Section 1

Living with a Long-term Condition
Chapter 1
Nutrition
Helen Ford

Learning objectives
After reading this chapter, the reader will have:

- Gained an understanding of how nutrition is a factor both in the cause of LTCs and as a treatment of LTCs
- Developed their understanding of the components of a healthy diet, and be able to demystify dietary advice for patients/clients
- A greater knowledge of obesity, its aetiology, link to LTCs, and current treatment recommendations
- Enhanced their understanding of undernutrition in LTCs, and how this can be identified and treated effectively

Introduction
This chapter explores the importance of good nutrition in both the prevention and management of long-term conditions (LTCs). The impact of poor diet and nutrition on individuals will be discussed, including obesity and, at the other extreme, undernutrition. In particular, the reasons why people with LTCs are at risk of poor nutrition will be examined, including both the effects of hospitalisation and exacerbations of disease. By the end of the chapter, it is hoped that the reader will have a solid foundation of knowledge about nutrition, and that they will be able to use this knowledge in improved assessment and care of their patients.

Nutrition in context
The Department of Health (DH) (2008a) state that 15.4 million people (almost one in three of those living in England) have an LTC. This statistic includes people across the age continuum, yet of those over 60, the proportion with an LTC increases to three out of five people. As has been identified...
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elsewhere in this book, LTCs do not necessarily occur singly as people may have more than one LTC, and again this incidence rises as age increases. For example, to look at some common conditions:

- In England, 6.7 million people have clinically identified hypertension.
- Diabetes (Types 1 and 2) affects 174,000 or 6% of the Welsh population.
- 864,000 people will experience a stroke at some point in their lives across England and Northern Ireland.
- Coronary heart disease affects almost 2 million people in England, from a population of approximately 61 million. This equates to 3.3% of the population, whereas in Scotland this percentage rises to 4.2%.


For conditions such as these, diet has been identified as one of the main factors influencing whether someone will develop them or not. Demographic data from the DH suggest that there is wide variation in prevalence of these diseases across the United Kingdom and access to the right kinds of foods to maintain a healthy diet is undoubtedly important. For example, the White Paper ‘Towards a Healthier Scotland’ (The Scottish Office 1999) stated that Scotland’s diet is a major cause of poor health, and that the Scottish diet is traditionally high in fat, salt and sugar, and low in fruit and vegetables. In addition, households that include someone with an LTC are more likely to be low earners, and those on low wages are less likely to be able to afford or have access to healthy food. The World Health Organisation (WHO 2002: 30) in their consultation document ‘Diet, Nutrition and the Prevention of Chronic Disease’ argue that in fact, events during the life-course of an individual are as important when considering good nutrition as focusing on snapshots in time, and that such factors are also being recognized as happening further and further ‘upstream’ in the chain of events predisposing humans to chronic disease.

However, it must be recognised that some LTCs are not precipitated by diet and other lifestyle factors. For individuals with conditions such as chronic obstructive pulmonary disease (COPD), rheumatoid arthritis (RA) or osteoarthritis, neurological conditions such as epilepsy, motor-neurone disease or multiple sclerosis, or mental health problems such as depression or dementia, poor diet may not have been a factor in the cause of the disease. However, as the reader will see, research into the role of good nutrition and health is showing that interventions to ensure that malnutrition is prevented, detected and managed can positively affect the outcome of a disease, modify symptoms, and reduce morbidity and mortality. This idea, of promoting nutrition to the forefront of a care programme, can be known as ‘nutrition as treatment’ and it recognises the power of carefully planned nutrition interventions to maintain positive health. However, nutrition does not happen in a vacuum, and the social, cultural, political and economic environment in which a person lives will all affect their eating habits.

How nutrition fits into the management of LTCs

As the number of people with one or more LTCs continues to grow over the next 20 years, the DH (2005) argue that health and social care services will need to focus on improving health outcomes through better detection and prevention of health problems. Promoting the benefits of a healthy lifestyle, including diet, can improve a person’s quality of life and allow them to lead as full a life as
they choose rather than becoming isolated and defined solely by their disease. An example of this is hypertension. The Health Survey for England (Office for National Statistics 2005) found that among people with no LTC, approximately 9% had a blood pressure (BP) above 150/90. However, this figure rose to 50% for people with one or more LTCs. The DASH (Dietary Approaches to Hypertension) study (Harsha et al. 1999) is a famous study that showed after eight weeks of a diet rich in fruit and vegetables and low fat dairy products, an 11.4 mm Hg drop in systolic BP and a 5.5 mm Hg drop in diastolic BP was observed in hypertensive subjects, compared with those eating a standard American diet. Gaining control of blood pressure alone would reduce the risks of further health problems and may also mean fewer tablets to take in the morning! For the person with an LTC, well-being would be improved as their confidence increased in their ability to manage the disease, rather than the disease managing them, and this could in turn lead to further positive changes in lifestyle.

Promoting health

The DH has identified four levels of care for LTCs (DH 2005). The first level is that of promoting health, both in the population as a whole to prevent LTCs from developing in the first place, and for those already with an LTC. For those working in health and social care, supporting people to make healthy choices is as important as other more clinical roles. Good knowledge of what constitutes a healthy diet is important here, as is being able to empower people to manage obesity and stabilise weight. Hydration must be included within this; for example, adequate hydration reduces risk of falls among the elderly (American Geriatrics Society, British Geriatrics Society and American Academy of Orthopaedic Surgeons Panel on Falls Prevention 2001). An example of a visually appealing tool to promote healthy hydration has been produced by the British Nutrition Foundation (2010b) and can be seen in Figure 1.1.

