

Can prescription of sip-feed supplements increase energy intake in hospitalised older people with medical problems?

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A blinded randomised controlled trial of prescribed oral sip-feed supplements compared with routine hospital practice was undertaken in acute admissions to a geriatric medicine department. Patients were eligible for inclusion if they were admitted from home, were not obese (BMI > 75th percentile), had no swallowing difficulties and were not deemed to be in the terminal stage of illness. On admission they were stratified by nutritional status (BMI < 5th, > 5th to < 25th, > 25th to < 75th percentile) and randomised. The intervention group received 120 ml oral sip-feed supplement prescribed three times per d in the medicine prescription chart (22.5 g protein, 2260 kJ (540 kcal) energy/d) distributed at medication rounds for the duration of hospital stay. The control group received routine hospital care. Outcomes were patient compliance with supplement, total energy intake and nursing staff views of the method. Patients were randomised to receive supplements (*n* 186 of total *n* 381). Half had full compliance and three-quarters at least moderate compliance. Total energy intake was significantly increased, on average, in the intervention group (*P* = 0.001). The proportion of patients meeting estimated minimum energy requirements was significantly increased (*P* = 0.023), but was still < 50% for the sample of patients in the intervention group. The present study suggests this method is acceptable to patients and staff and improves total energy intake. However, the amount prescribed did not ensure minimum energy requirements were met in all cases.

Oral sip-feed supplements: Randomised controlled trial: Energy balance: Older people

Undernutrition is common in acute hospital admissions and found in up to 40% of older medical patients (McWhirter & Pennington, 1994). Furthermore, energy balance studies have confirmed that nutritional state frequently deteriorates during hospital stay. There is some evidence that food offered may be nutritionally adequate, but not consumed (Bastow *et al.* 1983; Delmi *et al.* 1990; Klipstein-Grobusch *et al.* 1995).

Oral supplements either added to food or provided as oral sip-feeds are a straightforward method of improving nutritional intake, and this is supported by a meta-analysis of randomised trials of nutritional supplements with more than half using simple oral sip-feeds (Potter *et al.* 1998).

No consensus has emerged on a method to ensure an adequate intake of supplements for in-patients. When 'prescribed' by dietitians, they are usually offered as an additional mid-morning or afternoon drink, and considered optional, not aiding compliance (Keele *et al.* 1997; Gariballa *et al.* 1998). Medicine prescription charts have been used for administration of supplements, but there is little information about compliance (Hankey *et al.* 1993) and a lack of clarity on methodology (Peake *et al.* 1998).

A study by Wilson *et al.* (2002) considered that elderly patients remained satiated for longer than younger patients after large volumes of sip-feed.

The aim of the present study was to assess whether prescription of oral sip-feed supplements in small quantities in the medicine prescription chart and distribution at medication rounds could increase total energy intake (EI) and provide sufficient energy to prevent nutritional decline. To achieve this, good compliance with no adverse effect on normal dietary intake was required.

Methods

Study population

Patients admitted directly from home to four wards in a geriatric medical assessment unit were eligible for inclusion, unless they were overweight (BMI > 75th percentile), in a terminal stage of illness or had swallowing difficulties preventing oral intake. A nutritional assessment was performed within 24 h of admission. Knee height (measured using a steel measuring-tape) was used to

Abbreviation: EI, energy intake

This study was undertaken in the Department of Medicine for the Elderly, Victoria Infirmary, Glasgow, Scotland, UK.

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derive estimated height (Chumlea *et al.* 1985). Weight was measured using portable electronic scales accurate to 0.1 kg (SECA UK; CV 1.3%). BMI was calculated from these measurements and a SD score was then obtained using UK reference data (Burr & Phillips, 1984). Patients were stratified into three nutritional groups: severely undernourished (BMI < 5th percentile); moderately undernourished (BMI > 5th to < 25th percentile); adequately nourished (BMI > 25th to < 75th percentile).

Patients' characteristics, age, sex, functional ability (Barthel score, Colline *et al.* 1988) and medical diagnoses were noted.

