benefit of our intervention. In addition, the magnitude of our success in reducing inpatient mortality will have had an effect. The DA arm of the trial will have included a substantial number of frailer individuals who survived as a result of improved nutritional support, but who might be expected to need prolonged inpatient care before they were ready for discharge. It was not possible to define the extent of this effect within this trial.

This is the largest ever RCT of nutritional support following hip fracture, and the first evaluation that includes patients with cognitive impairment. The study was analysed on an intention to treat basis, even though not all of the women allocated to DA care were able to be offered support throughout their stay, and some refused to take nutritional supplements. This reflects the reality of clinical care in trauma wards, but despite this we have shown a consistent trend suggesting that this approach to nutritional support is of benefit to patients.

The nutritional density of conventional hospital food is often poor. Even among patients being actively targeted for nutritional support and dietary supplementation, it is clear that conventional approaches to oral feeding still provide most patients with an inadequate diet [18].

This study suggests that the DAs particularly helped energy intake by ensuring that nutritional supplements were offered regularly, and that the participants were helped and encouraged to drink them. At mealtimes, ordering of food was more efficient and effective and food waste reduced. Some women required extra assistance to eat. By providing help to choose food from the trolley, feeding aids, cutting up food, help with repositioning in bed and ensuring the bedside table was at the right height, the DAs enabled many participants to feed themselves.

Health care professionals found the additional help invaluable. Nurses report that some patients can take up to 45 minutes to eat a meal and the DAs' presence released this time, allowing nurses to carry out other duties. Another

benefit to patient care and the dietetic service has been the earlier identification and referral and treatment of patients at nutritional risk, both within and outside the trial, enabling these patients to be assessed and to receive appropriate intervention. As a direct result of the employment of DAs, the trauma dietitian was able to provide a specialist service to additional 19 trauma beds. Although a full economic evaluation was not undertaken, DA cover led to an annual cost of £13,000 in the first year, which was partially offset by estimated £6,000 dietetic and £5,000 nursing resources released.

Participants and carers have been very appreciative of the service and report that they feel more able to discuss food as DAs take time to listen and were not distracted by other clinical priorities. As one patient put it: 'it is as important to talk, and listen to our needs, as it is to provide physical help'.

Nutrition is an interdisciplinary concern, which requires effective liaison and communication between all members of the clinical and operational services teams. However, the feeding of frail older patients can too easily be viewed as a low priority in a busy trauma ward. In responding to indications of malnutrition as a significant problem among our patients, we have shown that a low-technology innovation emphasising personal attention is an effective way to improve nutrition and reduce mortality of our patients.

Our findings contrast with those of a recent study of intensive feeding support as part of the care offered by health care assistants to medical patients [15]. This work failed to show a benefit, but included a heterogeneous group of men and women with a wide range of medical diagnoses, and failed to achieve a significant increase in energy intake in the intervention group. Our success perhaps argues for an exclusive focus of additional care on food and nutrition, rather than also providing assistance with personal care or other activities of daily living.

Many other units have already introduced dietetic or nutrition assistants in response to recognition of their possible benefits for the quality of patient care [24]. Our findings provide a clinical evidence base to justify consideration of such innovation across the NHS.

## Key points

This study included participants with and without cognitive impairment and suggests that by giving practical help at mealtimes and encouraging the consumption of routine nutritional supplements DAs achieve:

- significant improvements in mortality,
- significant improvements in dietary energy intake and
- a pattern of improved nutritional and anthropological indices.

The results provide the first clinical evidence to justify examination of this popular, innovative approach to nutritional support, enhancing the nutritional management of a condition that impacts on the health of 70,000 older people in the UK every year.



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## Contributors

D.G.D. developed the original funding application, supervised the study, co-managed the database and entered data, conducted the statistical analysis, interpreted the results and wrote the paper with assistance from A.J. and K.H. Outcome data were collected and entered by S.J.B, he liaised with participants, co-managed the database and assisted in the interpretation of results. A.J. collaborated in the study design and submission of grant applications. K.H. advised on the conduct of statistical tests and interpretation of results. D.G.D. is guarantor and all authors have seen and approved the final version.

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## Competing interests

All authors declare that the answers to the questions on your competing interest form are No and therefore have nothing to declare.

Bro Taf Local Research Ethics Committee (protocol number 99/3189) gave ethical approval. Written 'assent' of a relative or 'significant other' was obtained before randomising any patient unable to give informed consent.

Trial registration number: M0054061695. UK National Research Register.

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