1.11 Oral nutritional support

Key points

- Altering food quality, quantity or availability can help improve nutritional intake and should be first-line advice in patients needing to improve their oral intake.
- Strategies such as increasing food frequency, increasing the consumption of energy- and nutrient-dense foods, and fortifying foods to increase the nutrient density can be used.
- Oral nutritional supplements have been shown to be beneficial in improving nutrient intake and should be used if changes in food intake have proved insufficient.
- Oral nutritional supplements should be prescribed under advice from a suitably trained professional.

The term 'nutritional support' does not just mean the use of supplements or enteral/parenteral nutrition. Chronic undernutrition usually results from poor food intake and, in most instances, improving nutritional intake via ordinary foods and beverages is the first step in the process of providing nutritional support. For many people with mild undernutrition (or identified as being at risk of undernutrition), simple dietary advice focused on food quality and quantity (or measures which ensure better food provision) may be sufficient to correct or avert the problem (Gall *et al.* 1998; Barton *et al.* 2000; Krassie *et al.* 2000). Specific guidance to help alleviate problems such as nausea or dry mouth may also result in considerable improvements in oral intake. If food intake is particularly poor, food enrichment measures may help improve nutrient density (Odlund-Olin *et al.* 1996). Some people may need further support in the form of oral nutritional supplements (ONS). Only a few will require artificial nutritional support in the form of enteral or parenteral nutrition (see Sections 1.12, *Enteral feeding*, and 1.14, *Parenteral nutrition*).

1.11.1 General dietary guidance to improve food intake

The first nutritional aims for anyone with a poor food intake are to:

- Increase the frequency of consumption of foods and fluids.
- Increase the energy and nutrient content of foods and fluids consumed.

In hospital and care home settings, it is also important to address the issue of access to food. Patients may need help both to order and to eat their food. This is considered a basic nursing duty of care (Bond 1997; DH 2001).

Increasing the frequency of consumption

People should be encouraged to consume some form of nourishment at frequent intervals, e.g. every 2–3 hours throughout the day. This might be:

- A small meal.
- A snack (e.g. a sandwich, yoghurt, biscuits, crackers and cheese, fruit).
- A nourishing drink (e.g. milk-based).

Patients should be encouraged to regard 'eating' as being as important as any other treatment or medication they are receiving, and a positive step they can take to help recovery. Medical and nursing staff sometimes need to be reminded of this too.

Increasing the energy and nutrient content of foods and fluids consumed

Energy-dense and nutrient-dense foods

Patients should be encouraged to consume foods which provide concentrated sources of energy and nutrients in a relatively small volume. Good choices are:

- Lean meat.
- Fish (tinned fish such as pilchards or sardines are particularly useful).
- Cheese (especially grated).
- Well-cooked eggs.
- Full-fat yoghurt.
- Double cream.
- Full-cream, evaporated or condensed milk.
- Butter and full-fat spreads.
- Jams and preserves, honey, peanut butter, chocolate spread.

Snack foods such as cakes, biscuits, pastries, chocolate and crisps can also be useful additional sources of energy

2.7 Minerals and trace elements

Key points

- Many factors affect mineral and trace element requirements, bioavailability and absorption.
- Younger adults tend to have lower intakes of minerals and trace elements than older adults.
- Many younger adults may not be consuming sufficient calcium to achieve maximum bone density and hence may be at increased risk of developing osteoporosis in later life.
- Many women, particularly younger women, have a low iron intake and some have evidence of poor iron status. Over 40% of women aged 19–34 years have an iron intake below the LRNI.
- Most adults consume excessive amounts of sodium; 85% of men and 69% of women exceed the target intake for salt.

