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Energy and nutrient intake of patients in acute care

INGE KOWANKO BSc, PhD
Senior Research Fellow, School of Nursing, Flinders University, Adelaide, Australia

STEPHEN SIMON BN, RN
Nurse Manager (Projects), Internal Medicine Service, Royal Adelaide Hospital, Australia

JACQUELIN WOOD BN, RN
Nursing Director, Internal Medicine Service, Royal Adelaide Hospital, Australia

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Summary

• There have been numerous reports that the nutritional intake of many hospitalized patients is sub-optimal, but there is little published information about patients' diets in Australian hospitals.

• In this study, the nutritional intake of patients in general medical wards of an Australian acute care hospital was assessed.

• Although the hospital diet can provide adequate energy and nutrients, many patients may not consume sufficient food to meet their needs.

• The estimated energy intake of about one-third of patients was very low, and vitamin C, calcium and zinc intakes were also of concern.

• The implications are discussed and recommendations for improved nutritional care are suggested.

Keywords: audit, food, hospital meals, nutrition.

Introduction

Over a century ago Florence Nightingale emphasized the vital role of diet in nursing (Nightingale, 1859). Since that time the importance of nutrition in hospital has been stressed, yet under-nutrition on admission and further deterioration in nutritional status during hospitalization is still prevalent in hospitals in the Western world (Tierney, 1996). Many factors contribute to this under-nutrition, but poor food intake is considered a major factor (Todd *et al*., 1984; Lennard-Jones, 1992; Klipstein-Grobusch *et al*., 1995). Under-nutrition is detrimental to patient outcomes and healthcare costs because it increases the incidence of complications, delays wound healing, reduces rates of rehabilitation, increases readmission rates, and extends lengths of stay (Gallagher-Allred *et al*., 1996; Arrowsmith, 1997; Chima *et al*., 1997).

Several studies from North America and Europe have indicated that patients' food intake whilst in hospital may be inadequate to meet their needs (Todd *et al*., 1984; Westin *et al*., 1988; Constans *et al*., 1992; Klipstein-Grobusch *et al*., 1995; Hankey & Wynne, 1996; Incalzi *et al*., 1996). There is little published information on the situation in Australian hospitals, except for some reports of

Correspondence to: Dr Inge Kowanko, School of Nursing, Flinders University of South Australia, GPO Box 2100, SA 5001, Australia (tel.: +61 882013273; fax +61 882013410; e-mail: Inge.Kowanko@post.flinders.edu.au).

malnutrition on admission (Marshman *et al.*, 1980; Wood *et al.*, 1985; Zador & Truswell, 1987). There is a paucity of information on what patients actually eat in hospital. In this report an audit of food consumption by inpatients of an acute care hospital was performed. This study was the initial phase of a larger project in which the knowledge and attitudes of nurses regarding nutritional care and audits of patients' food consumption were compared before and after an in-service nursing education programme.

Methods

PARTICIPANTS

The study was conducted in two 30-bed wards of the Internal Medical Service of a large adult acute care teaching hospital in metropolitan Australia. Patients who participated presented with a variety of general medical ailments such as respiratory infections, transient ischaemic attacks, stroke, congestive heart failure and degenerative nerve disorders. Length of stay varied widely but patients generally stayed on the ward for about 8 days. There were no day patients. Most patients were older (mean age at the time of the study was 65 years, range 22–94 years) and there were approximately equal numbers of males and females. The mean body weight was 66 kg (range 31–135 kg), and patients were mostly resting in bed due to their acute illnesses. The project was approved by the human research ethics committee of the hospital, and data were collected during the season of autumn, in April and May.

HOSPITAL MEALS

In this hospital the food was prepared and plated in a central kitchen on the premises. The majority of menu items were prepared from fresh ingredients purchased according to the hospital's specifications. There was a different menu for each day of the week. Menus were distributed once daily by catering staff for patients to make their meal choices for the following three meals. Catering staff also delivered the meal trays to patients and collected them again after the meal. Nurses were responsible for preparing patients for their meals, and assisting those who needed help to eat. Referrals were made to dieticians and allied health professionals at the discretion of both medical and nursing staff.