Randomisation and intervention

Over an 18-month period patients were recruited from consecutive admissions, and allocated to intervention or control groups using block randomisation within each nutritional group. Randomisation was undertaken using sealed cards by a third party, whose only other involvement in the study was prescribing the supplement.

Protein-energy sip-feed (120 ml) was prescribed in the medicine prescription chart at 09.00, 14.00 and 18.00 hours. It was given in a medicine cup on routine medication rounds together with other oral medication. The sip-feed (Fresenius Entera, Runcom, Cheshire, UK) was commenced within 48 h of admission and continued for the duration of the hospital stay. The sip-feed contained 62.5 g protein/l and 6800 kJ (1500 kcal)/l providing a maximum of 2260 kJ energy/d. A placebo was not used, as it was not found possible to provide one. All patients, including the control group, had access to routine dietetic referral.

Measurements

The observers undertaking outcome measurements were blinded to prescription and distribution of the supplement.

Distribution of the sip-feed was recorded in the medicine prescription chart. Consumption was monitored by nurses, and non-compliance noted using standard codes used for other medicines, which identify reasons for non-compliance. The total quantity of supplement consumed was extracted retrospectively from the chart, by calculating the number of times patient consumed supplement \times 120 ml. This was recorded as a percentage of the total volume prescribed throughout the hospital stay, from first prescription until discharge.

Trained nurses undertaking medication rounds were sent a questionnaire. This considered issues such as workload and acceptability of the method to nursing practice.

Over a 1-year period, the weighed dietary intake before and after consumption of food and drinks, including snacks, was undertaken by trained observers for one in three patients in each nutritional group using block randomisation. This was done on days 3, 10 and 17. Food intake data were converted into nutritional intakes using hospital recipes and a computerised version of *McCance and Widdowson's The Composition of Foods* (Paul *et al.* 1986). This allowed voluntary food intake and total EI to be calculated. Previous work in this unit has shown day-to-day variation in food intake to be low, therefore

voluntary food intake was derived from results on day 3 (Klipstein-Grobusch *et al.* 1995). Total EI was calculated by adding the amount of supplement consumed by that patient to the voluntary food intake.

The minimum EI required to balance energy requirements in this patient population is estimated at 130% BMR (Reilly *et al.* 1992), where BMR was calculated from the appropriate equations (Department of Health, 1992). This was found appropriate in the same ill population in a previous study in the unit (Klipstein-Grobusch *et al.* 1995).

Consent

Consent was gained from eligible patients, or next of kin for those unable to give consent, prior to initial assessment and randomisation. The study was approved by the Hospital Ethics Committee.

Statistics

Two sample *t* tests and χ^2 tests were used to test for significance of differences between intervention and control populations for continuous and categorical response variables respectively. CI were obtained from the usual *t* distributions and normal approximations to binomial distributions.

In a two-way ANOVA for total EI, the nutritional group \times treatment interaction ($P=0.93$) and nutritional group effect ($P=0.100$) were not significant, allowing results to be pooled across nutritional groups.

Results

There were 381 patients recruited to the study. Median length of stay was 18 (range 2–141) d. The baseline characteristics of the study population are shown in Table 1 and reflect a frail, thin, functionally dependent group. There was no statistically significant difference in any of the characteristics between intervention and controls in each nutritional group although, overall, group 1 were younger than groups 2 and 3.

Patients were randomised to receive supplements ($n=186$) and prescribing records were subsequently available in 178 of them. Although prescriptions were written within 48 h of randomisation, timing was not consistent for logistical reasons, i.e. range 24–48 h; therefore, few patients were recorded ingesting 100% of supplement, which required ingestion from day 1 of admission. Ingestion of $\geq 80\%$ realistically reflects full compliance with offered supplement. In advance of the study it was arbitrarily decided to consider < 50% as poor, 50–79% reasonable and > 80% as good compliance. Table 2 shows there was no significant difference in compliance patterns across the three nutritional groups ($P=0.59$). Good compliance was found in ninety-two patients (1800–2260 kJ (430–540 kcal)/d) and thirty-nine had reasonable compliance (1130–1799 kJ (270–429 kcal)/d). The reason for non-compliance was generally medical, e.g. no oral intake, vomiting. Sixty-one (33%) patients refused supplements at times, but of these only fifteen refused enough to ingest less than half the total quantity prescribed.

