

THE VALIDITY OF PATIENT KEPT FOOD DIARIES

DIETARY INTAKE OF OLDER PATIENTS IN HOSPITAL AND AT HOME:
THE VALIDITY OF PATIENT KEPT FOOD DIARIES

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Abstract: *Objective:* To investigate the validity of a patient kept food diary in relation to weighted intakes and to measure dietary intakes of older people both in hospital and after discharge at home. *Design:* A randomly selected cohort of hospitalised elderly patients was recruited. All patients were instructed how to keep a record of all food and drink consumed and any leftovers. Food diaries were kept for up to seven days in hospital and for seven days in the community. In 18 consecutive patients dietary records were compared with weighed intake. *Setting:* Associate Teaching Hospital, United Kingdom. *Results:* A total of 116 patients participated in the study (median age 77 years, range 66-86 yrs; 49 female). We found significant correlations between food diary and weighted macronutrient intakes both in hospital and in the community. Overall the food diary predicted within $\pm 17\%$ weighted energy intakes in 70% of individuals. Compared with the National Diet and Nutrition Survey for free-living elderly people in the UK (1998), we found more or less similar energy and micronutrient intakes in hospital, but lower intakes at home. *Conclusion:* Patients kept food diaries can be used to identify those at risk of undernutrition and monitor those on nutritional support. It can also be used for nutritional education and for achieving dietary goals.

Key words: Dietary intake, weighed intake, older people, food diary.

Introduction

The population of people over 65 years is growing rapidly worldwide (1). Undernutrition is associated with the development and progression of many chronic diseases in older people (2). Poor nutrition may lead to ill health, and ill health to poor nutrition, so identifying priorities for management remains a challenge for health professionals (3).

In the community for example, isolation with an inability to go out shopping, loss of spouse, depression, decreased mobility, dementia, and anorexia due to disease, medications, poor dentition, alcoholism and acute illness may hinder food preparation and eating (2). Poor appetite, nausea, vomiting, diarrhoea, dysphasia and increased demands can also affect the nutrition status of the older person during acute illness (4, 5). Consequently undernutrition is prevalent and unrecognized in elderly people on admission to acute and non-acute care settings and associated with increasing morbidity and mortality (2, 6, 7).

Assessing the energy intakes of acutely ill elderly patients is therefore vitally important in establishing dietary treatment strategies tailored to meet individual patients' needs to prevent energy and nutrient deficiencies. There are a number of methods, which could be used to assess dietary intakes ranging from weighed records to 24-hour recall (2). Food diaries are considered the most accurate as they do not rely on memory although under reporting has been reported. They offer information on the timing of meals, food and drink consumed, ingredients and brand names of food used and methods of cooking.

Despite all the effort a recent report from the UK has found that undernutrition in older patients is prevalent, goes unnoticed, untreated and worsen during their hospital stay (8). The aim of this study was therefore to investigate the validity of a patient kept food diary and to measure dietary intakes of older people both in hospital and at home immediately following discharge.

Method

Subjects were recruited from a 650-bed Associate Teaching Hospital in South Yorkshire, UK. The integrated medical unit has 168 beds on 7 wards admitting unselected patients on the basis of need. The patients of this study were a sub-group of a randomised double-blind placebo-control study of nutritional supplementation following acute illness. Each patient received 1-2 bottles (200 ml each) of oral nutritional supplement or an identical placebo daily at 08 00 & 12 00 hours in addition to the standard hospital diet. Inclusion criteria were 65 years or above community free living subjects and able to swallow. Patients suffering from severe medical or psychiatric illness, morbid obesity (BMI ≥ 40), difficulty with swallowing, moderate to severe dementia or inability to give consent were excluded. Local Health Ethical Committee approved the study and all patients gave written informed consent. All patients had demographic and medical data collected including current diagnosis, history of chronic illnesses, smoking, alcohol and drug intake.

