BRIEFING PAPER

Undernutrition in the UK

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Summary

There is a nutritional component to most illnesses (whether poor nutrition leads to disease or disease adversely affects nutritional status) and their treatment, often involving all the health care professions. Undernutrition can adversely affect every system of the body such as the muscular system (resulting in fatigue, lethargy and decreased peripheral and respiratory muscle strength), the immune system (predisposing to and delaying recovery from infection) and psycho-social function (causing anxiety, depression and self-neglect).

As a consequence, undernutrition consumes a disproportionate amount of health care resources. It is estimated that 70% of undernutrition in the UK goes unrecognised and untreated and that, in the community, 5% of the population have a body mass index (BMI) less than 20 kg/m^2. In hospitals this figure rises to 20–25%. It is important to recognise that not all people with low BMI are undernourished; some may be perfectly healthy. There are difficulties in defining undernutrition because the anthropometric measurements used are neither age nor disease specific. Ranges and cut-off points to define normal or ideal have been based on healthy young individuals and are applied to the whole population. However, the three key elements that help define undernutrition or risk of undernutrition are: assessment of chronic protein-energy status, history of weight loss, and underlying risk factors including disease and disabilities.

Patients may be malnourished on admission to hospital as a result of a variety of disease-related, social or psychological factors. Mental illnesses such as depression and dementia cause anorexia. Malignancy and acute or chronic physical disease reduce appetite and alter the taste, smell and preferences for different types of food. Infections and malignant disease may also increase nutritional requirements. Neurological and mechanical impairment of swallowing and diseases of the gastrointestinal tract affect nutritional intake. Factors such as social isolation and poverty can play an important role, and disability and immobility can interfere with food purchase and preparation. Taste appreciation also alters with ageing.

It is reported that 40% of all patients admitted to hospitals are undernourished, half of them severely so. Nutritional status tends to worsen during hospital stay and is associated with a worse outcome of the disease and prolonged hospital stay. Studies have shown that 40% of hospital food is wasted, which results in patients receiving only 70% of their energy and protein requirements. Because many patients are discharged from hospital in a worse nutritional state than they entered, a further group of undernourished individuals are discharged into the community, setting up a vicious circle. This can largely be prevented or treated with appropriate screening and management.

Weight loss often continues in many patients during their hospital stay for many reasons. These include surgical treatments and investigations that impair appetite or the ability to eat (while increasing nutritional requirements) or treatments and procedures that require a period of nil-by-mouth beforehand, which reduces intake. Frustratingly, sometimes a patient may be nil-by-mouth all morning only to have the treatment delayed or postponed to a later date. Often when the patient returns to the ward, no meal has been saved for them (due to lack of communication or lack

of suitable facilities to store it if it was hot) and there may be no other food available to them.

A major contributor to the worsening nutritional status during hospitalisation, however, is the inadequacy of current catering and feeding practices. Hospital catering is beset with all sorts of seemingly trivial problems that add up to one huge problem. For example, the wrong food may arrive for a patient because they were not able to choose it themselves or they have been given a meal chosen by somebody else occupying the bed before them. The meal that does come is difficult to eat, *e.g.* the provision of individual butter packs that are difficult for frail arthritic fingers to open.

Although special techniques of enteral and parenteral nutrition support are indicated for a minority of patients with failure of swallowing or gastrointestinal function, the majority of patients are dependent on hospital food to sustain them during illness. In many hospitals the three meals provided may be of a reasonable standard, as the catering officers struggle on the tight budget they have, but the range and quality of the snacks (essential to meet increased requirements in many patients) let them down. In many cases, proprietary oral supplements or sip feeds may be of value, but they should not become a convenient substitute for adequate and appropriate food provision.

Hospital menus and meals should provide sufficient choice to offer healthy, balanced, appetising nutrition for all patients. Menus should be designed to meet the needs of particular patient groups, *e.g.* elderly people, children and ethnic minorities. Adequate choice should be available to meet these needs. Special attention should be given to the requirements of sick and nutritionally vulnerable patients, and appropriate special therapeutic diets for those who need them should be provided. A range of meals specially fortified in energy and protein should also be available in every hospital, and snacks and nourishing drinks should be kept in the ward and routinely offered between meals. The timing of meals should be reviewed and made more relevant to patients' customary meal patterns. All methods of food preparation, *e.g.* in-house cook-serve or brought-in cook-chill (with ward regeneration) have proved successful, but each is highly dependent on the method of distribution and serving. With proper management, a bulk trolley bedside service serves patients' needs best. Nutritionally vulnerable patients should be placed in wards with kitchen areas, or near ward kitchens, so that special meals or snacks can be prepared for them or, when possible, patients can access the kitchen themselves. The primary responsibility of the nutritional care of in-patients rests with the nurses in charge of the ward; therefore, food should be served by nurses, supported where necessary by other grades of staff trained for this purpose, *e.g.* ward hostesses, diet technicians/helpers. Assistance with eating must be provided where necessary. Plate or tray collection should be supervised by nursing staff, to enable patients' food intake to be monitored.

Many studies have shown the benefits of nutritional intervention. Therefore, the presence of disease, whether in hospital or the community, should be seen as an indication of the need for nutritional screening to identify those at particular risk and those who might benefit from some form of nutritional intervention. In which

case, implementing measures such as improved staff training, nutritional screening and assessment, and monitoring, combined with better catering practices will result in most patients' nutritional requirements being met. Fortified meals, between-meal snacks and adequate ward staffing have all been shown to contribute to achieving this goal, which leads to better clinical outcome, less waste, a shorter hospital stay and a more cost-effective service.

Recently, a number of schemes and initiatives have been set up to help prevent or combat malnutrition both in hospitals and the community. These include the launch of *Better Hospital Food: a new menu for the National Health Service*, and the establishment of the Malnutrition Advisory Group, a group of experts convened to raise awareness and understanding of issues of undernutrition. Community initiatives include the establishment of the Neighbourhood Renewal Unit for deprived neighbourhoods, Sure Start – set up to operate local programmes for children and parents living in areas of high poverty, and Healthy Living Centres – set up to run schemes such as luncheon clubs for older people.

1 Introduction

Serious attention to the problem of undernutrition in hospitals was first given in 1992 with the publication of the King's Fund report, *A Positive Approach to Nutrition as Treatment* (King's Fund 1992). The report stated that 66% of all hospital patients were malnourished and cited evidence that undernutrition in hospital patients had both clinical and financial implications. The organisation of food and nutrition services in hospitals was reviewed and a number of recommendations for improving care were made.

Two years later, McWhirter & Pennington (1994) showed that 40% of adults admitted to hospital had some degree of undernutrition and in half of them this was severe. Patients continued to lose weight during their time in hospital, yet only 5% were referred for dietetic help. Those who did receive dietetic support gained weight, proving that, once identified, the problem could be treated. McWhirter & Pennington identified a number of contributing factors to the widespread existence of undernutrition. Most importantly they showed the failure of nurses and doctors to identify patients at risk and to recognise obvious signs and symptoms of undernutrition. There was often no reference in the medical notes to the nutritional status of the patient on admission, and 23% of patients were not weighed on admission and throughout their stay. Also, no mention was made of the patient's appetite or food intake.

Following the publication of the King's Fund report, a number of reports have produced recommendations specifically addressing the management of food and nutrition in hospitals (Bond 1997; Burke 1997). These cover such issues as staff roles and responsibilities, training, standards for hospital food, and the identification and assessment of undernutrition. The latest two reports: *Managing Nutrition in Hospital: A Recipe for Quality* (Nuffield Trust 1999) and *Hospital Food as Treatment* (BAPEN 1999) are in almost complete agreement as to causes and consequences of undernutrition in hospitals and their subsequent recommendations for improving the current situation (see Section 7).

Despite an increased awareness and widespread discussion of the issue, there is little evidence of general improvement in practice, either in the provision and organisation of nutrition care or in the prevalence of undernutrition among patients. The Nuffield Trust (1999) and BAPEN (1999) reports highlighted the continued confusion of roles and responsibilities over nutritional care, a lack of enforcement of existing guidelines, and a lack of status awarded to the whole area of food and nutrition in hospitals.

The functional, clinical and economic consequences of undernutrition have been well reviewed and demonstrated repeatedly. They include impaired mental and physical function, greater risk of death, increased complication rates during illness and following surgery, and delayed recovery with prolonged convalescence and

hospital stay. In some patients, undernutrition may be the main condition that precipitates hospital admission. Trials of nutritional intervention by oral or artificial means have shown that, in many patients, the clinical consequences of undernutrition can be avoided or reversed by appropriate nutritional care (Beier-Holgersen & Boesby 1996; Keele *et al*. 1995; Larsson *et al*. 1990; Rana *et al*. 1992).

2 Definition and classification of undernutrition

Undernutrition can be defined as a disturbance of form or function arising from the deficiency of one or more nutrients. Undernutrition can be mild or severe, helpful (if it results in appropriate weight loss in someone who is obese), or dangerous. Weight loss is a manifestation of energy depletion. The least essential tissues suffer first; the adipose tissue cells lose fat, which is oxidised to provide energy. Essential nutrients, protein and micronutrients, are likely to be depleted at the same time. The body stores of some micronutrients are large, while requirements for others are lower when energy intake is reduced. In children, who have relatively higher protein requirements than adults, serious depletion of protein accompanies undernutrition.

The consequences of protein depletion are apparent in two main ways: somatic protein depletion – the loss of tissue as general wasting of muscles; and visceral protein depletion – protein loss from the liver, pancreas and gut. When protein is lost from skeletal muscle, the muscle fibres shrink and the spaces between them are filled with an extracellular watery gel. In older people, some of the excess fluid collects in the legs during the day as oedema. If the loss is not too severe, the oedema will disappear when the person lies down.

In undernutrition the skeleton retains its outward size and shape, but the fatty marrow disappears and is replaced with aqueous material. The skin loses protein and becomes easily infected; this, with the loss of subcutaneous fat, gives it a loose hanging appearance. The internal organs, particularly the liver, lose mass. The heart and kidneys tend to lose mass in parallel with the rest of the body, but the brain retains its size and structure. The gut becomes thin, and weight is lost from both muscle and mucosa.

In spite of these structural changes, organ function and body systems remain normal until a great deal of weight has been lost. The resting metabolic rate per kilogram body weight is not greatly reduced in moderate undernutrition, but in starvation both metabolic rate and body temperature fall. Pulse rate and arterial blood pressure are low in undernutrition as the body adapts physiologically. In moderate undernutrition the gut functions normally, provided there is no infection, but in severe undernutrition diarrhoea can be severe (even without infection) and the resulting dehydration can prove fatal.

Table 1 Classification of undernutrition in adults by body mass index (BMI)

BMI (kg/m^2)	Classification
> 20	Normal
18.5–20	Marginal undernutrition
17–18.5	Mild undernutrition
16–17	Moderate undernutrition
< 16	Severe undernutrition

The presence of undernutrition in adults is assessed in terms of degrees of weight loss. An easy (but not the best) index is body mass index (BMI) (see Section 8.3.3), defined as weight (in kilograms) divided by the square of the height (in metres), *i.e.* weight/height^2. Table 1 gives values for defining adult grades of undernutrition.

The most sensitive indicator of undernutrition in children is failure to achieve normal growth, compared with a 'normal' reference growth rate for the age and sex of the child. Progression of growth is an important parameter and can be assessed in terms of height and weight, or in infants, weight and head circumference in relation to reference standards for age. New reference standards (Freeman *et al*. 1995) have been published to replace those compiled in the 1950s, which take into account the upward shift in the average weight and height of children in recent decades. However, a number of difficulties are associated with the use of these data. Firstly, children who cross centiles, but never actually reach the cut-off centile defining failure to thrive are not identified. For example, infants considered large at birth might fail to grow, but because they do not reach the cut-off centile, failure to thrive will not be diagnosed. Secondly, infancy is naturally a period of centile crossing (large for gestational age infants grow more slowly than those of small for gestational age). So, identifying failure to thrive depends on being able to distinguish poor growth from natural changes in growth rate. To address this problem, Cole (1997) has developed a chart that can be used to detect growth faltering over any period of 4 weeks or longer.

Key points

- Moderate undernutrition leads to fat loss, general wasting of muscles and loss of protein from internal organs
- Internal organs can function normally in moderate undernutrition but with severe undernutrition gut function breaks down causing malabsorption, diarrhoea and infection. This can be fatal
- There are a number of methods for the assessment of undernutrition. BMI is routinely used in adults, and growth reference standards are used in children

3 Causes of undernutrition

Undernutrition is the consequence of a dietary intake that does not meet nutritional needs, and may result from one or more of the following: decreased dietary intake, increased nutritional requirements/losses, impaired ability to absorb or utilise nutrients.

Undernutrition usually has a slow onset, resulting from periods of weeks or months when intake has not matched requirements. However, in conditions of acute metabolic stress, where nutritional demands are high, utilisation of energy and nutrients are disturbed and oral intake is likely to be compromised, nutritional depletion can occur rapidly and be severe.