Minerals and trace elements are, like vitamins, required in only small or even trace quantities, but are nonetheless essential for normal body function. They have a variety of roles and may be necessary for:

- **Tissue structure.** Minerals such as calcium and phosphorus are important structural components of bone; iron is an essential constituent of haemoglobin in blood.
- **Enzyme systems.** Many minerals and trace elements are required as cofactors, coenzymes or metalloenzymes in metabolic pathways.
- **Fluid balance.** The concentration of elements such as sodium and potassium in body fluids, and their movement between extracellular and intracellular compartments, are part of the regulatory mechanism for fluid balance.
- **Cellular function.** Some are necessary for membrane stability and inter- and intracellular transport mechanisms.
- **Neurotransmission.** Some influence electrical activity and have an essential role in nerve function.

Minerals and elements known to be essential for humans are summarised in Table 2.7.1. Those required in milligram quantities (sometimes several hundred milligrams) tend to be referred to as 'minerals'. Those required in smaller amounts (microgram quantities) are usually called 'trace elements'. This is, however, an arbitrary distinction.

The precise role, requirements and optimum levels of intake of some minerals and many trace elements remain to be established. As a result, there is some variability in the recommended levels of intake set by different countries or international advisory bodies, and dietary reference values (DRVs) can change over time (see Section 1.3.2 in *Dietary reference values*).

It can also be difficult to determine whether the estimated requirements for these micronutrients are being met due to:

1. **Difficulties in estimating the amount consumed.** Their content in food, particularly in respect of trace elements, can vary according to factors such as the soil in which plants are grown, animal feedstuffs, the species, ripeness or age of the plant or animal and food processing techniques. There are also analytical difficulties in accurately measuring the content of elements present in only minute amounts. For these reasons, tables of food composition provide an indication of mineral and trace element content but cannot be regarded as infallible (see Section 1.4.2 in *Food composition tables*).
2. **Difficulties in estimating the amount absorbed.** The amount absorbed is variable. Not only are there differences between minerals and trace elements in terms of bioavailability (some are well absorbed, others much less so), but also many other factors can further influence the absorption of a particular mineral or element, such as:
   - *Its dietary source*. Calcium in milk is absorbed better than calcium in cereal foods or vegetables.
   - *Its chemical form*. Haem iron is absorbed by a different, and more efficient, mechanism than non-haem iron.

Table 2.7.1 Minerals and trace elements known to be essential in humans

Minerals (required in milligram quantities)	Trace elements (required in microgram quantities)
Calcium	Copper
Phosphorus	Chromium
Magnesium	Manganese
Sodium	Molybdenum
Potassium	Selenium
Iron	Iodine
Zinc	
Fluoride*	

* Regarded as semi-essential. No physiological requirement can be shown to exist but it has known beneficial effects.

3.7 Adults (19–64 years)

Key points

- The adult phase of life is a crucial time for implementing the diet and lifestyle measures that help prevent chronic diseases such as cardiovascular disease and cancer – the principal causes of death in the UK.
- The prevalence of risk factors such as obesity, physical inactivity, dyslipidaemia, hypertension and excessive alcohol intake remains unacceptably high in the UK adult population.
- Younger adults are more likely to have an unhealthy diet and lifestyle than older adults.
- There are many health inequalities within the UK population. People from lower income groups tend to have poorer diets in terms of food choice and micronutrient composition.
- There are differences in the health concerns of men and women and also in the way in which they respond to health messages. Health promotion strategies may need to take these into account.

The adult phase of life (19–64 years) is very important in terms of diet and health. It is the period when chronic diseases begin to be expressed and a critical time for implementing preventive diet and lifestyle measures which may reduce the risk of developing them.

3.7.1 The health of the UK population

Morbidity and mortality

In the UK, the main threats to health are cardiovascular disease and cancers. During the age span of 19–64 years, the prevalence of these disease rises steeply, with cancers being the main cause of death (Table 3.7.1). However, after the age of 64 years, mortality from cardiovascular disease (CVD) increases more rapidly and is the main cause of all deaths in the UK. More than one in three people die from CVD, about half of these deaths being due to coronary heart disease (CHD) and about one-quarter as a result of stroke. CHD by itself is the most common cause of premature death in the UK, accounting for 22% of deaths in men and 12% in women aged under 75 years (Peterson *et al.* 2005).