Table 1. Characteristics of study population on admission

Nutritional group*	n			Age (years)		Barthel score on admission†		Weight (kg)	
	Total	m	f	Median	Range	Median	Range	Mean	SD
Severely undernourished									
Supplement	34	12	22	82	67–99	15	1–20	39.8	6.4
Control	40	15	25	78	66–95	13.5	0–20	39.7	5.2
Total	74	27	47						
Moderately undernourished									
Supplement	90	17	73	84	61–97	13.5	1–20	45.9	6.0
Control	87	19	68	83	65–100	14	1–20	46.3	6.5
Total	177	36	141						
Adequately nourished									
Supplement	62	17	45	83	63–99	14	2–20	57.6	6.6
Control	68	22	46	82	66–101	14	2–20	57.9	7.9
Total	130	39	91						

m, male; f, female.

* Nutritional group: severely undernourished BMI < 5th percentile; moderately undernourished BMI > 5th to < 25th percentile; adequately nourished BMI > 25th to < 75th percentile.

† Barthel score: functional rating scale (0, total dependence; 20, independent).

In no instance was the supplement discontinued by physicians because of side effects (e.g. diarrhoea).

Twenty out of twenty-two (91%) nurses responded to the questionnaire. Twelve indicated distribution of supplements during the medication round did not increase the complexity or time involved; fifteen considered it more likely that patients would receive supplements and seven indicated patients were more likely to comply when the supplement was dispensed this way. Only two nurses noted any adverse effects on compliance with other medication.

Weighed dietary intakes were undertaken in a randomly selected subset of ninety-six patients in the first year of the study. The mean voluntary food intake was not significantly different between control and intervention groups (Table 3). In ninety-two of the ninety-six patients prescription data was available to calculate total EI. The supplements led to a statistically significant increase in mean total EI when data was pooled across all nutritional groups ($P=0.001$). The 95% CI for the difference in mean total EI between the treatment and control populations, pooled over all nutritional groups, ranged from 557 to 2118 kJ/d.

Considering the total EI in relation to the calculated minimum energy requirement, Table 4 shows that even

with the addition of a supplement only about half the patients met this requirement. The proportion was, however, significantly greater among those on supplements compared with controls ($P=0.023$).

Discussion

The method used in the present study was devised as a simple method of routinely delivering supplements to a group of patients nutritionally at risk. Patient compliance was generally good and EI increased, but not sufficiently to achieve an additional intake of 1800 kJ (430 kcal) in > 50% patients. Even at a lower level of compliance, patients were adding a mean value of 1130 kJ (270 kcal)/d, with the supplement contributing 25–33% total EI. All patients could be referred for dietetic advice and treatment by physicians responsible for their care and this would normally lead to supplements being offered as an optional extra. It has previously been shown that in a non-hospital setting patient compliance with such an informal method may be good (Fiatarone Singh *et al.* 2000; Lauque *et al.* 2000), but in a hospital setting only about half was consumed (Peake *et al.* 1998). The present study shows that a more structured approach to distribution is more effective.

Table 2. Amount of supplement consumed by older hospitalised patients in each nutritional group*

Nutritional groups	n	Supplement consumed					
		80–100%		< 79–50%		< 50%	
		n	%	n	%	n	%
Severely undernourished (BMI < 5th percentile)	32	14	44	10	31	8	25
Moderately undernourished (BMI > 5th to < 25th percentile)	89	50	56	17	19	22	25
Adequately nourished (BMI > 25th to < 75th percentile)	57	28	49	12	21	17	30
TOTAL†	178	92	52	39	22	47	26

* For details of subjects, supplements and procedures, see Table 1 and p. 426.

† χ^2 2.796 (df 4), $P=0.59$.