Assessment of nutrient intake

Food diaries

Subjects were instructed how to keep records of all food and drinks consumed and record any leftovers excluding the nutritional supplement for up to 7 days in hospital and 7 days in the community. Food items were recorded in a diary, which included instructions with examples. Whilst in hospital the established portion sizes of foods given, method of cooking and preparation were provided by the catering department. At home subjects were asked to describe brand name, method of cooking and preparation and household measures portion sizes, which were then estimated using the Ministry of Agriculture, Fisheries and Food (MAFF) book (9). This gives average portion sizes in grams. Support was offered by regular visits to patients whilst they were in hospital and at home following discharge.

Weighted intakes

Eighteen consecutive subjects of the study cohort who were well enough and also agreed to take part into this sub-study had all food and drinks consumed in hospital over three days weighed using a digital scale just prior to consumption. Also any food waste, edible and inedible, was weighted at the end of each meal. Following discharge from hospital patients were visited at home and two meals were weighed and compared with corresponding dietary records.

The food diaries were analysed using the dietary software FOODBASE program.

Power of the study

The sample size of 116 patients would allow the detection of a true mean difference in dietary energy intake between hospital patients intakes and dietary reference values of 110 kcal/day (given the within group standard deviation [SD] 280 kcal). This sample size would also allow the detection of 10 mg/day difference in dietary vitamin C intake (given the within group SD 27 mg) with 80% power and type 1 error probability of ≤ 0.05 .

Statistical analysis

Statistical analyses were performed with SPSS software, version 11.0 (SPSS Inc., Chicago). Descriptive statistics including mean (SD), median, minimum and maximum values were calculated. Statistical comparisons between groups were carried out using Student's-t and Chi-squared tests. Correlation coefficients were calculated for weighed and diary food intakes.

Results

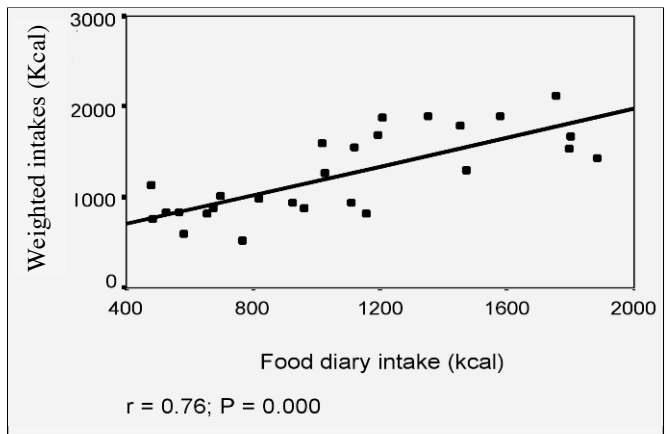
Table 1 & figure 2 show baseline characteristics of subjects and details of recruitment respectively.

Table 1
Baseline characteristics of all patients (n=116)

Variable	Number (%)
Age median (range)	77 (66-86)
Gender (Female)	49 (42)
Smoking	Current 19 (16) Ex Smoker 65 (56) (≥ 6 months)
Chronic illness (disease per patient)	1.5
Drugs per patient ^a	2.3
Body mass index, median (range)	25.7 (17.5-35.2)
Barthel, median (range) ^b	18 (5-20)
AMT median (range) ^c	10 (8-10)
C-reactive protein median (range) ^d	21.5mg/L (5-229)

a. Diuretics, ACE inhibitors, β -blockers, Calcium channel blockers, statins, aspirin warfarin, clopidogrel, pain killers, benzodiazepines, antidepressant, oral hypoglycaemics; b. The Barthel scores 10 functions on a scale 0 (fully dependent) to 20 (independent); c. Abbreviated mental test (score < 6 suggest dementia); d. C-reactive protein (CRP) concentration, a marker of acute inflammation (normal < 6 mg/L)

Figure 1
Weighted energy intake plotted against diary intake in hospital and at home



Weighed vs. diary intakes

Fifteen subjects had their food diaries and weighed intakes completed in hospital and 13 in the community with 10 of those had them completed both in hospital and in the community. We found highly significant correlations between food diary and weighted macronutrient intakes both in hospital and at home (Table 2 & Figure 1). Overall the food diary predicted within $\pm 17\%$ weighted energy intakes in 70% of individuals.