The continental breakfast menu included a choice of two fruit juices, a fruit compote (varied daily), four cold and two hot cereal choices, bread or toast with spreads and a hot drink. Lunch selections included soup, choice of hot entrée or meat salad with a bread roll or sandwich, and a cold dessert. The evening meal menu included three hot main meal choices with vegetables or side salad, with a bread roll or a mixed sandwich, and a dessert. Fresh fruit was also available as a menu choice at lunch and the evening meal. Soup, milk, jelly, custard and ice cream were available on request. Meals of modified consistency for patients with swallowing or chewing difficulties, and diets for those with special dietary needs (e.g. diabetics) were also provided. Patients selected items from the menu according to their appetites and tastes, and could eat food from outside unless on restricted diets.

AUDIT OF PATIENT FOOD INTAKE

An audit of the food consumption of all patients in the two study wards was conducted for 13 non-consecutive meals (four breakfasts, five lunches and four evening meals, spread over a 3-week period). A total of 585 patient meal remains were examined. Patients' food intake was assessed by visually estimating the percentage consumed of each component on the meal trays (in comparison to full servings). Nourishing fluids were included in the audit. In addition researchers asked patients if they had eaten any other food since the previous meal, e.g. food brought by visitors, and these items were included in the audit for that meal. All meal trays were assessed by two researchers to ensure reliability. Inter-researcher reliability and accuracy of researchers' food intake estimates in a sample of 16 meals were checked by a dietician using the weight of remaining food and standard serves of hospital menu items. The estimates were accurate within 2%.

DIET ANALYSIS

The nutritional content of standard portions of hospital food was calculated using the Diet 4 computer programme (XYRIS Software, Australia), referring to standard recipes of items prepared in the hospital kitchens. Those items which were purchased fully or partially pre-prepared had a nutritional analysis provided by the supplier which was entered into the Diet 4 programme, or an equivalent item was chosen from the Diet 4 database. Individual patients' intakes of energy, protein and other specific nutrients for each meal were then calculated from the amounts consumed using the Diet 4 programme. Descriptive summary statistics of energy and nutrient intake at breakfast, lunch and evening meal were generated.

STANDARD HOSPITAL MEALS

Patients' actual intakes at each meal were also compared to the content of standard hospital meals, which were theoretical constructs developed by the dietician and

Table 1 Nutritional composition of standard hospital meals*

Diet component	Meals			
	Breakfast	Lunch	Evening meal	All day**
Energy (kJ)	2492	2274	3517	8283
Protein (g)	16	27	50	93
Vitamin C (mg)	60	16	12	88
Calcium (mg)	362	242	313	917
Iron (mg)	3.9	3.5	5.8	13.2
Zinc (mg)	2.0	2.9	6.2	11.1

* Standard hospital meals are theoretical constructs developed by the dietician and represent the average energy and nutrient content of all available menu choices proportionately represented over the 7-day menu cycle.

** All day = (standard hospital breakfast) + (standard hospital lunch) + (standard hospital evening meal).

represent the average energy and nutrient content of all available menu choices proportionately represented over the 7-day menu cycle (Table 1). Truswell *et al.* (1990) have published recommended daily intakes of energy and nutrients for Australians, with adjustments for age, health and activity. For example, a 65-year-old, 66-kg, acutely ill patient resting in bed has an recommended daily intake of 7050 kJ (Truswell *et al.*, 1990), assuming no surgery, major sepsis, skeletal trauma or cachexia. The standard hospital diet provided protein, iron and vitamin C at about double the recommended daily intake for such a patient, whereas the energy, calcium and zinc content of the standard diet was approximately equal to the recommended daily intake.

Results

A total of 585 meals were examined (181 breakfasts from 4 days, 242 lunches from 5 days and 186 evening meals from 4 days). There was wide variation in both the food which was ordered and the amounts eaten. Patients often selected less food from the menu than allowed for in standard hospital meals, although some ordered more. There were 82 breakfasts, 114 lunches, and 116 evening meals for patients on special diets, such as diabetic, high protein or modified consistency diets.