Many factors can impair dietary intake. These include:

- difficulties with shopping (both access and affordability), and/or preparing, cooking or eating food, resulting from illness, lack of mobility or poverty;
- reduced appetite as a result of the effects of illness, or associated anxiety or depression;
- symptoms associated with a disease or its treatment, *e.g.* nausea, vomiting, sore mouth, abdominal discomfort or diarrhoea;
- lack of interest in food as a result of social isolation, significant life change (such as bereavement) or mental illness;
- inadequate or unappetising meals or the provision of inappropriate food;
- repeated fasting for diagnostic or treatment procedures;
- problems associated with skipping meals;
- difficulties with eating or chewing, *e.g.* ill-fitting dentures or poor oral hygiene;
- swallowing difficulties;
- difficulty with self-feeding (*e.g.* owing to disability or disorders such as Parkinson's disease) or inadequate help given to those unable to self-feed;
- sedation, semiconsciousness or coma.

These factors can be separated into effects of lifestyle and effects of disease and consequent treatment, and are explored in greater detail below.

3.1 Causes in the community

In this briefing paper causes in the community are confined to those undernourished individuals who may have previously been patients in hospital and have been discharged while undernourished, or people with onset of a disease that has yet to be diagnosed or treated and will enter hospital in due course.

3.1.1 Poverty

One in four of the UK population, nearly 14 million people, live in households with incomes below the European poverty line of half the average income. Approximately 9.6 million of these people are in households that receive income support and the remainder live on low or insecure wages. Diets in low-income households are characterised by less dietary variety, which is itself associated with poorer nutrient profiles.

National Food Survey results have consistently shown lower nutrient intakes in the lowest income groups compared to the highest. In addition, the Dietary and Nutritional Survey of British adults (Gregory *et al.* 1990) found that men and women who were unemployed, or living in households claiming benefit, or in social classes IV and V, had significantly lower intakes of many vitamins (especially vitamin C, β-carotene and vitamin E) and minerals (especially iron) than people not in these categories. Data from the new NDNS of adults can be found on the FSA website (http://www.food.gov.uk).

In the National Diet and Nutrition Survey (NDNS) of young children (Gregory *et al.* 1995), those from manual social classes or from less-advantaged homes (where the head of the household was unemployed, or claimed benefits) had lower intakes and/or blood levels of β-carotene niacin, vitamin C, iron, calcium, phosphorus and potassium, than those from non-manual or more-advantaged households. Preschool children from single-parent families had lower levels of β-carotene and vitamin C. In the NDNS of young people (Gregory *et al.* 2000), those who received free school meals (and were

therefore from households in receipt of benefits) had lower vitamin and mineral intakes (Buttriss 2002).

Similar findings have been reported from other large-scale surveys in the UK, such as the Scottish Heart Health Study, in which the data were controlled for smoking and education level (Bolton-Smith *et al*. 1991), and the 36-year follow-up to the National Birth Cohort Study (Braddon *et al*. 1988). The survey of nutrient intakes in Northern Ireland found similar nutrient differences by occupational social class (Barker *et al*. 1989). These findings are comparable with those from smaller surveys looking at nutrient intakes in different socioeconomic circumstances (Calvert *et al*. 1994; Moynihan *et al*. 1993) including the homeless (Rushden & Wheeler 1993). A study by Dowler & Calvert (1995) of nutrient intakes in lone-parent households showed that where parents had lived for some time on income support, and particularly where they had fixed regular deductions for debt recovery, nutrient intakes were half of the levels of those not living in such circumstances.

In terms of dietary variety and overall dietary patterns, those in poorer households consume less fruit juice, lean meat, oily fish and wholemeal products, and fewer salads, and are more likely to eat white bread, potatoes, cheaper fatty meats, beans, eggs and chips (Anderson & Hunt 1992; Gregory *et al*. 1995; Whichelow *et al*. 1991). Those on lower incomes have a much less diverse food base, so their diet is more likely to lack variety.

Many foods that are integral to a healthy diet are perceived as a luxury by those on low incomes and are an 'expensive' form of energy; such foods include fruits, vegetables and fish. In addition, many healthier alternatives carry a price premium, *e.g.* wholemeal bread, fats and spreads low in saturates and lean meat. However, in addition to price, many factors influence the purchasing and consumption patterns in low-income households, which are related to their poor financial status, such as limited food preparation facilities. Low income is also often associated with lack of knowledge, and skills related to food, nutrition and cooking.

Policies adopted by government, local authorities and food retailers can influence which foods are available and accessible to people with low incomes. For example, there is the issue of price variability between shops. Food is generally more expensive in corner shops, convenience stores and small independent supermarkets than in large supermarkets. Piachaud & Webb (1996) found that, on average, basic foodstuffs cost 24% more in small stores than in supermarkets; taking supermarket own brands into account, the differences in costs were 60%. They calculated that people living in a household on benefits would have to spend 25% more of their income on food if they could not get to a large supermarket or street market.

Access to shopping facilities in areas where low-income households are concentrated is restricted in terms of the physical difficulties or cost of travelling to shops, and by a lack of choice of shops. Therefore, access to a healthy diet becomes a particular problem for low-income households. The number of food retail outlets is continually decreasing, mainly at the expense of shops such as small grocery retailers, butchers, fishmongers and greengrocers. The number of large retail outlets has also decreased, mainly because of the increase in the number of superstores located on the outskirts of towns and designed for access primarily by car. Economies of scale allow food sold in supermarkets to be cheaper and cover a wider range than that in smaller high street stores. The 1998 Independent Inquiry into Inequalities in Health report (Acheson 1998) found, paradoxically, that a basket of food cost more in disadvantaged areas than in affluent areas.

The price of a healthy diet and the variation between prices of some foods is therefore of major concern for those living on low incomes. Many of the poorest people in the UK are concentrated in local authority housing in inner cities and there is evidence to suggest a continuing geographical polarisation of income inequalities. In many of these areas, shops and banks have withdrawn, partly because the residents spend so little, and partly because of the retail concentration in superstores (defined as having a total floor surface area of more than 7620 m^2) designed primarily for car access. The rise in vandalism is another contributing factor. In a bid to resolve these problems the supermarket chain Somerfield operates a policy of maintaining small- and medium-sized high street shops to serve local communities and not to build large out-of town superstores. Many deprived sectors of society suffer from a lack of access to good shopping facilities, and in particular, fresh fruit and vegetables. To avoid these 'fresh food deserts', Somerfield opted to offer a free delivery service to village shops and small local stores. Unfortunately, the company had to close some of these small stores in some areas due to vandalism.

3.1.2 Social and physical factors

Some of the social factors that influence food choice and eating patterns are listed below:

- Budgeting skills;
- Cultural traditions;
- Religious beliefs;
- Education;
- Nutritional knowledge;
- Lack of cooking facilities, *e.g.* families housed in bed-and-breakfast accommodation;
- Habits;
- Likes and dislikes;
- Previous food experience;
- Willingness to experiment;
- Time available;
- Eating alone;
- Depression;
- Bereavement.

For example, a recently widowed man may not only be suffering the effects of bereavement and depression, which are likely to reduce appetite, but he may also suddenly find himself having to cope alone. If his wife had always been responsible for shopping, cooking and providing food, the widower may have difficulty budgeting for food, preparing and cooking food, and may find the new experience of eating alone all too painful.

Poor dentition is another factor. The NDNS of people aged 65 years and over (Finch *et al*. 1998) reported that people with no natural teeth or few natural teeth ate a more restricted range of foods, influenced by their perceived inability to chew. The survey showed an association between oral function and nutrient intake and nutritional status. Subjects without their own teeth were less likely to choose foods that need chewing, such as fruit and vegetables; had lower intakes of iron, vitamins C and E and retinol; and had lower plasma levels of vitamin C. This was particularly true of those who lived in various forms of residential care. Physical disabilities also influence a person's ability to shop, prepare and cook food. Something as simple as opening a can of baked beans is far from simple for someone with arthritic hands.

3.2 Effect of disease on nutritional status

3.2.1 The nutritional requirements of illness

Tissue repair imposes demands on nutritional supply, and an increased activity of body defence mechanisms may also increase nutritional needs. Despite this, ill health is often associated with a decreased desire for food and decreased nutritional intake.

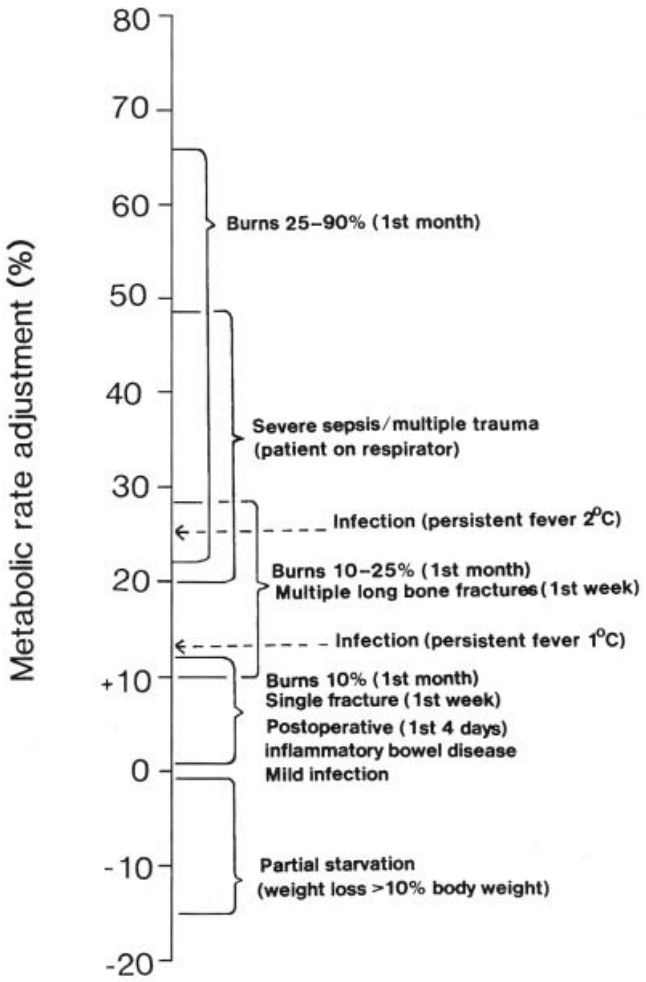

Figure 1 Guidelines for estimating the approximate energy and nitrogen requirements for an adult patient receiving artificial nutritional support. Reproduced from Garrow *et al.* 2000. Reproduced with permission from Elsevier.

Various changes in the metabolism of carbohydrate, fat and protein can be observed in illness. Proportional to the severity of illness, there is an increase in the body's energy requirement and also an increase in urinary nitrogen loss (Cuthbertson 1980). The scale of these changes can be seen in Fig. 1. This response to illness has been termed a stress response and the state of increased energy and protein needs, a hypermetabolic state.

The metabolic response to illness traditionally has three phases: ebb, flow and anabolic, although these can be moderated with drug treatment: The ebb phase only lasts for a few hours and there is a depression of metabolic function and a reduction in energy expenditure. In

the flow phase, metabolic rate increases and energy reserves in the form of fat stores are mobilised. Visceral and muscle tissue provide amino acids that can be used for gluconeogenesis, providing glucose for the brain and red blood cells, and for wound-healing mechanisms. Hormonal changes appear to be important determinants of the stress response. Simply stated, insulin stimulates glucose uptake and metabolism, and glycogen, fat and protein synthesis. During starvation, insulin levels are low, and other hormones are effective in mobilising body stores (*i.e.* promote glycogen, fat and protein breakdown and stimulate gluconeogenesis and ketogenesis). In the stress response there is an increased secretion of catabolic hormones. Especially important are the glucocorticoids, catecholamines and glucagon. The actions of insulin seem to be opposed by the catabolic hormones, leading to a state of insulin resistance (Cuthbertson 1980).

Another fundamental event is the production of the mediator interleukin-1, a polypeptide produced by phagocytic cells (white blood cells that help fight infection). A number of direct effects, collectively termed the acute-phase response, are ascribed to interleukin-1. These include fever, which is one of the strategies the body uses to fight infection, and the induction of muscle protein breakdown leading to increased blood levels of the acute-phase proteins prealbumin, retinol-binding protein (RBP) and C-reactive protein (Casati *et al.* 1998).

In simple starvation, the breakdown of body fat is reversed by feeding with glucose. In the hypermetabolic patient, it is found that fat breakdown continues despite giving glucose, and that gluconeogenesis and glucose oxidation also occur at increased rates. Hence the increased gluconeogenesis can increase the amount of carbohydrate that is required to obviate protein breakdown. Achievement of energy balance fails to alleviate catabolism in critically ill patients. Therefore, provision of energy intake to match energy expenditure is unnecessary during the flow phase and may even be unhelpful (Frankenfield *et al.* 1997).

The increased nitrogen loss observed in stressed patients can be accounted for by both a depression of protein synthesis and an increase in the rate of protein breakdown. Provision of adequate protein stimulates protein synthesis, but it also stimulates breakdown (Campbell 1999).

In the anabolic phase, catabolism eventually declines and is coupled with an increase in appetite and ability to move. This phase provides the opportunity for nutritional therapy to restore muscle mass and increase protein synthesis.