Table 3. Effect of supplement on total energy intake of older hospitalised patients* (Mean values and standard deviations)

Nutritional groups	n	Voluntary EI (kJ/d)		Total EI (kJ/d)†	
		Mean	SD	Mean	SD
Severely undernourished (BMI < 5th percentile)					
Supplement	8	4002	1967	5350	2265
Control	10	4178	1792	4178	1792
Moderately undernourished (BMI > 5th to < 25th percentile)					
Supplement	24	4383	1779	5722	1988
Control	19	4282	1662	4282	1662
Adequately nourished (BMI > 25th to < 75th percentile)					
Supplement	12	5027	1884	6614	1875
Control	19	5044	1783	5044	1783
All nutritional groups					
Supplement	44	4513	1842	5898	2018
Control	48	4563	1746	4563	1746
95% CI‡		-783, +687		557, 2331	

EI, energy intake.

* For details of subjects, supplements and procedures, see Table 1 and p. 426.

† Total EI = voluntary EI + supplement EI.

‡ 95% CI for mean difference between intervention group and controls (pooled across all nutritional groups); *P* = 0.9 and 0.001 for voluntary and total EI groups respectively.

Despite the additional work involved at medication rounds, nursing staff generally considered this a more effective way of delivering supplements. Others have suggested that delivery of supplements as a medication confers an importance to patients and staff that an additional drink does not, i.e. it is perceived as a 'treatment' (King's Fund, 1992).

There is concern that nutritional supplements can suppress normal dietary intake (Fiatarone Singh *et al.* 2000): previous work has shown that elderly patients receiving large volumes of supplements at once consume less voluntary food than a younger population, and suggests that sip-feeds should be timed to be as far from meal times as possible (Wilson *et al.* 2002). The present

study took the novel approach of using regular low-volume supplements given out with medication rounds, and has shown that voluntary food intake is not suppressed. This supports other formal studies (Delmi *et al.* 1990; Lauque *et al.* 2000). The timing of the medication rounds was about 1.0–1.5 h after meal times and a small volume was offered, which may be relevant compared with giving supplements with meals. However, giving nutritional supplements the same status as medication may also be important. The present study confirms the findings of other studies in that intake of voluntary food in hospital falls short of recommended energy requirements (Keele *et al.* 1997; Gariballa *et al.* 1998), and the addition of oral supplements did not fully compensate. Supplements can improve total EI to 70% energy requirements (McWhirter & Pennington, 1995), but larger volumes of supplements may lead to poorer compliance (Hogarth *et al.* 1996). In the present study, the volume chosen was a compromise between what would be acceptable and the provision of a reasonable energy supplement.

Klipstein-Grobusch *et al.* (1995) showed that calculated energy requirements are appropriate to this patient group, and thus further consideration needs to be given to EI, either by improving voluntary food intake together with routine prescription of supplements, or increasing the quantity or frequency of supplement distribution used.

Conclusion

In a hospital setting, EI can be improved by the prescription of small quantities of oral sip-feeds delivered during medication rounds. This method secures nursing compliance with nutritional support and is accompanied by a high level of patient compliance. It ensures patients' nutritional needs are being addressed to some extent, but should not induce complacency that energy requirements are being met completely.

Table 4. Number of older hospitalised patients receiving adequate energy intake for minimum energy requirements*

Nutritional groups	n	Total EI < MER		Total EI ≥ MER	
		n	%	n	%
Severely undernourished (BMI < 5th percentile)					
Supplement	8	4	50	4	50
Control	10	7	70	3	30
Moderately undernourished (BMI > 5th to < 25th percentile)					
Supplement	24	12	50	12	50
Control	19	15	79	4	21
Adequately nourished (BMI > 25th to < 75th percentile)					
Supplement	14	7	58	5	42
Control	19	14	74	5	26
All nutritional groups					
Supplement	44	23	52	21	48
Control	48	36	75	12	25
95% CI†		3.5, 41.9			

EI, energy intake; MER, minimum energy requirement.

* For details of subjects, supplements and procedures, see Table 1 and p. 426.

† 95% CI For difference between proportions achieving MER in interventions and controls (pooled across nutritional groups) (χ^2 5.155 (df 1), *P* = 0.023).

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