Breakfasts ordered by patients were usually light, consisting of one or two pieces of toast or bread with spread, with or without some fruit, cereal and milk. The majority of patients consumed between three-quarters and two portions of bread or cereals, and little fruit apart from juice. A protein-rich dish was not generally available at breakfast, other than milk, which was consumed in variable amounts (one-third of patients had none).

Patients generally ordered more substantial lunches, typically consisting of a hot main protein dish, two or more portions of cooked vegetables or salad, and a dessert. However, food consumption at lunch was considerably less than the amount ordered. One-third of patients ate no bread or cereal and most of the remainder ate one portion or less of bread/cereal (usually a sandwich). Fruit was ordered by around half the patients, and was mostly eaten. Vegetables were a popular menu choice at lunch but were often not very well eaten. Two-thirds of patients ordered a main protein dish, and this was mostly eaten.

The evening meals which were ordered were also often quite substantial, but much was left uneaten on the trays. Bread/cereal was chosen by less than half the patients, who mostly consumed one portion or less. Fruit was commonly ordered (sometimes more than one portion), but half the patients ate no fruit, and most of the others ate one portion. Vegetables were ordered by most patients, and often more than one portion was consumed. Most evening meals ordered by patients contained a hot main protein dish, of which most ate one portion or less and only one fifth ate none.

The hospital does not usually provide between-meal snacks, but approximately 10% of patients reported eating something since the previous meal. Many of these were diabetic. Snacks were mostly fruit, biscuits, confectionery and milk drinks. These items were included in the audit for the next meal.

Patients' intake of energy and nutrients at breakfast, lunch and evening meals was calculated. Table 2 provides a descriptive summary of the data. There was wide variation between patients' intakes.

Individual energy and nutrient intakes were compared to the content of standard hospital meals (see Table 1). The results are shown in Table 3, which is a frequency table of the percentages of patients who consumed the

Table 2 Descriptive summary of patients' energy and nutrient intakes at breakfast, lunch and evening meal

Meal		Energy (kJ)	Protein (g)	Vit C (mg)	Calcium (mg)	Iron (mg)	Zinc (mg)
Breakfast	mean	1106	10	6	191	2	1
(n = 181)	SD	713	7	8	153	1	1
	median	1034	9	2	177	2	1
Lunch	mean	1760	26	20	158	3	3
(n = 242)	SD	910	14	20	142	2	2
	median	1774	26	12	106	3	3
Evening meal	mean	1859	29	50	179	3	3
(n = 186)	SD	1041	15	35	142	2	2
	median	1782	34	42	164	3	3

Table 3 Percentages of patients who consumed the indicated percentages of energy and nutrient content of standard hospital meals

Meal*	% of standard hospital meal consumed	Energy	Protein	Vit C	Calcium	Iron	Zinc
Breakfast	0	3	4	20	3	4	4
	1–25	25	19	69	33	24	19
	26–50	38	25	11	16	23	29
	51–75	25	26	0	21	27	23
	76–100	4	14	0	17	15	14
	>100†	5	12	0	10	7	11
Lunch	0	2	2	12	2	2	2
	1–25	7	7	15	30	8	9
	26–50	15	12	22	20	12	13
	51–75	24	19	5	16	21	14
	76–100	30	16	5	8	19	15
	>100†	22	44	41	24	38	47
Evening meal	0	3	3	4	4	4	4
	1–25	15	17	14	21	19	21
	26–50	33	16	12	25	22	29
	51–75	32	30	22	24	22	19
	76–100	11	28	6	17	21	10
	>100†	6	6	42	9	12	17

* Meal audits included any snacks eaten since previous meal.
† Some patients ate more than the full amount allocated in a standard hospital meal.

indicated percentages of energy and nutrient content of standard hospital meals.

It is apparent that breakfast was poorly eaten by many patients, with about two-thirds consuming less than 50% of the energy value of a standard hospital breakfast. In contrast, more of the lunches and the evening meals were eaten, but there was about one-quarter of patients whose energy intake was less than 50% of the standard hospital meal. It is noteworthy that about 3% of patients ate nothing at all, which is significant as the study design specifically excluded patients required to fast.