3.3 Reaching hospital

On reaching hospital, dietary intake may be further reduced by one or more of the following problems:

- Confusion;
- Fear;
- Depression;
- Dysphagia (inability or reduced ability to swallow);
- Loss of appetite, taste, smell or thirst;
- Poor dentition;
- Constipation, which is caused by reduced mobility and the fear that eating will make it worse;
- Discomfort;
- Dislike of the type of food available;
- Difference in routine and meal pattern;
- Problems with feeding;
- Lack of staff available to help with feeding.

Key points

Factors influencing poor dietary intake include:
- loss of appetite;
- disease or recurrent illness and consequent treatment;
- impaired ability to absorb or utilise nutrients;
- poverty resulting in lack of car ownership or alternative transport leading to limited access to bulk buying low-cost food;
- poor housing with poor food storage and preparation facilities;
- problems of shopping and lack of preparation and cooking skills;
- less education leading to less knowledge and motivation to make healthy diet choices;
- unemployment so there is less money available for expenditure on food;
- social isolation, depression and bereavement, low self-esteem.

4 Extent of the problem of undernutrition

Undernutrition among patients in UK hospitals was documented in the mid-1970s (Bistrian *et al.* 1974; Hill *et al.* 1977) and it remains a common and often unrecognised problem that contributes to patient morbidity and mortality (Lennard-Jones 1992; McWhirter & Pennington 1994; Potter *et al.* 1998).

Many studies over the last 30 years have since emphasised the presence of disease-related undernutrition in hospitalised patients (Bistrian *et al*. 1974; Corish *et al*. 2000; Hill *et al*. 1977; Kelly *et al*. 2000; McWhirter & Pennington 1994). However, there is controversy about its exact prevalence in the hospital setting. One of the major reasons for this is that there is no universal agreement about the definition of undernutrition. Because various workers have used different criteria to screen for undernutrition, the reported magnitude of the problem has been highly variable, ranging from 10 to 60%.

Corish *et al*. (2000) have screened for undernutrition in patients admitted to two teaching hospitals in Dublin. To ensure more reliable comparisons, they used the same criteria employed by McWhirter & Pennington (1994) in a Dundee hospital 6 years earlier. In both studies, patients were classified as undernourished if they had a BMI < 20 kg/m^2 and a triceps skinfold thickness or mid-arm muscle circumference (MAMC) below the 15th percentile. The incidence of undernutrition in newly admitted patients in Dublin was reported to be more than threefold lower (11%) than in Dundee (40%).

This striking difference has led other experts in the field to question the criteria for defining undernutrition. Elia & Stratton (2000) suggest that anthropometric cut-off values should not be used as a diagnostic label of undernutrition, but rather to classify an individual's risk of undernutrition. Some healthy subjects have a BMI < 20 kg/m^2 (especially young adults) and are perfectly well. In addition, anthropometric criteria alone suggest a chronic protein-energy deficiency status. However, a patient showing substantial recent weight loss (*e.g.* greater than 10% weight loss over 3–6 months) is at risk of undernutrition and impaired bodily functions, even though the anthropometric cut-off values may not have been reached.

The standard data used for anthropometry require regular review so that they achieve the right balance between reflecting what is the norm (which may not be desirable) and what is desirable (which may not be appropriate to the current generation). Unlike BMI, which is a fixed criterion, percentile values can show substantial change over time. For example, the reference values provided by Bishop *et al*. (1981) for arm anthropometry were established in the USA about 30 years ago. The secular trends in obesity over that period mean that these reference values may no longer apply. Furthermore, the choice of the percentile cut-off for use as part of the screening tool to classify patients as undernourished may be inappropriately high (since 15% of the reference population falls below this cut-off).

While the picture may be incomplete with regard to the prevalence of undernutrition in hospitals, it is clear that disease-related undernutrition remains a significant clinical problem in hospitals.

However, the problem of disease-related undernutrition is not confined to people in hospital. Within the community, up to 10% of people with cancer or other chronic diseases may be significantly malnourished (Edington *et al*. 1996) and many elderly people are also at high risk of undernutrition. As a result, people are commonly admitted to hospital nutritionally depleted. In a study conducted in four hospitals in England, Edington *et al*. (2000) found that one in every five patients admitted was malnourished. Patients were assessed using anthropometric measurements and BMI and by recording history of unintentional weight loss. This figure is likely to be an underestimate because it did not include those who were too ill on admission to be assessed. Kelly *et al*. (2000) estimated that undernutrition among acute hospital admissions goes unrecognised in 70% of cases.

Once in hospital, undernutrition is likely to get worse. In the study by McWhirter and Pennington, two-thirds of the 500 patients, who had been assessed on admission and were reassessed on discharge, had lost weight. A study on a random sample of 150 in-patients found approximately half of them to be either at moderate risk or high risk of undernutrition (Reilly *et al*. 1995). The prevalence and level of risk is probably higher among high dependency medical, surgical, geriatric and paediatric patients (Reilly *et al*. 1995). As illness and hospitalisation are frequently associated with weight loss, deterioration in nutritional status is inevitable unless action is taken to prevent it.

Key points

- It is estimated that 70% of all undernutrition in the UK goes unrecognised and untreated
- In the community, 5% of the population have a BMI < 20 kg/m^2. In hospitals this figure is 20–25%
- It is estimated that 40% of adults and 15% of children admitted to hospital are malnourished, half of these severely so, and many others become malnourished during their stay in hospital
- It is estimated that at any one time approximately 66% of hospital patients are malnourished

5 Cost of the problem of undernutrition

Undernutrition primarily results in loss of body tissue (depletion of body fat stores and muscle wasting). However, because nutrient intake is so closely correlated with energy intake, a deficiency of energy is likely to result in an inadequate intake of protein, vitamins, minerals and trace elements. This can cause widespread metabolic, physiological and functional effects which may include:

- Impaired immune function, and hence increased susceptibility to infection and sepsis. Infection will further impair a malnourished state;
- Delayed wound healing;
- Increased risk of pressure sores, particularly due to loss of cushioning fat stores;
- Muscle wasting and weakness, which may affect:
  - Respiratory function: impaired respiratory muscle strength makes it difficult for a patient to cough and expectorate effectively, so increasing the risk of chest infection. It may also be more difficult to wean a patient off a ventilator;
  - Cardiac function: this may be impaired, resulting in reduced cardiac output and risk of heart failure;
  - Mobility: weakness of skeletal muscles delays a return to full mobility. Reduced mobility increases the risk of thromboembolism and bedsores;
- Altered structure of the small intestine, which may result in malabsorption;
- Increased risk of postoperative complications;
- Apathy and depression leading to loss of morale and reduced will to recover;
- General sense of weakness and illness which impairs appetite and physical ability to eat, and hence tends to perpetuate and worsen any undernutrition.

In summary, undernutrition causes considerable morbidity, delays recovery and increases the risk of death. A BMI at or below the 15th percentile has been shown to be a significant and independent predictor of death in seriously ill patients (Galanos *et al*. 1997). There is also an economic cost in terms of increased need of nursing care and extended hospital stay.

There is clear evidence that correcting undernutrition has many benefits (Potter *et al*. 1998). Improvements in body weight status and anthropometric parameters are associated with improvement in immune function (Chandra 1992; Dionigi *et al*. 1988), wound healing (Haydock & Hill 1987) and muscle function (Fiatarone & Evans 1993) and in clinical outcomes such as recovery time and incidence of postoperative complications.

Hospitals spend approximately £1.5 billion on food annually, and studies conducted in one hospital found that 30–40% of food is discarded (Kelly 1999). This is consistent with national estimates that 30–50% of hospital food is wasted, with a monetary value calculated to be £45 million each year (Edwards & Nash 1997; Fenton *et al*. 1995). With the inclusion of labour and overheads, this cost rises to £144 million annually. There is also the hidden cost of the extra ill health associated with undernutrition. Some hospitals also typically spend approximately £800 000 on enteral and parenteral nutrition (see Sections 9.2 and 9.3). The King's Fund (1992) report calculated that provision of comprehensive nutrition support would result in a 5-day reduction in hospital stay for approximately 10% of patients. The consequent saving was estimated to be £266 million annually in the UK. A review conducted by Bond (1997) in the USA, showed a clear relationship between undernutrition and prolonged hospital stay. When nutritional intervention was introduced 2 days earlier than usual, the result was a 1-day shortening of hospital stay. It was calculated that a more aggressive nutritional intervention policy would save the average hospital $1 million per year.

Key points

- Between 30 and 50% of hospital food is wasted
- On average food intake is less than 75% of that recommended, particularly among the elderly
- The monetary value of hospital food wasted each year in England alone is calculated to be £45 million. By including labour and overheads, this cost rises to £144 million
- There is also the hidden cost of the extra ill health associated with undernutrition because it increases the risk of complications, lowers resistance to infection, impairs physical and mental functioning, and delays recovery

6 Why the problem of undernutrition is exacerbated in hospitals

In more than 60% of patients, nutritional status deteriorates during their stay in hospital, with those who are malnourished on admission particularly affected. Pennington (1998) demonstrated that progressive nutritional depletion occurs for up to 8 weeks after curative surgery (*e.g.* a heart by-pass operation). This therefore indicates the need to consider nutritional status from onset of illness through to complete recovery, including

time after discharge. However, undernutrition remains undetected in the majority of patients affected because many clinicians and nurses still do not consider nutrition to be an important factor in the management of disease (Schenker 2000) and so do not routinely monitor nutritional status and body weight. Economic analysis has demonstrated that appropriate nutritional treatment is cost-effective, but benefits will only be achieved with high standards of nutritional care. Multi-professional nutritional support teams best conduct such treatment but there is continuing evidence of poor practice and a high incidence of treatment-related complications, which negate the benefits of nutritional treatments (Schenker 2000). In the hospital or institutional setting, therefore, the problems that cause undernutrition may be compounded by the fact that nutritional considerations may receive little attention from medical and nursing staff. Lack of awareness of the prognostic significance of undernutrition, and lack of knowledge among doctors and nurses regarding its assessment and management (Nightingale & Reeves 1999) may mean that it is neither looked for nor taken into account when treatment priorities are being set. In particular there may be failure to:

- identify those with, or at risk of, nutritional depletion;
- identify nutritional requirements, especially when these are increased because of fever, surgery or injury;
- provide food of an appropriate quality, composition and consistency;
- encourage food intake: food is of no benefit if not eaten;
- monitor what is actually consumed; in some circumstances direct observation of food and fluid consumption is essential;
- identify those whose nutritional needs are not being met (through regular weighing or the use of other anthropometric measurements);
- correct inadequate intake.

6.1 Hospital food and feeding

The following factors have been identified as causes for poor dietary intake in hospital patients.

6.1.1 Problems with ordering

- Menus lack clarity: dishes should be described accurately so that patients have a reasonable idea of what to expect.
- Help with ordering should be available (but in many cases is not), where there are problems with a patient's comprehension, speech or language.
- Menus are often not printed in languages other than English. This is a particular problem in areas with a high immigrant population. Illiteracy may limit usefulness of translated menus. Verbal translation may be better.
- Ordering from the menu too far in advance. A patient may be discharged after they have ordered food for the next day, resulting in the bed's new occupant receiving food chosen by someone else, which may be unsuitable. Same day ordering systems reduce waste and encourage consumption.
- Patients' orders are not checked to ensure that the food received and the portions requested are correct. In this respect, ward hostesses or feeding care attendants may be helpful; however, this does have financial implications.
- Inefficient ordering systems and poor two-way communication between the wards and the catering department lead to waste, *e.g.* food sent to patients who have been discharged, transferred or have died. Such trays are then either wasted or given to another patient who leaves most of it because it was not their choice.

6.1.2 Menu choice

- Menus do not always take account of the needs, tastes and customary eating habits of different groups of patients. These will vary according to age, race or culture, or the disease process.
- Menus often do not take account of those needing fortified and/or modified-consistency meals.
- Inappropriate promotion of 'healthy eating', *e.g.* low-fat diets, in undernourished or nutritionally at-risk patients.
- Some elderly patients often adopt a grazing habit and require frequent, small volume, high energy density feeds and snacks.
- Special needs. Although some disease-specific menus, *e.g.* for renal failure, may be provided from a diet kitchen, it may be cost-effective to be able to supplement the standard menu with high-energy, high-protein additions.
- Nutritional needs and appetites of children differ from those of adults and also vary according to age. Meals should be made attractive to children.

6.1.3 Appropriate food choices

- Food suitable for 'healthy eating' by the overweight patient with cardiovascular disease is inappropriate for the depleted, malnourished patient.
- Puréed or semisolid diets are required by patients with neurological or mechanical dysphagia who may be

unable to cope with either liquid or solid food. Such diets can have low-energy contents and this may need attention.

6.1.4 Quality and presentation

- The general appearance and presentation of food is often poor in hospitals. These aspects are very important and influence whether or not food is consumed.
- Lack of variety may be a problem for longer-stay patients.
- In many hospitals the kitchens are situated far away from the wards. This has implications for how far in advance food is prepared and how it is transported to the wards. In addition, some hospitals buy in externally prepared food which is heated up on the premises, again potentially affecting taste and presentation.
- Methods used are not always most conducive to preservation of nutrient content and palatability.
- Food served from trolleys by the bedside may aid choice and induce greater consumption than provision of a plated meal where the patient has little control over portion size. Some patients find receiving a large meal very off-putting.