Other major health concerns in the UK population include the rising prevalence of type 2 diabetes, which has many serious health consequences including an increased risk of CVD. Much of the increase in type 2 diabetes is a consequence of the high and increasing prevalence of obesity, which has many other implications for health (see below). Other disorders such as osteoporosis, constipation

Table 3.7.1 Major causes of mortality in UK adults aged 35–64 years. Data from Peterson *et al.* (2005)

Cause of death	Number of deaths in the UK population by age group, 2003		
	35–44 years	45–54 years	55–64 years
All causes	7463 men 4479 women	14 609 men 9824 women	32 741 men 20 888 women
All CVD	1542 men 710 women	4699 men 1708 women	11 485 men 4511 women
CHD	866 men 213 women	3198 men 685 women	7913 men 2280 women
Stroke	263 men 248 women	674 men 559 women	1534 men 1151 women
All cancer	1285 men 1730 women	4316 men 4926 women	12 958 men 10 732 women
Lung cancer	137 men 116 women	923 men 726 women	3484 men 2151 women
Colorectal cancer	105 men 84 women	404 men 346 women	1407 men 882 women
Breast cancer	654 women	1507 women	2257 women

4.13 Renal disease

Key points

- Nutritional therapy is an important part of the management of chronic renal failure (CRF), end-stage renal failure (ESRF), acute renal failure (ARF) and nephrotic syndrome.
- CRF: Fluid restriction (500 ml + the equivalent volume to the previous day's urine output) is indicated if there is fluid overload. If fluid is restricted, sodium intake will also need to be restricted to alleviate thirst. If hyperkalaemia is present, potassium intake should be restricted to approximately 1 mmol/kg body weight/day. Blood phosphate levels should be kept below 1.9 mmol/l, if necessary by means of dietary phosphate restriction and phosphate binders. The appropriate protein intake remains controversial; low-protein diets can increase the risk of malnutrition.
- ESRF: Malnutrition is a high risk in patients on haemodialysis. Peritoneal dialysis results in loss of amino acids and it is important that protein depletion is prevented. Dialysate fluid is also a source of energy and glucose which may have implications in patients who have diabetes or are overweight.
- Renal transplantation: Although the diet can be more liberal following transplantation, nutrition remains an important aspect of care in the post-surgery phase and in the long term when healthy eating should be encouraged.
- ARF: Nutritional management will be determined by whether the condition is catabolic or non-catabolic.
- Nephrotic syndrome: Protein, salt and fat intake may need to be adjusted in patients who do not respond rapidly to pharmaceutical treatment.

Nutritional therapy plays a central role in the management of individuals with renal disease. Dietetic intervention can help limit the effects of renal dysfunction and patients frequently require nutritional support to maintain or improve nutritional status. In renal disease, several dietary elements require consideration (Table 4.13.1). These should be individualised to the particular needs of the patient, bearing in mind their clinical condition, treatment and blood biochemistry. An appreciation of both medical and dietetic aspects of care is therefore required if appropriate treatment strategies are to be planned.

This section aims to provide readers with the background information and the practical guidelines necessary to treat renal patients in the general setting. An introduction to the more specialised areas, where individuals would be managed on a renal unit or critical care unit, is also included.

Following a brief review of kidney function in health and disease, the medical and dietetic aspects of care are covered using the following classifications:

- **Chronic renal failure (CRF)**, where the renal failure develops in the longer term, over months and years.
- **End-stage renal failure (ESRF)**, where renal function has deteriorated to a point that renal replacement therapy (dialysis or transplantation) is required to maintain the life of the patient.
- **Acute renal failure (ARF)**, where the renal failure develops over a short time span of hours or days but is potentially reversible.
- **The nephrotic syndrome**, in which patients lose excessive quantities of protein in the urine. Renal function may either be normal or deranged.

Some questions and answers have been included towards the end of the section. These may help with the practical assessment of the patient.