The standard hospital evening meal provides the major source of protein for the day, and although one-third of patients achieved this amount, another third ate less than 50% of this amount. Protein intake at breakfast and lunch was variable. The pattern of iron intake at different meals reflected protein intake.

The major source of vitamin C in hospital is orange juice at breakfast, yet patients' actual vitamin C intake at breakfast was never more than 50% of the amount provided in the standard hospital breakfast. However, vitamin C intake at lunch and evening meal was better, with almost half of the patients consuming at least as much as the amount provided in the corresponding standard hospital meal.

The standard hospital breakfast contains most of the calcium in the hospital diet, and half the patients consumed less than 50% of the amount provided as standard at each meal. The standard hospital evening meal is the major source of zinc, but again, more than half the patients achieved less than 50% of this amount.

Discussion

This study reports contemporary Australian data on what patients eat in hospital, and highlights some areas of concern regarding nutritional care. The methods used to estimate food intake were developed by the researchers and found to be simple, accurate and reliable. Similar visual estimations have been used elsewhere (Todd *et al.*, 1984; Incalzi *et al.*, 1996), whereas others have weighed plate waste (Klipstein-Grobusch *et al.*, 1995). An accurate estimation of dietary intake is not an easy task and it was important to choose a method carefully to match the study purpose and design. A number of the usual methods of estimating the food intake of individuals could not be easily applied under this circumstance. Self-reporting, such as 24 h recall, diet diaries or food frequency questionnaires, could not be readily used as patients were out of their normal surroundings, eating unfamiliar foods, and suffering from illnesses and treatments which could influence their ability to record or self-report. Unlike a dining room type of setting, the ward environment did not lend itself to observation of food consumption by a group of patients without being prohibitively labour-intensive, disrupting the ward routine and possibly influencing patients' eating behaviour. Similarly it was considered that enlisting the help of nursing staff would be impractical

and influence normal eating behaviour, compromising the validity of the study. The dietary requirements of individual patients were not assessed and compared to individual intakes. The approach was to estimate the food intake of a large number of patients at many separate meals over several weeks. This has enabled general patterns of food intake in the study population of acute medical patients to be established, and the identification of important problems with their food intake.

The results of the study indicate that the nutritional intake of many patients was poor, even though the standard hospital diet theoretically provides sufficient energy and nutrients. This is in broad agreement with published studies from Europe (Todd *et al*., 1984; Westin *et al*., 1988; Simon, 1991; Klipstein-Grobusch *et al*., 1995; Incalzi *et al*., 1996). Although individual patients' intakes were not studied over 24-h periods, the general pattern of daily food intake may be inferred from the large amount of data collected. Nutritional analysis of standard hospital meals has been used as a reference. Together, the standard hospital breakfast, lunch and evening meal provide close to the recommended daily intake of energy, calcium and zinc, and double the recommended daily intake of protein, iron and vitamin C for a typical older medical patient, although of course individual dietary requirements are likely to vary considerably from this (Truswell *et al*., 1990).

The energy value of the food consumed by patients in this study varied considerably, but it is worrying that on average the energy intake of over one-third of patients was less than 50% of that provided by standard hospital meals. This pattern of intake suggests that the daily energy consumption of a large proportion of patients would be unlikely to meet even the basal metabolic needs of a typical bed-resting 65-year-old patient, with even greater potential to affect the recovery of younger, more active patients, or those recovering from physical trauma or infection, who have a greater metabolic need (Truswell *et al*., 1990). Carbohydrate and fat intake were not analysed separately in this study because energy value was considered a more useful indicator of adequacy of the diet. Underweight patients consuming dangerously low amounts of energy will deplete their protein stores, further compromising their nutritional status.