6.1.5 Quality: portion control

- Insufficient account is taken of the evidence from nutritional science of the differing energy and protein requirements of patients of different age, sex, size, current nutritional status and disease process.
- Portion control is often poor or non-existent.

6.1.6 Interference with meal times by ward rounds, investigations and procedures

- Delayed meals may spoil and become unappetising.
- Meals are often missed rather than saved or a substitute provided.
- Patients are reluctant to eat after others have finished. The social encouragement to eat is lost.
- 'Nil-by-mouth' orders may be used inappropriately or prolonged unnecessarily. A patient may be kept nil-by-mouth all morning only to find that their treatment has been cancelled or delayed.

6.1.7 Timing

- Meal times are often inflexible and ill-adapted to patients' normal habits.
- There can be long gaps between some meals, *e.g.* 12 h between the evening meal and breakfast, and narrow gaps between others, *e.g.* 4 h between breakfast and lunch – more suited to administrative convenience than patient needs.
- Preferences of the local patient population should be sought and adopted.
- Lack of access to nutritious snacks and drinks between meals.

6.1.8 Medication (see Section 6.2 for more details)

- Many drugs cause anorexia, taste changes, nausea, vomiting or constipation, thereby reducing food intake. Such drugs can sometimes be stopped or changed following discussion between medical and pharmacy staff without detriment to treatment.

6.1.9 Physical problems

- As a result of paralysis, fractures, arthritis or other musculo-skeletal problems, a patient may be unable to unwrap or access food and drink.
- Eating utensils may be ill-suited to the needs of patients with disability, who require utensils that are easier to hold.
- False teeth may be lost, misplaced or not fitted at mealtimes.
- False teeth may be poor fitting.
- Patients with impaired hearing or vision may have difficulty ordering food or eating it when it arrives.

6.1.10 Position

- The tray may be placed by untrained staff out of reach of the patient, who may be too ill to bother reaching out for it, or because of a disability be unable to do so.
- The patient may not have been positioned properly to facilitate manipulation, eating and swallowing of food. Eating lying down is difficult and can be dangerous (Royal Institute of Public Health 2002).

6.1.11 Help with eating

- Sick people give up easily and need encouragement.
- Patients who need special help are not always identified.
- Nurses rarely have time to help patients eat.
- Few hospitals employ trained ward hostesses or care assistants to help patients with food choices, and to provide encouragement and help at meal times.
- Insufficient staff are available at meal times to assist or monitor patients.

• Untrained orderlies, care assistants or volunteers may not report uneaten meals, but simply place the tray at the bedside and remove it unquestioningly if it is untouched.

6.1.12 Environment

• This has an important effect on meal consumption. Eating is a social activity and may be enhanced if patients on the ward eat together.
• Patients who are able to move about are likely to eat more in an attractive dining area with social interaction.
• Those eating at the bedside may be put off by unpleasant odours, and the behaviour or medical condition of other patients. The use of commodes should be discouraged at meal times.
• Some patients with disabilities are embarrassed by their own messy eating and avoid this by leaving food.

6.1.13 Communication

• There is often poor communication between catering and nursing staff over menus, ordering food and serving meals.
• Staff who serve meals may not tell nursing staff when patients leave most of their meal, and nurses may not discover or record the fact through pressure of other work, or lack of motivation or understanding of the clinical importance of such observations.
• There is often poor communication between dietetic, nursing and catering staff.

6.1.14 Failure of management

• The provision of policies, design of protocols and setting of standards for food service in hospitals is generally inadequate.
• Cost is often cited unjustifiably as a reason for not implementing change in food service or mealtime routines.

6.1.15 Education

• Previous surveys have shown the low standard of nutritional knowledge among medical and nursing staff to be one of the main impediments to improving patient nutrition (see Section 7.4 for how this problem is now being addressed).
• Education of catering and domestic staff in basic nutrition is essential if they are to appreciate and execute their vital role in the provision of food as a treatment.

Despite the enormous complexities involved in feeding patients, and despite its vital role in patient recovery, the planning and delivery of a good food service is often overlooked. Some hospitals have introduced small yet effective measures to aid patient feeding. These include employing dietetic helpers to assist with feeding patients on the wards, or serving the main meal of the day in the evening rather than at mid-day, which is more familiar and comfortable for the majority of patients. Many hospitals have changed from plated meals to bulk trolley service, giving the patient a better choice and ensuring that food is still hot by the time it is served. In Northern Ireland, one Health Authority has ruled that during lunchtimes no other ward activity should take place and all staff effort should concentrate on feeding patients.

6.2 Drug–nutrient interactions

Drugs and nutrients interact in many ways because they are absorbed from similar sites and metabolised, and end products excreted by similar processes. Food intake can be altered or decreased as a consequence of the side-effects of drugs. It is therefore important to assess the effect of patients' medication on their nutritional status.

While the greatest impact on nutritional status is from prescribed drugs, some over-the-counter preparations exert pharmacological effects that have nutritional implications. These include:

• indigestion remedies, analgesics and laxatives that can impact on nutrition as well as being an indication of poor eating habits;
• herbal remedies;
• misuse of nutritional supplements or mega-dosing of vitamins or minerals.

6.2.1 Effect of nutrition on drugs

Nutritional factors influence drug absorption, action and effectiveness. The presence or absence of food can either delay or enhance the rate and extent to which an orally administered drug is absorbed, through effects on gastric emptying, gastrointestinal pH, competition for binding sites, and the presence of components of food such as iron and calcium ions. Some drugs should be taken on an empty stomach to maximise their absorption rate. Conversely, other drugs must be taken with food to achieve a slower, sustained rate of absorption.

Periods of short-term starvation or prolonged periods

of poor nutritional intake can influence the effectiveness or safety of a drug. Body weight determines the amount of drug required to produce a certain pharmacological effect. Therefore, sudden weight loss or dehydration can result in an overdose. Undernutrition also reduces the activity of microsomal drug-metabolising enzymes, and this can diminish a drug's effectiveness, by reducing the rate of synthesis of an active metabolite or enhancing its toxicity by reducing the rate of its excretion (Truswell 2000). This emphasises the importance of ensuring good nutrition during an illness that is being treated with drugs.

Key points

- In many hospitals the quality of the food has been poor (see Section 7.2) and existing feeding policies are inadequate
- Such problems include the limited choice, the way food is served, and the lack of help for those unable to feed themselves properly
- Others need additional nutritional support but this often goes unrecognised
- Food intake can be altered or decreased as a consequence of drug side-effects

6.2.2 Effects of drugs on nutrition

Food intake may be reduced as a result of the following side-effects:

- Anorexia – either as a direct effect of the drug on appetite, or as a result of side-effects such as drowsiness or lethargy;
- Nausea or vomiting;
- Effect on the gastrointestinal tract – such as indigestion, heartburn or gastritis, bloating, early satiety (feeling full after eating very little) or abdominal pain;
- Taste changes;
- Dry or sore or painful mouth;
- Confusion;
- Specific interference, *e.g.* some antibiotics on the absorption of folate.

Furthermore, nutrient absorption can then be impaired as a result of the following:

- Formation of insoluble complexes – many drugs can chelate with minerals and trace elements;
- Competition for binding sites within the intestinal mucosa;
- Damage to the absorptive surface of the intestinal mucosa;
- Lack of bile acids – affecting the absorption of fat soluble vitamins;
- Increased intestinal motility – causing diarrhoea.

It is important to recognise that poor nutritional status can impair drug metabolism and that drug treatment can have a detrimental effect on nutritional status. Although in many instances, losses in nutrient availability or drug action will be small or short-lived, those most at risk from interactions are patients in a nutritionally compromised state, those who have experienced recent weight loss, or who are dehydrated.

7 What can and is being done?

Improvements are on-going at every level of patient care to help combat undernutrition in hospitals. New strategies include changes within the National Health Service (NHS) to help identify patients at risk of malnutrition; setting up government bodies to develop standards for treating malnutrition; improvements in hospital food and its provision; improvements in teaching nutrition to medical, nursing and other health care professionals; government initiatives being conducted in the community to reduce the prevalence of undernutrition, which will in turn help reduce the number of patients who are undernourished on admission. Each of these strategies is discussed further below.

7.1 Changes within the NHS

The NHS Plan (Department of Health 2000) details future reforms for the NHS. There is planned action to introduce a hospital nutrition policy to improve the outcome of care for patients.

Both the Nuffield Trust (1999) and BAPEN (1999) reports recommended that robust indicators concerning nutritional care of nutritionally at-risk or malnourished people in hospital to fit the National Service Framework (NSF) should be developed and agreed. NSFs have been set out by the National Institute for Clinical Excellence, which has been set up in England to develop standards of best practice in health care (NHS Executive 1998). The frameworks provide a plan of action by which to tackle major health issues and important diseases. Currently, a framework is being set up to include requirements for best practice in food service. The framework will need to be consistent with similar frameworks that have been developed for related aspects of care, *e.g.* care of elderly people (http://www.doh.gov.uk/nsf). This will mean that authorities will have their own explicit writ-

ten nutritional standards and guidelines based on official national standards. Appropriate funding will have to be made available to attain these standards. For nutrition to have the status it deserves within the trust management environment, trust boards must be fully committed to the notion of food provision being a key component of clinical care and subject to the clinical governance programme. The inspection body that will enforce NSFs is The Commission for Health Improvement, and this has the ultimate sanction to dismiss the board of a hospital trust.

7.2 Improvements in hospital food

In May 2001 the government launched *Better Hospital Food: a new menu for the NHS*, as part of a £40 million scheme to overhaul hospital food. The emphasis is on providing calorific and nutritious food, and a 24-h snack box service of chocolate and crisps with fruit is available for patients who miss meals. The NHS menu offers more choices, more fresh food, and more options for vegetarians and others with specialised diets (see below). Forty-three of the new dishes known as 'Chef's Specials' have been designed by expert chefs, and include 'steak and kidney pie with olive oil mash', 'cauliflower with very cheesy sauce', and 'posh pear and chocolate crumble'. These dishes are part of the National Dish Selector, and have been extensively trialled and tested with patients, hospital chefs and dietitians. Each dish costs approximately 80 p per serving. Accompanying the menu are guidelines for the delivery of services; timing, availability, flexibility and presentation have all been considered. Introduction of the national menu and the national dish list is the first step in the process of revitalising NHS catering; the menu has been sent out as a national cookery book to all hospital trusts (Better Hospital Food 2001).

Better Hospital Food is part of a long-term programme to continually improve catering services in hospitals. The three objectives are:

- to ensure all hospitals meet the required standards;
- to bring all hospitals to existing levels of excellence;
- to develop and introduce across the NHS new catering systems, which provide modern services that are both efficient and responsive to the needs of patients.

Better Hospital Food is a blueprint for the revitalisation of NHS catering across the country, reflecting changes in social patterns, the way we eat and our evolving tastes for a wider variety of foods. The aim is to provide patients with a service that encourages them to eat enough food to satisfy their nutritional requirements, by offering them foods that they will want to eat at times they want to eat them. Each hospital will receive an Implementation Support Pack, which has been designed to assist hospitals in meeting the challenge set out in the NHS Plan, and offers a practical source of help and advice.

In addition to those for whom a 'traditional' diet is suitable, The NHS Menu includes options for: children, vegetarians, those preferring a soft diet, those with special dietary needs because of religious or cultural observance, certain patients who have to follow a medically modified diet. The menu also has an 'All Hours' section setting out the 24-h catering service. Hospitals should ensure that the range of meals available in each section has been specifically designed to reflect the needs of patients within those groups.

All dishes have been designed to meet adequate nutritional standards including meeting criteria for:

- dietary reference values (Department of Health 1991);
- coding for common therapeutic diets;
- food textures and consistency;
- food rules of different religions.

The National Dish Selector contains dishes designed by both expert chefs (see above) and the NHS group of catering managers, dietitians and nurses. Trusts are encouraged to adopt dishes from the Dish Selector whenever possible, thus alleviating the need to continually develop recipes and undertake nutritional analysis of these at every hospital. With the exception of those labelled 'Chef's Specials' that have been developed by the expert chefs, use of which is mandatory, it is not compulsory for hospitals to use the exact recipes.

The *Better Hospital Food* plan also proposes that in order to reflect changes in modern eating habits, the main meal of the day should be served in the evening. However, some groups of patients, particularly older patients, still prefer their main meal at mid-day. Trusts are therefore encouraged to ensure that delivery of the main meal continues to meet the needs of the hospital population in the short term, but that in time, adjustments are made to meet the requirements of the plan. Serving the main meal of the day in the evening should have been implemented in all trusts by December 2002.