4.13.1 Kidney function

In health, the kidneys' major activities are involved with homeostasis and a number of important metabolic functions (Table 4.13.2). Reduced renal function may result in fluid and electrolyte imbalance, the accumulation of metabolic waste products, anaemia, acidosis and altered metabolic processes. These have an adverse effect on nutrition (Table 4.13.3).

Glomerular filtration rate (GFR) is the most valid measurement of kidney function. It can be determined formally from clearance studies or estimated by formulae using the patient's age, weight, height and gender. Healthy individuals have a GFR of approximately 120 ml/minute. GFR declines as kidney failure advances. However, because the kidneys have a large degree of functional reserve, it is only when at least 50% of kidney function has been lost (GFR $<$60 ml/minute) that blood biochemistry becomes abnormal.

In day-to-day clinical practice, serum creatinine concentration is used to monitor renal function. Serum creatinine levels rise with decreasing GFR. However, care is needed

5.1 Critical care

Key points

- Critically ill patients are difficult to feed because their optimum macro- and micronutrient requirements (i.e. those associated with improved clinical outcomes) have yet to be determined.
- Data are inconsistent on whether providing 'adequate' energy can improve outcomes in intensive care unit patients, but both under- and overfeeding have been associated with undesirable consequences. An appropriate energy intake is approximately 25 kcal/kg body weight/day.
- Sufficient protein should be provided to attenuate muscle wasting, probably in the region of intake of about 1.2 g/kg body weight/day.
- A safe form of enteral feeding should be instituted at as early a stage as possible.
- Dietetic input should be an integral part of the multidisciplinary care.
- The use of various 'immune enhancing nutrients', particularly glutamine, and the tight control of blood glucose using insulin may represent novel therapies to improve nutritional support and outcome.

Critical care is a branch of medicine primarily concerned with the management of patients with acute life-threatening disorders. Such patients are normally cared for within designated intensive care units (ICUs). The immediate objective of care is to preserve life and to prevent, minimise or reverse damage to vital organs. The aims of nutritional support are the same and the objectives are governed by the metabolic response to stress.

Department of Health guidelines (DH 2000) suggest that 1–2% of acute beds in a general hospital should be designated ICU beds, and that this number should be greater where there are specialist units (e.g. those performing cardiac or major vascular surgery or neurosurgery). The guidelines also recommend that patients are classified according to the severity of the illness and the level of support that is needed rather than their hospital location, e.g. ICU or high-dependency unit (HDU); see Table 5.1.1.

Table 5.1.1 Classification of patients in the acute hospital setting

Classification	Level of support required
Level 0	Patients whose needs can be met through normal ward care in an acute hospital
Level 1	Patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team
Level 2	Patients requiring more detailed observation or intervention including support for a single failed organ system or postoperative care and those 'stepping down' from higher levels of care
Level 3	Patients requiring advanced respiratory support alone or basic respiratory support together with support of at least two organ systems

Common causes for admission to an ICU include:

- Major trauma including head injury, road traffic accidents (RTAs).
- Postoperative care – cardiac, abdominal, transplantation or major vascular surgery.
- Respiratory failure.
- Post-cardiopulmonary resuscitation.
- Severe sepsis.

5.1.1 The intensive care unit

For those unfamiliar with the ICU environment, coming face-to-face for the first time with extremely ill patients and the host of medical equipment by the bedside can be a very daunting experience. Dietitians working in the field of critical care should take time to familiarise themselves with standard equipment and treatment procedures to ensure that their nutritional therapy recommendations are safe and appropriate.

Severity of illness scoring systems

Many medical specialties use scoring systems to 'quantify' the severity of a particular condition. In critical care, scoring systems not only provide a measure of illness severity but may also be used to estimate the risk of death (Ridley 2002). The most commonly utilised score is the Acute Physiology and Chronic Health Evaluation (APACHE II) score, which uses age, the Glasgow Coma Scale score, 12 current physiological variables and the patient's chronic health status to predict mortality risk (Knaus *et al.* 1986).

ICU patients present with, or are at risk of developing, more than one organ failure. Multiple organ dysfunction syndrome (MODS) is the most common cause of death in