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Table 2
Correlation between food diaries and weighed nutrients intake in hospital and at home

Nutrient Mean (SD)+	Hospital (n=15)			Home (n=13)		
	Food Diary	Weighed intake	R value*+	Food Diary	Weighed intake	R value*
Energy/Kcal	1302 (413)	1392 (473)	0.718	779 (278)	1033 (377)	0.734
Protein/g	69 (28)	67 (26)	0.761	44 (48)	48 (16)	0.484
Carbohydrate/g	148 (50)	162 (53)	0.693	99 (43)	126 (61)	0.868
Fat/g	52 (17)	57 (24)	0.688	28 (15)	39 (21)	0.568
Fibre/g	9 (4)	11 (4)	0.884	8 (5)	10 (6)	0.927

*P < 0.05, +Spearman rank correlation; +(SD)=(standard deviation)

Dietary records of all patients

All together 78 and 61 food diaries were completed in hospital and at home respectively. Energy and macronutrient intakes especially carbohydrates in hospital were lower but protein intake significantly higher compared with the dietary reference values (DRV) (Table 3). For micronutrient intakes we found that vitamin C, riboflavin, vitamin B6, vitamin B12 and folate intakes in hospital exceeded recommended needs. Calcium intake was higher than DRV but the difference was not statistically significant. Vitamin D intake was however, significantly below DRV (P<0.05). At home people had low energy, carbohydrate and vitamin D intakes, but adequate total fat and calcium intakes. However daily protein, vitamin C, riboflavin, vitamin B6, vitamin B12, and folate intakes exceeded recommended requirements (Table 4). Compared with the National Diet and Nutrition Survey for free-living elderly people in the UK 1998 (NDNS survey), we found similar energy and micronutrient intakes in hospital, but lower energy, total fat, riboflavin, vitamin B6, vitamin B12, vitamin C, vitamin D, folate, calcium intakes at home.

Table 3

Macro and micronutrient diary intakes in hospital (n=79)

Nutrient	Mean intake (+SD)	* %DRV (+SD)	NDNS survey (9) of people aged 65 years or over
Energy (Kcal/d)	1713+436	82.4+21.4	1628
Protein (g/d)	81+21	158.8+40.5	62.6
Total fat (%/d)	36+6.3	103+18	35
Carbohydrate (%/d)	44.6+7	89+14	46.7
Vitamin C (mg/d)	76.6+25.4	191.4+63.4	63.3
Vitamin D (ug/d)	4.1+1.8	40.5+17.8	3.4
Riboflavin (mg/d)	1.8+0.6	147+50	1.6
Vitamin B6 (mg/d)	1.96+0.6	145+39.2	1.8
Vitamin B12 (mg/d)	8.1+5.2	541.7+344.2	5.1
Folate (ug/d)	279.6+77.2	140+38.6	233
Calcium (mg/d)	782.2+253.8	111.7+36.2	752

* Dietary reference values (DRV)

Table 4

Macro and micronutrient diary intakes at home (n=61)