However, it is important to recognise that improvement in provision is only the first step in helping to reduce the incidence of undernutrition in hospitals. The Royal College of Nursing welcomed the initiative, but stressed that it was important to recognise that there were many other problems related to the practical

aspects of feeding patients in hospitals, other than the nutritional content, quality and variety of foods served (Royal College of Nursing, personal communication). Once a suitable meal that is both appetising and of an adequate nutritional standard is served to the patient, help with eating must also be provided when necessary. This is one of the most important problems faced by hospitals as there are staffing implications (*e.g.* feeding a patient who has had a stroke can take 30 min). The patient should be in a comfortable position, in a pleasant environment, and practical issues such as use of special cutlery and good fitting dentures should be considered. If a patient does not eat a meal, it is important for the nurse or carer to identify the problem and its solution.

Information about *Better Hospital Food* can be found at http://www.betterhospitalfood.com.

7.3 Improvements in the provision of hospital food

The Nuffield Trust (1999) and BAPEN (1999) reports both called for a nutrition steering group to be set up within each trust. A named senior health professional should have responsibility for co-ordinating nutritional care services across the entire trust. The steering group should give consideration to:

- transferring the catering and nutritional care service from the domestic facilities budget to the clinical support and treatment service budget;
- setting up a new nutrition directorate with overall responsibility for all aspects of nutritional care.

The steering group should have the power to make recommendations and implement change. It should consist of a core group including the chief dietitian, the chief catering officer, a manager from the finance section, a senior clinician with a special interest in nutrition, a senior nurse or nutrition nurse specialist, and a pharmacist. The steering group must be involved in contractual arrangements for catering or in the development of in-house catering services from the beginning. It should also be responsible for evaluating the experience of other centres and seeking expert advice. The chief dietitian should have executive not just advisory input into the catering services.

Another set of recommendations made by the Nuffield Trust (1999) and BAPEN (1999) focus on ward practicalities.

- The timing of meals should be reviewed and made more relevant to patients' customary meal patterns. All food preparation methods (*e.g.* in-house cook-serve, or brought-in cook-chill – heated up and served at ward level) have proved successful, but are highly dependent on the method of distribution and service. With proper management, a bulk trolley bedside service best serves patients' needs and is the recommended method.
- Nutritionally vulnerable patients should be placed in wards with kitchen areas, or near ward kitchens. In this way special meals or snacks can be prepared for patients, or when possible, they can access the kitchen themselves.
- Delivering the food to the patient is one thing, ensuring that it has been eaten is quite another. The nurses in charge of the ward have primary responsibility for the nutritional care of in-patients. BAPEN and the Nuffield Trust advise that food should be served by nurses, supported where necessary by other grades of staff trained for this purpose (*e.g.* ward hostesses, diet technicians/helpers). Assistance with eating must be provided where it is needed. Plate or tray collection should be supervised by nursing staff, to enable patients' food intake to be monitored.

Both the BAPEN and Nuffield Trust reports recognise that all members of the multi-disciplinary team, but nursing staff in particular, should be aware of drugs that cause anorexia, nausea or gastrointestinal side-effects, and should seek to stop or minimise the use of such drugs where possible. Polypharmacy in the elderly is particularly culpable in this respect. In some cases of terminal disease, nutritional status inevitably continues to deteriorate, and over-aggressive nutritional intervention may not be appropriate.

Thirty years after they were abolished, the government has re-introduced matrons, as a step towards driving up standards of nutrition and feeding practices on wards. Among matrons' responsibilities will be to ensure that the food is good and patients are fed properly. The aim is to have 2000 matrons in place by 2004.

7.4 Improvements in the nutrition education of health professionals and care workers

7.4.1 Health professionals

The Malnutrition Advisory Group (MAG), launched in 1999, was established to combat undernutrition in the UK (Elia 2001). MAG consists of hospital doctors, academics, dietitians and other members of the primary health care team, and seeks to raise awareness and understanding of undernutrition to ensure the issue is given priority by health care professionals and policy

makers. As part of this process, MAG has produced guidelines for the treatment and identification of undernutrition in the community with the aim of improving patient care and reducing NHS costs.

Previously, the training in nutrition for health care professionals was fragmentary. MAG has highlighted the need for further education and training for health care professionals, particularly doctors and nurses, to raise the awareness of the importance of food and nutrition. This followed a MORI survey that MAG commissioned, which showed that: doctors would like further training and education in nutrition; 60% of general practitioners (GPs) felt they needed further training in detection of undernutrition; and 74% of GPs had no undergraduate training in nutrition.

A working party of the Royal College of Physicians has recently published a report (Royal College of Physicians 2002) focusing on the responsibility of doctors for the nutritional care of patients. The report highlights the impact of both undernutrition and overnutrition on disease processes, the influence of illness on nutrition, and the potential for nutritional intervention to contribute to disease management and prevention. Recommendations are made for clinical governance to address potential shortcomings in patient care and to provide methods for improving the nutritional knowledge and skills of doctors.

A core curriculum, which has been accepted by all undergraduate medical schools, has been developed for undergraduates to provide a standard for training that ensures safe practice. The curriculum identifies 18 key learning points including: the principles of nutritional science; public health nutrition; clinical nutrition and nutritional support. The Royal Colleges have responsibility for the postgraduate training of doctors. An intercollegiate group on nutrition has been formed and runs three 1-week foundation courses for doctors, at different centres around the country. For more information see http://www.icgnutrition.org.uk.

7.4.2 Care workers

The Caroline Walker Trust has been pivotal in the nutritional education of care workers working in different establishments. The work of the trust is particularly targeted towards nutritionally vulnerable groups and people who need special help with feeding. Nutritional and practical guidelines have been produced for:

- school meals (Caroline Walker Trust 1992);
- older people in residential and nursing homes (Caroline Walker Trust 1995) including special guidelines for those with dementia (Caroline Walker Trust 1998a);
- under-5s in childcare (Caroline Walker Trust 1998b).

The most recent project (Caroline Walker Trust 2001) is a report on the nutritional and practical guidelines for looked-after children and young people, and is aimed to help carers provide a nutritionally balanced, varied and tasty diet. The report is accompanied by a training manual, and a computer program, *CHOMP*, for planning menus for under-5s in childcare, was launched in 2001. This is to help users produce varied and interesting menus to satisfy the nutritional guidelines detailed in the report. The program is similar to the *CORA* menu planner for those catering in residential and nursing homes for older people.

For more information on the Caroline Walker Trust and details of other publications, see http://www.cwt.org.uk.

7.5 Community initiatives

The Women's Royal Voluntary Service has been the main body for the running of the Meals on Wheels scheme across the UK, which has been in operation since 1943. The majority of meals are provided by three main catering companies which are required to meet nutritional criteria specified by either the Caroline Walker Trust or the Advisory Body of Social Services Catering. For further information see http://www.wrvs.org.uk.

In the last few years the problems associated with a poor dietary intake have received government attention. A number of reports have been published including: the *Nutrition Task Force Eat Well II* (Department of Health 1996a), the *Low Income Project Team's Report* (Department of Health 1996b), the *Independent Inquiry into Inequalities in Health* (Acheson 1998), *Bringing Britain Together* (Social Exclusion Unit 1998) and *Saving Lives: Our Healthier Nation* (Department of Health 1999a). These reports identify the link between diet and health and consider the difficulties of those living on a low income. They have resulted in a number of action plans and policies designed to tackle all the things which make people ill (Department of Health 1999b) by taking a holistic approach which includes nutrition.

The Neighbourhood Renewal Unit was set up with the aim of narrowing the gap between deprived neighbourhoods and the rest of the country by delivering better health as well as better education and better housing among other services. It is hoped that better health will

be achieved through the Renewal Neighbourhood Fund, New Deal for Communities and the Single Regeneration Budget. For more information see http://www.neighbourhood.dtlr.gov.uk. Related to this, the Department of Health has recently issued proposals to revise the Welfare Foods Scheme, which currently benefits pregnant women and children under 5 years living in families receiving income support and Job Seekers Allowance (Department of Health 2002a,b). The scheme currently benefits pregnant women and under-5s living in families receiving Income Support and Jobseekers allowance, and also provides milk for nursery school children. (See http://www.doh.gov.uk/coma/welfarefoodsreview.pdf.)

Sure Start has been set up by the government to tackle child poverty and social exclusion. The aim is to have 500 Sure Start local programmes in operation by 2004, concentrated in areas where a high proportion of children are living in poverty. Local programmes will work with parents and parents-to-be to improve children's life chances through better access to health services among others. For more information see http://www.surestart.gov.uk. Again, related to this is Welfare Foods Scheme (Department of Health 2002a,b).

Education Action Zones and Health Action Zones have been launched by the Department for Education and Skills and the Department of Health, respectively. Both initiatives include poor diet and nutritional intake as a problem to be tackled in improving performance in school and improving the health of those who are worst off. For further information see http://www.dfes.gov.uk and http://www.doh.gov.uk/pricare/haz.htm.

The Healthy Living Centre initiative was set up in 1999 under the New Opportunities Fund, the lottery body established under the National Lottery Act. The programme promotes health in its broadest sense, and targets areas and groups in the most disadvantaged sectors of the population. Funds are awarded to some applicants from Healthy Action Zones. Schemes include community cafes, luncheon clubs for older people and activities such as swimming classes and 'walking for health' schemes. For further information visit http://www.doh.gov.uk/hlc/index.htm.

The Low Income Project Team, set up by the government's Nutrition Task Force in the early 1990s, identified strategic priorities that will help low-income households gain access to an adequate variety of good-quality food that is within their financial grasp, to have information to help them make appropriate food choices, and to obtain the skills and facilities to prepare food (Department of Health 1996b). The following objectives contribute to this goal:

- To increase the control that people living on low incomes have in matters related to food, ensuring more real choice and affordable good-quality food;
- To develop and improve opportunities for the UK's food manufacturing and retailing industries;
- To increase opportunities for choice by diverse means, whether retailing competition, different pricing policies, better individual and collective skills and education, improved shopping access and involvement by local people;
- To increase the collective money available for food by maximising income through better take-up of available benefits;
- To nurture local food partnerships influencing where, when and at what price people can buy their food.

Numerous individual projects have been set up as a result of these objectives, including:

- food co-operatives and mobile shops;
- cookery and shopping skills courses;
- development and provision of healthy recipe leaflets;
- community cafes and lunch clubs providing healthy food at low cost;
- food and nutrition education courses;
- meal provision for those with special needs;
- food coupons;
- transport to shops.

The overall aim is to reduce inequalities and improve health including nutritional status, thus reducing the incidence and prevalence of undernutrition in the community. Details of these sorts of projects and information about their effectiveness can be found on Sustain's website http://www.sustainweb.org and the Health Development Agency's website http://www.hda-online.org.uk.

Key points

- There is strong evidence that measures such as improved staff training, nutritional screening and assessment, and monitoring, combined with better catering practices, can result in most patients' nutritional requirements being met
- Fortified meals, between-meal snacks and adequate ward staffing have all been shown to contribute to achieving this goal, which leads to better clinical outcome, less waste, shorter hospital stay and a more cost-effective service

Continued

Key points (*continued*)

• There is increasing evidence that those who live on low incomes for long periods cannot afford a healthy diet. A number of community food initiatives have been developed in an attempt to improve the eating behaviours of those living on a low income. These initiatives include 'cook and eat' groups, food co-operatives, community cafes and breakfast clubs

8 Screening for undernutrition

8.1 Nutritional screening and assessment of patients in hospitals

It has been recommended that all patients admitted to hospital are assessed for nutritional risk using one of the many available protocols (Sizer 1996). The use of a formal nutritional screening tool for every admission is probably inappropriate and ineffective, but it may be more realistic to screen for nutritional risk (Lennard-Jones *et al*. 1995). More formal clinical assessment may then be carried out by a dietitian or nutrition nurse. The objectives of the assessment are:

• to accurately define the nutritional status of the patient;
• to define clinically relevant undernutrition;
• to monitor changes in nutritional status during nutritional support.

Clinically relevant undernutrition has been defined as 'the state of altered nutritional status that is associated with an increased risk of adverse clinical events such as complications or death' (Dempsey & Mullen 1987). Ideally, nutritional assessment should help determine the type and aggressiveness of nutritional support required for an individual patient, which should be timely and cost-effective.

There is no consensus on the best method for the accurate assessment of nutritional status. The most frequently used methods include dietary, anthropometric, biochemical and functional indices.

Specific patient groups have been studied and identified as being at risk of protein-energy undernutrition. Nutritional screening has become more common in many clinical areas, and many tools have been developed for this purpose. However, there remains a need for a published, universally accepted and validated screening tool. Lennard-Jones *et al*. (1995) found that half of the 454 ward nurses and two-thirds of the 319 junior doctors questioned had asked their patients about recent unintentional weight loss before admission to hospital. This survey led to the identification of four basic questions which, it is recommended, are asked of every patient admitted to hospital patients. These are:

• Have you unintentionally lost weight recently?
• Have you been eating less than usual?
• What is your normal weight?
• How tall are you?

Following these questions, all patients should be weighed. All answers and measurements should be documented in case notes, and those patients considered to be at risk of nutritional depletion should be referred for specialist assessment and advice.