Protein, iron, calcium, vitamin C and zinc were chosen for nutritional analysis as they represent key nutrients required for healing and immunity (Olde Damink & Soeters, 1997; Rollins, 1997; Westwood, 1997). Protein is abundant in the standard hospital diet and consequently the majority of patients' protein intake was adequate. The pattern of iron intake was similar to protein, which was expected because the major source of iron in the hospital diet is meat. However, a considerable number of patients consumed very low amounts of protein and iron, which has implications for those with trauma, surgery, infections and compromised immunity, who have greater requirements for these nutrients (Bastow *et al*., 1983; Truswell *et al*., 1990). Vitamin C, calcium and zinc are important for tissue repair and maintenance of immune function (Olde Damink & Soeters, 1997; Rollins, 1997; Westwood, 1997). About half the patients in this study consumed very low amounts of these nutrients. The vitamin C content of the hospital diet, after adjustment for cooking and storage loss, is about double the recommended daily intake for a typical older bedridden medical patient, and much of it is in the fruit juice provided at breakfast. Most of the calcium is also provided at breakfast. The finding that breakfast was the most poorly eaten meal of the day is a partial explanation for the poor intake of calcium and vitamin C.

There is no one single reason for a poor nutritional intake in hospital and clearly the maintenance of an adequate intake is more critical for some patients. A number of factors influence patients' food intake while they are in hospital, including patient factors, food service arrangements and factors associated with the nursing staff and ward routines. Patients do not necessarily order a nutritionally adequate diet while in hospital (Todd *et al*., 1984; Incalzi *et al*., 1996); hospital food may not be enjoyed and they may have physical difficulties with eating (Todd *et al*., 1984; Kayser-Jones & Schell, 1997). The hospital food service is organized such that patients order meals in advance, with little opportunity to alter menu choices later (Kowanko *et al*., 1999). Although the menu offers choices it cannot cater for all individual needs and preferences. Food service staff vary in their ability to communicate with patients and understand their individual needs. Busy nurses have little time to encourage patients to eat and to assist those unable to feed themselves (Isaksson, 1982; Kayser-Jones & Schell, 1997; Kowanko *et al*., 1999). Nurses may lack the knowledge to provide good nutritional care and some do not value this activity as legitimate nursing work (Arrowsmith, 1997; Perry, 1997; Kowanko *et al*., 1999). Meals may be missed due to investigations and treatments (Eastwood, 1997), and in this hospital breakfast is often rushed due to other morning activities such as ward rounds and hygiene routines (Kowanko *et al*., 1999).

The results of this study as well as parallel studies on nursing knowledge and attitudes about nutrition (Kowanko *et al*., 1999), and a review of the literature (Kowanko, 1997) are being considered by the hospital, along with a recently published compilation of strategies used in UK hospitals to improve nutritional care (Bond,

1997). There are some changes that could be introduced at once to improve the current situation, including:

- The use of a simple universal nutritional status assessment tool to screen all patients on admission, enabling targeting of the nutritionally vulnerable for attention at meal times.
- Assistance with menus and appropriate interventions (e.g. providing early and continuing nutritional advice, referrals to dieticians and allied health professionals, nutritional supplements and monitoring of nutritional status).
- Promotion of the nurses' role in the nutritional care of in-patients, including clarification of the responsibilities of nursing and food service staff in preparing patients for meals, assistance with the menu, etc.
- Inclusion of food service policies and procedures in nursing orientation to ensure that nursing staff understand the food service system and how best to meet the needs of their patients.
- Review of ward routines with respect to nursing requirements at meal-times, particularly breakfast.
- Review of communication systems, with food service staff to facilitate responsiveness to individual patient needs within the limits of the food service system and budgetary constraints.
- Continue regular menu review and patient satisfaction surveys to optimize nutritional value and patient acceptability of hospital meals.

Conclusion

The results indicate that in the study group of predominantly older general medical patients, there was a significant subgroup who consumed an inadequate diet during their in-patient stay. It is known that there are inverse relationships between nutritional status and length of stay in hospital, number of complications and rate of rehabilitation (Gallagher-Allred *et al.*, 1996; Arrowsmith, 1997; Chima *et al.*, 1997). With the current focus of healthcare on patient outcome and cost, there is clearly an urgent need to improve nutritional care, with potential for long-term benefits to both patients and hospitals.

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