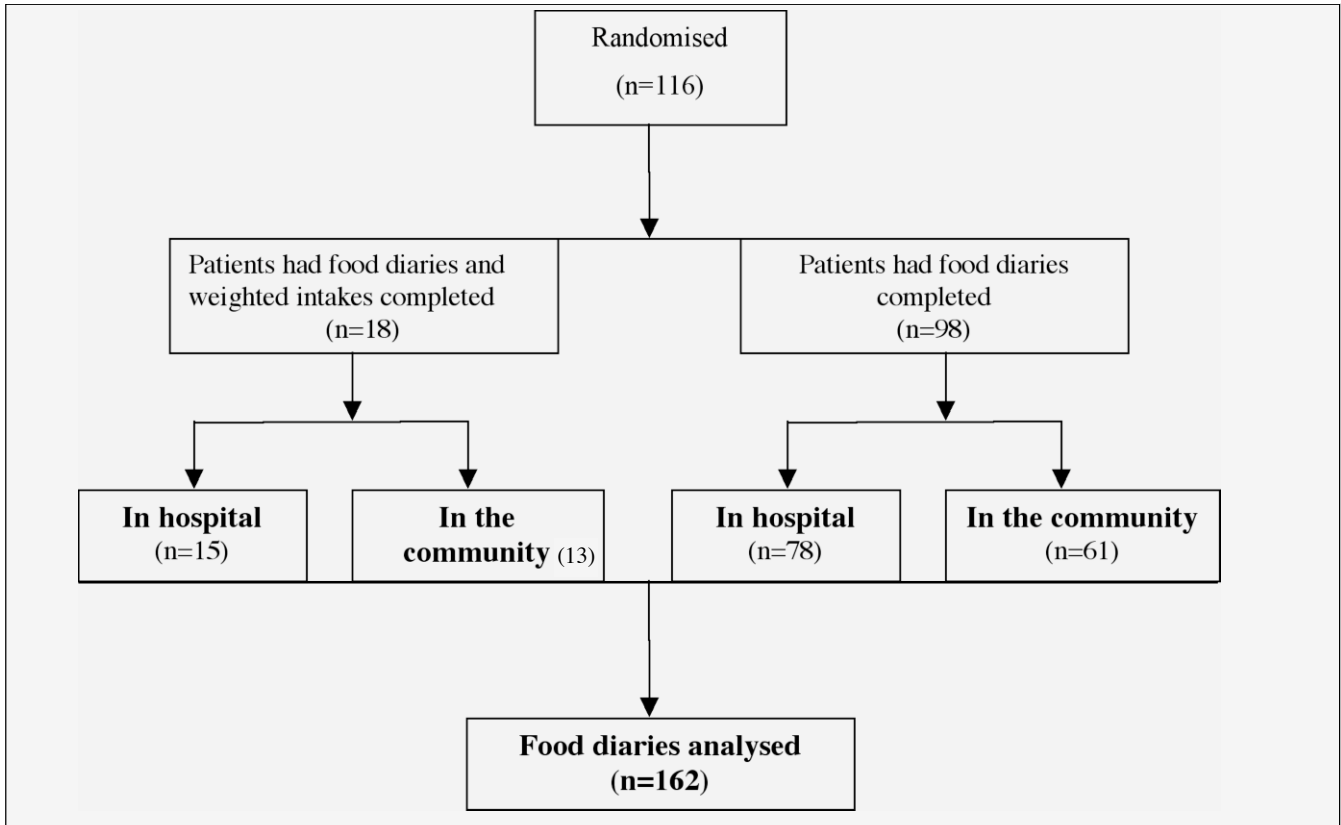
Nutrient	Mean intake (+SD)	* %DRV (+SD)	NDNS survey (9) of people aged 65 years or over
Energy (Kcal/d)	1457+331	67.7+17.3	1628
Protein (g/d)	64.3+14.4	123.3+ 28.3	62.6
Total fat (%/d)	33.3+5.6	95.2+16	35
Carbohydrate (%/d)	47.6+5.7	95.2+11.4	46.7
Vitamin C (mg/d)	58+35.6	144.8+89	63.3
Vitamin D (ug/d)	3.3+2.6	33+25.5	3.4
Riboflavin (mg/d)	1.56+0.5	124.2+44.2	1.6
Vitamin B6 (mg/d)	1.7+0.5	122+41	1.8
Vitamin B12 (mg/d)	4.1+ 3	273.2+202.8	5.1
Folate (ug/d)	228.6+72.3	114+36	233
Calcium (mg/d)	703.2+252.1	100.5+36	752

* Dietary reference values (DRV)

Discussion

The results of this study show that the food diary can be used to assess the dietary intakes of older patients in hospital and in the community. The energy intakes found were comparable to those found by the last national survey on nutrition and diet of older people of the UK in (1998) (10). Overall our study found that energy and macronutrient intakes especially carbohydrates in hospital were lower compared with the DRV. Although these findings were similar to other previous studies, energy intakes reported in this study were still higher than what was reported before (11-13). The reason for these discrepancies might be due the difference in the number of days used by different studies to assess nutrient intakes. Anorexia as a result of acute illness and medications may also be part of the explanation for the lower intakes in hospital.