8.2 Measurement of nutritional status

The World Health Organization defines nutritional status as the condition of the body resulting from the intake, absorption and utilisation of food, as well as from factors of pathological significance. Nutritional assessment allows measurement of changes in body composition variables and associated functional changes that adversely affect clinical outcome. The measurement of height and weight and calculation of BMI often relies on the willingness of staff to comply. Lack of compliance may be due to a lack of insight into the need to record such data or simply that the necessary equipment is not available in clinics or on wards. Furthermore, available equipment may not be regularly calibrated or maintained. Lennard-Jones *et al*. (1995) found that most of the nurses and doctors who were asked questions about the height and weight measurements of their patients had not taken measurements because they regarded the information as unimportant. Of the wards surveyed, 86% had weighing scales, but only just over half the hospitals had a service contract for their maintenance.

There is no single or standard way of assessing nutritional status. This is a dynamic state, which reflects physiological requirements, nutritional intake, body composition and body function. Methods used to evaluate these parameters include:

- Clinical factors
  - Increased nutrient requirement
  - Increased nutrient loss
  - Impaired nutrient digestion and absorption
- Physical factors
  - Appearance of patient
  - Mobility of patient
  - Mood of patient

  - Breathing difficulties
  - Pressure sores and wound healing
  - Oedema
- Dietary factors
  - Change in appetite
  - Change in meal pattern
  - Change in food choice or food consistency
- Anthropometry (see Section 8.3)
- Biochemical measurements (see Section 8.4).

Various assessment tools have been developed, which may be disease specific (Stall *et al*. 1996), age specific (Boosalis & Stiles 1995) or are simple tools such as the Mini Nutritional Assessment designed for those at risk of undernutrition and which can be predictive of mortality and hospital cost (Vellas *et al*. 1999). However, no single assessment tool is appropriate for all circumstances.

8.3 Body composition

Foe the purpose of this briefing paper, body composition can be considered to comprise lean body mass (*i.e*. muscle and organs), fat stores and body water. Accurate results are highly dependant on the quality of the measurements taken, the experience and skill of the person conducting the measurements, and whether or not the method is indeed suitable. Accurate monitoring of changes, using techniques such as skinfold thickness, is highly dependent on the measurements being made by the same observer. It should be noted that all methods of assessing body composition in humans are indirect; the only direct method is complete chemical analysis of cadavers. Therefore, measurement of *changes*, rather than attempts to measure *absolute* values will give more useful information.

Bedside/clinic techniques to assess lean body mass include:

- MAMC;
- grip strength;
- nitrogen balance;
- plasma proteins and urea.

Bedside/clinic techniques to assess fat stores include:

- tricep skinfold thickness;
- BMI.

There are a number of other techniques to measure body composition, generally used in clinical research, because the equipment is laboratory-based. These include bioimpedance analysis, total body water and dual-energy X-ray absorptiometry (DXA). In the past few years DXA scanners have been developed that can assess lean and fat tissue; they were originally developed to measure bone mineral density only. More rarely, other scanning techniques such as computer-assisted tomography, magnetic resonance imaging, nuclear magnetic resonance, neutron inelastic scattering and gamma-ray resonance, are also used to assess body composition. Only those techniques that are commonly used in clinical practice will be discussed here. For a review of body composition techniques, their appropriate application for different circumstances, and the equipment and facilities required, see Jebb & Elia (1993).

8.3.1 Height

The accurate measurement of a patient's height depends on the availability of a fixed or a portable stadiometer, and on the ability of the patient to stand upright. In a survey of the nutritional status of 500 patients, 200 were undernourished. Of these, only 15.5% had their height measured at a clinic visit and one patient had height recorded on admission (McWhirter & Pennington 1994). Not all hospitalised patients are able to have their height measured, so an estimate of stature can be made if necessary. One method, which has a high correlation with total height, is knee height (Baxter 1999). This is particularly useful in elderly people, those with severe spinal curvature, or patients who are unable to stand. Knee height is more accurate than arm span (Mitchell & Lipschitz 1982), with less interobserver variation (Chumlea *et al*. 1985). Knee height is measured with a caliper on the left leg with the knee bent at a 90° angle. Equations are then used to estimate height in men and women, with a 90% error of approximately 80 mm in both sexes.

8.3.2 Weight

Actual body weight and percentage weight loss are probably the most important indices of nutritional assessment, and the most readily obtainable marker of energy reserves. However, because weight also reflects body water, interpretation of weight and its fluctuations becomes more difficult in those patients in whom there is a relative increase in total body water, such as in liver, kidney and heart disease.

Percentage weight change is the most commonly used dynamic measurement of nutritional status, with acute unintentional weight loss particularly associated with increased morbidity and mortality. Weight loss can easily be determined if measurements are made on at least two occasions. Difficulties arise when the preillness

weight is unknown, particularly as patients at nutritional risk have already lost weight. Discrepancy between actual and recalled weight is likely (Pirie *et al*. 1981). However, there is evidence that estimation of weight loss by patient recall is more useful than the use of published ideal-weight tables (Morgan *et al*. 1980). It is important that the composition, the rate and the cause of weight loss are investigated. Percentage weight loss detects patients who were previously overweight but have unintentionally lost weight quickly. Such individuals may have lost mainly lean body mass rather than body fat (Garrow 1980).

The significance of weight loss as a percentage of preillness weight (Heymsfield & Matthews 1994) has been defined as:

- < 5% weight loss – not significant;
- 5–9% weight loss – only clinically significant if weight loss was rapid;
- 10–20% weight loss – clinically significant, nutritional support indicated;
- > 20% weight loss – severe, needs aggressive nutritional support.

8.3.3 Body mass index

BMI is not a sensitive indicator of protein-energy undernutrition, because changes do not distinguish between depletion of fat and protein stores. However, individuals with a BMI of less than 20 kg/m^2 may be at risk of nutritional depletion (see Table 1).

8.3.4 Other anthropometric measurements

Anthropometric measurements can be used in two ways: either as a measure of change in body composition using serial measurements in an individual, with a baseline for reference, or in epidemiological studies where values are compared with values, according to age and gender, given in tables. Unfortunately, the accuracy of relatively simple measurements can be compromised by a number of errors in technique. Furthermore, standard tables must be used with caution, as many were derived from data from narrowly defined healthy populations.

In experienced hands, the clinical use of MAMC, using a non-stretchy measuring tape, and triceps skinfold thickness, using skinfold calipers, to estimate stores of muscle protein and fat in the mid-arm is a useful component of nutritional assessment. It is the accessibility of the upper arm that makes these useful techniques. Both measurements may be used in patients who are immobile, are too ill to be weighed, or have fluid imbalance which makes a weight measurement unreliable. Although changes in values occur slowly, it is useful to monitor MAMC and tricep skinfold thickness of patients who are on long-term nutritional support in order to assess efficacy.

Interpretation of nutritional assessment in disease states may be difficult. There is a lack of sensitivity provided by individual nutritional indices: percentage ideal body weight has been shown to be less than 85% of standard in most patients, reflecting increased body water, mean triceps skinfold thickness measurements were 49% of standard, and MAMC was 78% of standard. In a survey of 54 patients with cancer cachexia, 42% had triceps skinfold thickness below 80% of standard and 23% had MAMC below 80% of standard (Nixon *et al*. 1980). In a study of 43 type I diabetic patients on haemodialysis, MAMC was below the 5th percentile in almost half, and 26% of patients had body weights below 85% of ideal (Miller *et al*. 1983).

8.3.5 Dual-energy X-ray absorptiometry

Bone and other tissues are able to absorb energy from a photon beam. This means that the mass of bone mineral in the body can be estimated by scanning the whole body with a photon beam of known energy and measuring the difference between energy absorbed and energy not absorbed. This technique can also be used to measure the lean to fat ratio in the soft tissue. The subject is exposed to radiation, but the dose is extremely low. DXA scanning is now quite a common technique for assessing body composition because of its primary widespread use for measuring bone mineral density.

8.3.6 Bioelectrical impedance analysis (BIA)

Lean tissue is a good conductor of electricity whereas fat is not. It is this difference that is measured in BIA. Two pairs of electrodes are attached to a subject's left hand and left foot. A very small electric current is passed through the outer electrodes and the voltage drop is measured at the proximal electrodes, from which the resistance (impedance) of the tissues is calculated. The impedance value is then entered into a regression equation with other data including height, weight, gender and age. This gives a prediction of total body water, and hence fat-free mass. It is usually assumed that fat-free mass is about 73% water. BIA measurements are significantly affected by dehydration, which is common in many undernourished patients, so general equations may not be appropriate.

8.4 Biochemical assessment

There is no single universally accepted objective biochemical marker of nutritional status. Commonly used indices include albumin and prealbumin, transferrin and retinol-binding protein (RBP).

8.4.1 Albumin

Protein-energy undernutrition causes a decrease in the rate of albumin synthesis (Fleck *et al.* 1985). Albumin has a half-life of 21 days, and responds slowly to altered protein intake, so it will not reflect recent changes in nutritional intake (Klein 1990). In the classic Minnesota study (Keys *et al.* 1950), after 24 weeks of semistarvation, serum albumin concentrations had fallen by only 10% and the total circulating albumin by 2%. It was concluded that the decrease in circulating plasma levels, commonly seen in disease, is not due to simple undernutrition. If oedema is present, there is a dilution effect on plasma albumin concentrations. Low concentrations have been correlated with increased morbidity and mortality in hospital patients, and with longer hospital stays (Dreblow *et al.* 1981; Inglebleek *et al.* 1975). Albumin is not a good marker of nutritional status.

8.4.2 Transferrin

The main function of transferrin is to bind and transport iron. It is therefore affected by iron status. Concentrations are affected by the acute-phase response so the usefulness of transferrin measurements in nutritional assessment is limited. Iron deficiency results in an increase in transferrin synthesis in the liver, and consequent low concentrations are seen in many inflammatory states.

8.4.3 Thyroxine-binding pre-albumin

Pre-albumin is synthesised in the liver and has a shorter half-life than albumin (2 days). Pre-albumin responds acutely when energy and/or protein intakes are low. Its sensitivity to nutritional therapy means that it is more likely to be an indicator of recent dietary intake than an accurate measure of nutritional status (Casati *et al.* 1998).

8.4.4 Retinol-binding protein

RBP is also produced by the liver and has an extremely short half-life (12 h). As RBP is responsible for the transport of vitamin A, it is affected by vitamin A deficiency as well as hyperthyroidism, zinc deficiency, liver disease and the acute-phase response. Although RBP has been investigated and used as a nutritional marker, it is present in very low concentrations and is difficult to measure. RBP is similar to pre-albumin in that it responds to recent dietary intake rather than being a marker of nutritional status (Casati *et al.* 1998).

8.4.5 Insulin-like growth factor 1 (IGF-1)

A number of studies have suggested that IGF-1, which has a half-life of a few hours, may be a useful objective indicator of nutritional status. However, at present this is not used routinely. The mechanism for the reported fall in concentration in undernutrition is unknown; it may simply be a reflection of the general decrease in protein synthesis. Unlike albumin and the other markers, IGF-1 is unaffected by the acute-phase response, and may therefore be a more accurate reflection of nutritional status independent of disease activity. Unterman *et al.* (1985) measured IGF-1 levels in 37 malnourished patients and compared these to conventional nutritional indices (albumin, transferrin and lymphocyte count). The level of IGF-1 correlated well and levels rose in six patients who were provided with nutritional support. However, poor correlation was found when IGF-1 levels were used as a marker in patients in whom undernutrition was determined by anthropometry (McWhirter *et al.* 1995).

8.5 Functional assessment

8.5.1 Grip strength

Measurement of muscle function is important in the assessment of nutritional status, but the laboratory methods are not suitable for practice in the clinical setting. Undernutrition results in reduced muscle function, which may be reversed during nutritional support, although measurement of nutritional indices may take longer to improve (Lopez *et al.* 1982). Maximum voluntary grip strength measured using a dynamometer is a useful functional measurement and is related to whole-body muscle mass assessed by creatine excretion, limb muscle circumference and anthropometry (Hunt *et al.* 1985). Specificity and sensitivity are improved if age and sex standardised values are used for comparison. A grip strength of less than 85% of standard could be evidence of muscle protein depletion (Klidjian *et al.* 1980). Grip strength cannot be assessed in patients with arthritis, those who are critically ill or prescribed muscle relaxants. Up to 10% of patients in the acute setting may be

unable to comply with dynamometry (McWhirter 1995). It may be useful in patients receiving long-term nutritional support.

Key points

- If there is no request to measure a patient's height or weight, it is often not carried out, and lack of the necessary equipment and skills is an important issue to be addressed
- An action plan of appropriate nutritional care, together with follow-up measures taken to evaluate the effect of the nutritional support is then needed
- Simple bedside techniques (*e.g.* tricep skinfold thickness) of measuring nutritional status should be used to determine those patients at risk of developing nutrition-related complications
- The ideal nutritional assessment should be relatively inexpensive, minimally invasive, and the results should be accurate and reproducible
- Measurements such as height, weight and BMI, tricep skinfold thickness and MAMC are quick, cheap and non-invasive methods of estimating weight-for-height, subcutaneous fat and protein stores

8.6 Nutritional screening and assessment of patients in the community

A patient's health often deteriorates before admission to hospital while they are still in the community, bringing with it a concomitant deterioration in their nutritional status (see Section 3.1). This often remains unrecognised by the primary health care team for a number of reasons. The first problem is one of identifying who needs nutritional screening, as this should happen automatically for patients on admission to hospital. Both Ham (1994) and Chernoff (1994) have recommended that elderly people should be screened routinely, particularly those in nursing homes, those attending GP clinics and those requiring home care. In the USA, it has been shown that 74% of meals-on-wheels recipients were at risk of poor nutritional status (Coulston *et al.* 1996). Furthermore, McWhirter & Pennington (1994) have shown that 43% of elderly patients in the UK admitted to hospital from the community were malnourished.

Other groups of patients who require regular screening and assessment are the chronically ill, and those with cancer and neurological disorders, many of whom are elderly (Barrocas *et al.* 1995). Children with developmental disabilities are also at increased nutritional risk (Campbell & Kelsey 1994).

In the community, practice and community nurses see the majority of at-risk patients. Grindel & Costello (1996) suggest that these members of the primary health care team should conduct routine nutrition screening of their patients. But, if screening and assessment are to take place in the community, the primary health care team must be provided with simple tools and training in how to use them. The problem of how patients should be screened is a major one. As discussed in Sections 8.4 and 8.5, currently, there are no national standards by which to measure nutritional status, and these are urgently needed to ensure consistency in screening and assessment.

Despite the many published papers describing nutritional screening tools that are used in hospitals, there are few describing tools that have been developed for use in the community (Green & McLaren 1998). Hickson & Hill (1997) describe the adaptation for use in the community of a tool that was originally designed for hospital use. This tool requires nurses to measure BMI, which could create difficulties if patients are being seen at home and scales and stadiometers are not available. Several tools have been developed in the USA and Europe for screening nutritional risk in the elderly (Guigoz *et al.* 1994; The Nutrition Screening Initiative 1994). In the UK, dietitians from the Nutrition Advisory Group for Elderly People have produced a nutrition assessment checklist for community care workers to identify the potential nutritional problems of elderly clients (Nutrition Advisory Group for Elderly People 1992). The list covers general questions about eating habits, weight change, use of supplements and laxatives, and has four sections aimed at identifying deficiencies of particular nutrients: iron, vitamin C, calcium and vitamin D, and fibre. Advice is given in each section on how to take appropriate action to improve intake. Reliability and validity of the checklist have not been established.

Children with developmental problems are a vulnerable group whose nutritional status needs to be monitored regularly. Campbell & Kelsey (1994) in the USA have developed the Parent Eating and Nutrition Assessment for Children with Special Needs (PEACH) survey, which is a checklist of questions designed to be administered by the child's primary caregiver. Six developmental paediatricians assessed the questions for content and face validity, then assigned scores to each question. The tool was validated in 79 children by comparing the total score obtained using the PEACH survey with a nutritional survey by a dietitian. The tool was found to have a sensitivity of 88.6% and a specificity of 90.9%, with an overall predictive value of 88.6%. The authors con-

cluded that, in children with developmental problems, the PEACH tool provides a quick method of screening out unnecessary referrals and maximises effective use of the dietitian's time.

To date, in the UK, only Bryan *et al*. (1998) have developed and validated a screening tool for clients with learning difficulties. The form has questions about food frequency, weight and nutrition-related problems. This tool requires the patient to be weighed and measured, which could create difficulties for clients in wheelchairs.

Ward *et al*. (1998) have developed a screening tool for use in general practice in the UK. It has been constructed using a list of questions that require only 'yes' or 'no' answers, which are predictive of nutritional risk. The validity of the tool was tested by comparing the questions administered by a community nurse to a full nutritional assessment conducted by a dietitian, within 4 days of each other. Discriminant analysis and multiple regression analysis were then used to determine which questions were predictive of nutritional risk, and to assign weightings to each question. Patients are categorised according to their level of risk. There are three categories of scores (0–6 not at risk, 7–16 possible or probable risk, 17 or more malnourished). The tool has a positive predictive value of 94.6% and a negative predictive value of 81.1%.

Once patients have been found to be at nutritional risk, the community dietitian takes responsibility for conducting a full assessment in the community. As discussed previously, there are no national reference standards by which to measure nutritional status. In addition, the reference standards for anthropometry that are currently used for those over 65 years of age are standards derived in the USA and the UK in the 1980s (Bishop *et al*. 1981; Burr & Philips 1984).

Klein *et al*. (1997) have reviewed nutritional assessment methods, and conclude that there is no gold standard because there is no universally accepted definition of undernutrition. The dietitian must use their clinical expertise to determine each individual patient's nutritional status and consider the following problems: assessment of patients with oedema, fluid overload, heart failure, or dehydration; decreasing height with old age; assessment of patients with neurological problems leading to undernutrition, as degeneration will not reverse with nutrition; and assessment of bed-bound patients.

8.7 Recommendations

- A definition of undernutrition needs to be established and accepted.
- National reference standards for anthropometric measurements by which to evaluate body composition need to be established for both young and elderly populations, since the body size of the population has changed over the last 20 years and those currently used are outdated.
- If BMI is to be used as a standard measurement of nutritional status, universally accepted cut-off points for low BMIs need to be agreed.
- Nutritional screening needs to be incorporated as a routine part of yearly check-ups for people over 75 years (Caroline Walker Trust 1995), and for all patients deemed to be at risk because of their disease status. In addition, all health care professionals should be educated about the contribution of nutritional status to general health of all patients in their care, and the detrimental effect poor nutritional status can have if it is left untreated.
- Different ranges for anthropometric measurements that are age and/or disease specific for certain population groups may be more useful in predicting undernutrition, particularly when used in addition to clinical measurements of body function such as serum albumin level.

Key points

- Difficulties exist in defining undernutrition as the anthropometric measurements used are neither age nor disease specific
- Ranges and cut-off points to define normal or ideal have been based on healthy young individuals but are applied to the whole population. Different ranges that are age and/or disease specific for certain population groups may be more useful in predicting undernutrition

9 Specialised feeding

Appendix 2 gives a short comprehensive overview of the principles involved in specialised feeding, and covers the three main types of specialised feeding techniques including indications and contraindications for their use, energy needs and some of the practical issues involved in nutrition support. More detailed information can be obtained from specialised textbooks such as *Manual of Dietetic Practice* (Thomas 2001) and *Human Nutrition and Dietetics* (Garrow *et al*. 2000).

10 Conclusions

It is estimated that 70% of undernutrition in the UK goes unrecognised and untreated and that in the community 5% of the population has a BMI < 20 kg/m^2. Poverty is a major contributory factor. To address this problem, a number of community food initiatives have been developed in an attempt to improve the eating behaviours of those living on a low income. These initiatives include 'cook and eat' groups, food co-operatives, community cafes and breakfast clubs. However, it should be recognised that the success of these initiatives depend upon appropriate advice and support being offered to people living on a low income as well as whether they have enough money to implement the dietary changes that are advocated.

In hospitals the prevalence of underweight (BMI < 20 kg/m^2) rises to 20–25%. It is also estimated that 40% of adults and 15% of children admitted to hospital are malnourished, half of these severely so, and many others become malnourished during their stay in hospital. Undernutrition increases the risk of complications, lowers resistance to infection, impairs physical and mental functioning and delays recovery.

For patients already undernourished, or those who are at risk of undernutrition on admission, the problems may become worse often owing to the quality of hospital food and the inadequacy of current feeding policies. Such problems include the limited choice, the way food is served, and the lack of help for those unable to feed themselves properly. Others need additional nutritional support but this often goes unrecognised. Between 30 and 50% of hospital food is wasted and average food intake is less than 75% of that recommended, particularly among the elderly. As well as impairing clinical outcome, this wastes resources. The monetary value of hospital food wasted each year in England alone is calculated to be £45 million. By including labour and overheads, this cost rises to £144 million. There is also the hidden cost of the extra ill health associated with undernutrition.

There is strong evidence that measures such as improved staff training, nutritional screening and assessment, and monitoring, combined with better catering practices, can result in most patients' nutritional requirements being met. Fortified meals, between-meal snacks and adequate ward staffing have all been shown to contribute to achieving this goal, which leads to better clinical outcome, less waste, shorter hospital stay and a more cost-effective service. Many of these problems are now being tackled with the establishment of new schemes such as *Better Hospital Food* and implementation of guidelines such as those produced by the Caroline Walker Trust on the nutritional education of care workers.

Difficulties exist in defining undernutrition, specifically undernutrition, as the anthropometric measurements used are neither age nor disease specific. Ranges and cut-off points to define normal or ideal have been based on healthy young individuals but are applied to the whole population. Different ranges that are age and/or disease specific for certain population groups may be more useful in predicting undernutrition. Compounding this problem is the fact that many clinicians, GPs, nurses and other health care professionals have had no training in the detection and management of undernutrition or on the guidance of prescribing nutritional supplements. Thus, despite the widespread use of oral nutritional supplements in the community, their effectiveness is questionable. The nutrition education of doctors has been addressed by the Royal Colleges and an intercollegiate group on nutrition has now been established and runs regular training courses.

Since most patients are discharged from hospital with a worse nutritional status than they entered it, this then injects into the community a further group of undernourished individuals, setting up a vicious circle. Therefore, the presence of disease, whether in hospital or the community, should be seen as an indication of the need for nutritional screening to identify those at particular risk and those who might benefit from some form of nutritional intervention. Clinical governance should be used to ensure appropriate nutritional management for patients. The National Institute of Clinical Excellence is currently setting up a new NSF to include standards of best practice in food service in hospitals.

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Appendix 1: Useful addresses and websites

Addresses

- British Association for Parenteral and Enteral Nutrition (BAPEN), PO Box 922, Maidenhead, Berks SL6 4SH; http://www.bapen.org.uk
- British Dietetic Association, 5th Floor, Charles House, 148/9 Great Charles Street, Queensway, Birmingham B3 3HT; http://www.bda.uk.com
- Caroline Walker Trust, 22 Kindersley Way, Abbots Langley, Hertfordshire WD5 0DQ; http://www.cwt.org.uk
- King's Fund Centre, 11–13 Cavendish Square, London W1M 0AN; http://www.kingsfund.org.uk
- National Institute for Clinical Excellence, 11 Strand, London WC2N 5HR; http://www.nice.org.uk
- Nuffield Trust, 59 New Cavendish Street, London W1M 7RD; http://www.nuffieldtrust.org.uk
- Patients Association, 7 Milton Street, Northampton NN2 7JG; http://www.patients-association.com
- Royal College of Nursing, 20 Cavendish Square, London W1G 0RN; http://www.rcn.org.uk
- WRVS, Milton Hill House, Steventon, Abingdon, Oxon OX13 6AD; http://www.wrvs.org.uk

Websites

- http://www.betterhospitalfood.com
- http://www.dfes.gov.uk
- http://www.doh.gov.uk/coma/welfarefoodsreview.pdf
- http://www.doh.gov.uk/hlc/index.htm
- http://www.doh.gov.uk/nsf
- http://www.doh.gov.uk/pricare/haz.htm
- http://www.hda-online.org.uk
- http://www.icgnutrition.org.uk
- http://www.intercollegiate.org.uk
- http://www.neighbourhood.dtlr.gov.uk
- http://www.oxfam.org.uk
- http://www.sign.ac.uk
- http://www.surestart.gov.uk
- http://www.sustainweb.org

Appendix 2: Specialised feeding

This section is designed to give a short comprehensive overview of the principles involved in specialised feeding. The three main types of specialised feeding techniques including indications and contraindications for their use, energy needs and some of the practical issues involved in nutrition support are covered briefly. More detailed information can found in specialised textbooks (Garrow *et al.* 2000; Thomas 2001).

Once specialised feeding of a patient has been agreed upon, it is the responsibility of the dietitian to assess nutritional requirements and decide on how these can best be met through a variety of different feeding methods. Combinations of methods can be used and the dietitian must co-ordinate these to ensure they complement each other. The dietitian not only calculates nutrient requirements but also must take into account the physical and mental condition of the patient, other treatment being received and the predicted length of time that the patient will require special feeding.

Use of oral nutrition supplements

If sufficient energy intake cannot be achieved with normal foods, proprietary supplements can be a useful addition to the diet. Some types can be purchased directly from chemists and supermarkets. They are usually in powdered form and made up with milk to make milkshakes or soups. They are not nutritionally complete, however, as they lack trace elements. The majority of the nutritionally complete supplements are prescribable on FP 10 forms. The Advisory Committee on Borderline Substances lists the conditions for which each product is prescribable in the Monthly Index of Medical Specialities and the British National Formulary. Most come ready-to-drink, in cartons and in a variety of flavours. Prescribable soups and puddings are also available.

Prescribed supplementary oral nutrition products are costly to the NHS so it is important that they are not used unnecessarily. They can be effective in some patients when used properly, but auditing procedures have shown these products are often prescribed without the involvement of a dietitian and before any attempt has been made to improve dietary intake by conventional foods (McCombie 1999). Supplements should not be regarded as an easier option than providing high nutrient density meals or extra snacks. Supplementation should only be considered when dietary measures are insufficient to sustain or improve intake. They should be regarded as an addition to normal intake and not as a substitute, except on days when food cannot be faced at all. Patients should always be given simple written guidance on the use of supplements, and should be encouraged to consume supplements at intervals throughout the day and not before meals to avoid impairing appetite.