Figure 2
Enrolment and follow up of study patients



We found protein intake in our subjects in hospital significantly higher than DRV. Other studies have also reported adequate protein intake in hospitalised older patients (13). We noticed that most of our subjects in hospital consumed red meat such as beef, roast pork, lamb, sausage and bacon which contributed to the higher protein intakes. We have also observed that many patients tend to order cooked breakfast such as scrambled eggs, tomato on toast, backed beans, sausages, bacon provided by the catering services. Barton et al (2000) (11) reported that "Serving a cooked breakfast rather than a cereal breakfast resulted in a significantly higher protein intake." This may explain why our subjects had higher protein intakes than what other researchers have reported in previous studies.

For micronutrient intakes we found that vitamin C, riboflavin, vitamin B6, vitamin B12 and folate intakes in hospital exceeded recommended needs. Calcium intake was non-significantly higher than DRV. This was inconsistent with previous studies, which found inadequate vitamin C intake 14, low calcium (14-16) and low folate intakes (17); however, our subject's vitamin D intake was significantly below DRV. Subjects only received 41% of their vitamin D requirements. This finding was similar to other studies including the Department of Health and Social Security 1979 survey (14, 16,

18).

At home people had low energy, carbohydrate and vitamin D intakes, whilst total fat and calcium intakes were adequate. Although these findings were similar to that found in hospitalized subjects, overall nutrient intakes were lower at home compared with the hospital except for carbohydrate intake. The reason for lower intakes at home immediately following discharge from hospital might be due difficulties with shopping, cooking, isolation, depression, and ill health with associated poor appetite and physical frailty. A recent study of predictors of early non-elective hospital readmission in elderly patients has found that individuals with any amount of weight loss and no improvement in albumin concentrations during the first month after hospitalisation were at a much higher risk of readmission than were those who maintained or increased their post-discharge weight and had repleted their serum albumin concentrations (19).

Despite all the effort undernutrition in older patients goes unnoticed and worsen during their hospital stay. A very recent report by Age Concern from the UK revealed that up to 14% of older people aged over 65 years in the UK are malnourished. Six out of ten older people are at risk of becoming undernourished, or their situation get worse, in hospital (8). There are obviously many ways of tackling this problem

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including helping with eating and monitoring intakes. The food diary is another way to involve patients, relatives and carers to achieve the goal of tackling undernutrition in hospital and the community among older people at risk. It can also be used for nutritional education to help patients learn how to read food labels and achieve dietary goals by increasing the variety of nutrient-rich foods such as increase intake of fruit and vegetables and calcium.

Food items shown in FOODBASE program did not cover all the food groups described in the food diaries. For these food items some assumptions had to be made based on similar food groups during analysis. This in turn might have introduced some errors for example when calculating vitamin losses during cooking.

We found the food diaries more accurate in hospital than at home. This could be due to a number of reasons including less supervision, less regular meals and difficulties with keeping record and estimating portion sizes at home compared with the hospital settings. The difference could also be due to the less number of meals weighed at home (two) compared with three meals in hospital. Despite these limitations there was a high degree of correlation between weighed and diary nutrient intakes at home which suggest that a food diary may provide valuable information on dietary intakes of older patients following discharge from hospital.

In conclusion our findings suggest that food diaries kept by patients in hospital and in the community following discharge provide a good estimate of their actual food intakes. Information gained may be of help in identifying those at risk of undernutrition and monitor those on nutritional support. Furthermore it can be used for nutritional education and for achieving dietary goals.

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