In the community, GPs are able to prescribe supplements in response to requests from district or palliative care nurses as well as dietitians, and this has led to widespread use of oral nutritional supplements in the com-

munity. However, there is uncertainty regarding the value of their use, because it is often inappropriate and unnecessary. A critical systematic review has been conducted by Stratton (2000) to gain insights into the effects of supplements on body weight and structure, spontaneous food intake and body function. The author reviewed 84 trials categorised into different patient groups. The results showed that following supplementation, weight gain varied considerably and depended on the duration and amount of supplementation, and on the disease status of patients. Percent weight change was greater in patients with a mean BMI < 20 kg/m^2 than with a mean BMI > 20 kg/m^2. Total energy intake increased during supplementation and the energy from the supplement was largely additional to, rather than substituting for, food eaten. Additional energy intake via supplementation also varied considerably, depending on the disease state and BMI of the patient. This highlights the need for better guidelines regarding supplement use (Stratton & Elia 1999).

Enteral nutrition

Enteral tube feeding is the preferred route for patients with a functioning gastrointestinal tract but who cannot swallow, or for those who cannot obtain adequate nutrition from the intake of food and/or dietary supplements. Enteral nutrition is simpler, cheaper and physiologically preferable to parenteral nutrition (see the section on 'Parenteral nutrition') because it maintains the integrity of the gut barrier better, which prevents bacteria from entering the systemic circulation.

Guidelines for the use of enteral tube feeding are given in Table 2. Contraindications to its use include prolonged gastrointestinal failure such as bowel stasis, eritonitis, severe and recurrent pancreatitis, high intestinal fistulae, short bowel syndrome, or severe inflammatory disease of the bowel such as mucositis following cytotoxic therapy or Crohn's disease complicated by fistulae.

Table 2 Clinical guidelines for the use of enteral nutrition in the adult patient

Where artificial enteral nutrition should be part of routine care	Protein-energy undernutrition (greater than 10% weight loss) with little or no oral intake for the previous 5 days
	Less than 50% of the required oral nutrient intake for the previous 7–10 days
	Swallowing-related difficulties, *e.g.* head injury, strokes, motor neurone disease
	Major full-thickness burns
	Massive small bowel resection in combination with parenteral nutrition (in patients with 50–90% small bowel resection, enteral nutrition is given to hasten gut regeneration and return to oral intake)
	Low-output enterocutaneous fistulae (less than 500 mL/day) (elemental diets may hasten closure of fistula)
Where enteral nutrition would normally be helpful	Major trauma
	Radiation therapy
	Mild chemotherapy
Where enteral nutrition is of limited or undetermined value	Intensive chemotherapy
	Immediate postoperative period or poststress period (especially if an adequate oral intake will be resumed within 5–7 days)
	Acute enteritis
	Less than 10% of small intestine remaining after surgery
Where enteral nutrition should not be used	Complete mechanical intestinal obstruction
	Poor muscle movement of the intestinal tract
	Severe uncontrollable diarrhoea
	High-output fistulae – a leaking hole in the intestinal tract
	Severe acute pancreatitis
	Shock
	Not desired by the patient or legal guardian, and such action being in accordance with hospital policy and existing law
	Prognosis not warranting aggressive nutritional support

Source: Elia (2000).

Table 3 Guidelines for the use of parenteral nutrition in the hospitalised patient

Clinical settings where parenteral nutrition should be part of routine care	Patients unable to absorb nutrients via the gastrointestinal tract, *e.g.* massive bowel removal (greater than 70% small bowel removal shortly after surgery, greater than 80–90% resection requires parental nutrition indefinitely), severe diseases of the small intestine, including radiation enteritis, severe protracted diarrhoea, intractable vomiting
	Patients undergoing high-dose chemotherapy radiation, and bone marrow transplantation
	Moderate to severe acute pancreatitis, *e.g.* the need for continued bowel rest is anticipated beyond 5–7 days
	Severe undernutrition in the case of a non-functional gastrointestinal tract
	Severe catabolic patients with or without undernutrition when the gastrointestinal tract will not be usable for 5–7 days
Clinical settings where parenteral nutrition would usually be helpful	Major surgery, *e.g.* when an adequate enteral diet is not expected to be resumed within 7–10 days
	Moderate stress, *e.g.* moderate trauma or 30–50% body surface burns, when an enteral diet cannot be resumed over 7–10 days
	Enterocutaneous fistulae
	Inflammatory bowel disease, *e.g.* in patients not responding to medical treatment including enteral feeding
	Hyperemesis gravidarum, *e.g.* severe protracted nausea and vomiting in pregnancy which persists for more than 5–7 days
	Moderately malnourished patients who require intensive medical or surgical intervention, *e.g.* those whose gastrointestinal tract function is impaired
	Patients in whom adequate enteral nutrition cannot be established within a 7–10-day period of hospitalisation
	Patients receiving intensive cancer chemotherapy
Clinical settings where parenteral nutrition is of limited use	Minimal stress and trauma in the well-nourished patient when the gastrointestinal tract is usable within a 10-day period, *e.g.* burns with less than 20% body surface affected, limited soft tissue injury or self-limited acute pancreatitis
	Immediate postoperative or poststress period, *e.g.* in a well-nourished patient in whom the gastrointestinal tract is expected to recover in 7–10 days
	Proven or suspected untreatable disease state
Clinical settings where parenteral nutrition should not be used	Patients who have a functional and usable gastrointestinal tract capable of absorption of adequate nutrients
	When the sole dependence on parenteral nutrition is anticipated to be less than 5 days
	Whenever aggressive nutritional support is not desired by the patient or legal guardian, and when such action is in accordance with hospital policy and existing law
	Patients whose prognosis does not warrant aggressive nutritional support
	When the risk of parenteral nutrition is judged to exceed the potential benefits

Source: Elia (2000).

Parenteral nutrition

As detailed in Table 3, this is usually considered only when nutrition support cannot be given by the oral or enteral routes. The high osmolarities of parenteral feed solutions are damaging to blood vessel walls if administered into peripheral veins, whereas infusion into a central vein allows rapid dilution and mixing with blood.

Nutritional requirements

Energy

During the last 20 years, the prescribed energy intake for critically ill patients receiving parenteral nutrition has decreased by up to twofold (Elia & Jebb 1992) because of re-evaluation of needs, changes in clinical practice and the recognition that overfeeding can be harmful. The energy requirements of patients with disease are usually similar to or less than those of healthy subjects (Elia 1995), with the basal hypermetabolism of disease often more than offset by decreased physical activity.

The energy requirements of individuals with disease used to be overestimated partly because measurements of resting energy expenditure were made close to the time of peak hypermetabolism (typically, the first few days after trauma, injury or burns), and then extrapolated to much longer periods during which artificial nutritional support was needed. Measurements were also obtained while patients were being infused with large amounts of nutrients, which increased resting energy expenditure by 30%. The previous recommendation that sufficient energy should be provided to take into account the effects of fever (13% of resting meta-

bolic rate per °C rise in temperature) is also inappropriate if resting metabolic rate is measured while the patient has a high temperature. The energy cost of breathing, normally 2–3% of resting metabolic rate, increases up to 10-fold in patients with acute respiratory distress, but is included in direct measures of resting metabolic rate.

Changes in clinical practice have reduced energy needs (Elia 1995). The early surgical removal of necrotic tissue in burns, rather than leaving it intact to form a scab, has decreased the energy requirements of patients with burns. Patients in burn and intensive care units do not wear clothes and are consequently nursed at higher ambient temperatures, so reducing energy expenditure.

More aggressive management of infections (*e.g.* drainage of abscesses) has reduced both the magnitude and duration of hypermetabolism in various clinical settings. Thus patients in an intensive care unit with systemic infections could have a resting metabolic rate of only 15% above that predicted, even though the measurements were made while enteral feeds were infused at a rate of 1.5 times the metabolic rate.

Adverse effects of overfeeding

Animal models of sepsis have shown that overfeeding can produce huge increases in mortality (Elia & Jebb 1992). Clinically, excess carbohydrate and excess lipid have both been linked to hepatic fat accumulation and abnormal liver function. Lipids may also be deposited in the lungs and impair diffusion of gases, and produce infusional hyperlipidaemia. Overfeeding with excess carbohydrate induces excess carbon dioxide production, which can precipitate respiratory failure in patients with poor respiratory reserve. In critically ill patients, hyperglycaemia is common and blood glucose control is more difficult during overfeeding with high carbohydrate loads.

The rationale for reducing the intake of large amounts of energy in patients with acute illnesses has been reinforced by the measurement of energy expenditure by 24 h continuous indirect calorimetry (*e.g.* in ventilated patients in intensive care units) and by tracer techniques. The daily energy expenditure in adults is generally 30–35 kcal per kilogram body weight. This is irrespective of whether the patients are preoperative or postoperative, receiving parenteral nutrition in hospital or at home, or are in intensive care units. Even children with severe burns may expend similar amounts or less energy than healthy children.

Hypocaloric feeding may be practised in the early stages of injury to reduce the risk of metabolic instability and its consequences. This form of nutritional support, while not preventing loss of lean or fat tissue, will limit the loss. An emphasis on repletion is then made in the recovery phase.

Further information on nutrient requirements in enteral and parenteral feeding is given in Elia (2000).

Practical aspects of nutrition support

Once the method of feeding has been agreed by the clinical nutrition team, a number of factors will influence the specific site of feeding, the type of feed used, and the common complications associated with both the method and physical and psychological state of the patient.

Tube feeding

The use of fine-bore feeding tubes has reduced the extent of complications, such as rhinitis, oesophagitis and oesophageal strictures that were formerly associated with large-bore nasogastric Ryle's tubes. Nasogastric feeding is not suitable for patients who may regurgitate and/or aspirate feed into the lungs, so passing the tube further into the small intestine may then help. Gastrostomy feeding (feeding directly into the stomach via a fine tube) is used for long-term (greater than 30 days) or permanent enteral feeding. Gastrostomies may be made surgically but this requires laparotomy and a general anaesthetic; therefore, percutaneous endoscopic gastrostomy is now performed, using a local anaesthetic and a fibreoptic endoscope. Jejunostomies (feeding tubes directly into the jejunum) are used in patients prone to aspiration pneumonia.

Line feeding

Central vein parenteral nutrition is considered for patients who require prolonged nutrition support or who have poor venous access. Peripheral vein parenteral nutrition is being increasingly used for providing nutritional support to the majority of patients who require short-term parenteral nutrition. Mechanical problems with the catheter and catheter-related sepsis are significantly less than with peripheral parental nutrition. This method of feeding is often satisfactory for 1–2 weeks, but the incidence of thrombophlebitis after this period is high. Thrombophlebitis is the main disadvantage of peripheral vein parenteral nutrition and there are a number of factors that can affect the incidence of this condition; most important is the high osmolality of parenteral feeds. The carbohydrate content can be

Table 4 Some complications associated with enteral and parenteral nutrition

Cause	Enteral nutrition	Parenteral nutrition
Mechanical	Tube malposition Insertion trauma Damage to gut Tube blockage/occlusion	Catheter malposition Insertion trauma Vein damage Catheter blockage/embolus Air embolus Thrombosis and embolism from catheter tip
Feed/flow-related	Diarrhoea/constipation Bloated abdomen/cramps Regurgitiation/aspiration pneumonia Hyperglycaemia	Substrate overload
Infections	Infection of feed or giving set Infection of entry site	Catheter-related sepsis
Metabolic	Fluid and electrolyte disturbances Hyper/hypoglycaemia	
Organ/tissue dysfunction	Disease-related	
Allergic reactions	With some feed constituents (avoided with elemental feeds)	
Psychological	Anxiety Depression Abnormal self-image Social isolation	

Source: Herberer & Marx (1995).

reduced but this limits the overall energy value of the feed.

Types of feeds

Most patients receive a standard general purpose polymeric liquid feed. However, a range of disease-specific formulations is available, including pulmonary formulations with a high fat to carbohydrate ratio and hepatic failure formulations which are high in branched chain amino acids and low in aromatic amino acids. The American Gastroenterological Association (1995) has reached three general conclusions regarding the use of feeds:

- Standard isotonic polymeric formulations can meet the nutritional needs of most patients.
- The use of elemental formulations should be reserved for patients with severe small bowel absorptive dysfunction.
- Disease-specific formulations have a limited clinical role, and more information is needed regarding their practicality and effectiveness.

There are a number of different commercially prepared solutions available for parenteral nutrition. Nutritional requirements vary between patients and depend on their nutritional status and disease state.

Complications

A summary of the major complications that may be encountered during enteral and parenteral nutrition is given in Table 4.

Key points

- There is widespread use of oral nutritional supplements in the community yet their effectiveness is questionable
- The key to clinical nutrition is the identification of nutritionally responsive conditions with respect to function
- Clinical governance should be used to ensure appropriate nutritional management for patients