Supported self-care

The second level is supported self-care and aims to empower people with LTCs to manage their condition effectively by improving skills and knowledge. The Expert Patients Programme (EPP), for example, is one initiative where individuals are trained by others with an LTC in how to best help themselves to cope with their condition. How to improve diet and maintain optimum health is one of the possible training sessions available in the EPP.

Disease management

The third level of care delivery is that of disease management. Here, proactive disease management to diagnose problems and work actively with patients who have a single LTC or range of problems can make a difference to their health and well-being. An example would be a patient with Type 1 diabetes mellitus, who has a designated contact such as a Diabetes Nurse Specialist to help advise on what to do in the event of illness that might impact upon good glycaemic control.

Case management

Finally, for the most complex cases or patients with high-intensity needs, case-management is used. Here, a community matron, for example, works as a single point of contact to look holistically at a person’s needs and prevent, where possible, unplanned hospital admissions. As will be seen later in this chapter, prevention of undernutrition for people with high-intensity needs will reduce the downward spiral of decline that can lead to hospitalisation or long-term institutionalisation.

With these thoughts in mind, it is now time to think about what nutrition is.

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Figure 1.1 Healthy hydration. (British Nutrition Foundation 2010b.)
What is nutrition?

Definitions of nutrition vary, depending on the source. The Wellness Community (2009) is an American non-profit organisation that provides support for people with cancer. They define nutrition as:

A three-part process that gives the body the nutrients it needs. First, you eat or drink food. Second, the body breaks the food down into nutrients. Third, the nutrients travel through the bloodstream to different parts of the body where they are used as ‘fuel’ and for many other purposes. To give your body proper nutrition, you have to eat and drink enough of the foods that contain key nutrients.

This definition is useful in that it gives lay people a simplified version of what nutrition is, yet from a biological perspective. It emphasises the physiological processes that enable the body to extract the nutrients it needs from the food or liquid consumed. However, it must be obvious to the reader that nutrition is not just about the acquisition of nutrients. Another definition of nutrition is:

the study of the relationship between people and their food.

(Barasi 2003: 4)

This definition is somewhat different, as it introduces the notion that food is not simply fuel, but a part of people’s everyday lives in the same way that a partner or a child may be. It acknowledges that although food is a necessity, it is also part of a complex web of social and psychological processes, and as such has been the subject of much research by social scientists. An illustrative example of this can be found in the Food Standard Agency’s (FSA) (2002) survey on ‘Food Fundamentals’. The FSA interviewed adults from different social groups in order to understand their attitudes and approaches towards food, including food trends and food scares. They found that the people interviewed could be divided into the following three broad groups:

- **Enthusiasts:** These were a minority of the sample who were deeply involved with food, who enjoyed all aspects of its preparation and consumption, and were confident they knew what was good or bad.
- **Functional eaters:** The other minority, at the opposite end of the spectrum from the enthusiasts, who looked upon food as fuel, and were mainly concerned with value and cost.
- **Consumers:** The largest group, who enjoyed and consumed food and its associated products and media, and were receptive to food fashion and marketing.

Habits and attitudes

The habits of these broad groups of people are just one way of identifying attitudes of people towards their diet. The implications of groupings such as this are that they can contribute to a deeper understanding of the factors that shape food choices, from among the many different choices that can be made. The survey above showed that eating habits differ between age groups: convenience foods were believed to be becoming increasingly popular, particularly in those aged 20–30. The older respondents, however, felt that convenience foods encouraged lazy eating habits, and on occasion criticised their own children for taking grandchildren to fast-food outlets. This type of information is useful because in understanding how people make choices regarding food, healthcare interventions on diet and nutrition can be more closely tailored to the values and needs of the individual. However, the very word ‘choices’ here may be misleading, as for some people their choice is severely limited by the money or time available to them. The DH (2008a), for example, state that households that contain
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someone with an LTC are more likely to have a low income and that this will have a measurable effect on the quality of food purchased and eaten.

In order to effectively engage with people about nutrition, healthcare professionals need to recognise that attitudes about food are fundamental, particularly when exploring strategies for change as in LTC management. Telford et al. (2007) conducted a qualitative study into the meaning of nutrition for people living with a chronic disease. They found that, for those who took part in the study:

- Nutrition is more than eating; it ‘nourished the soul’.
- Having an LTC could disrupt family routines as the individual could not bear the thought of eating or food preparation, for example.
- Having an LTC such as diabetes meant constantly having to think about food; eating was not done when hungry, instead it was done for ‘blood sugars’.
- Indulging in certain foods (such as chocolate for a person with diabetes) caused the person to feel ‘bad’, ‘irresponsible’, and led to feelings of reduced personal effectiveness and self-esteem.

How food is produced, where raw materials come from, where food is obtained, how it is cooked, how it is served and the very purpose of diet can be, in the developed world, a matter of individual preference. By understanding this, it is possible to engage with patients or clients in a meaningful way and enable care that takes these factors into account.

Summary

Gaining adequate nutrition is complex, and is not just about getting enough calories. Attitudes to food can shape how people, including those with LTCs, make food choices.

Basics of nutrition

At a very basic level, nutrition can be seen to form a balance between the requirements of the body and the nutrients necessary to keep it functioning. However, the term ‘nutrients’ does not provide much information in itself, and so can be further divided into micro- and macro-nutrients. Before reading about nutrients, a read of Case study 1.1 should help illustrate why it is important for health professionals to understand about the basic building blocks of nutrition.

Case study 1.1  Ray

Aby Taylor works in a GP practice as a Practice Nurse. She is responsible for diagnosing and managing diabetes, in partnership with patients. Today, she is seeing a 72-year-old man called Ray, who has been diagnosed with Type 2 diabetes a year ago. As well as this, Ray has hypertension, high blood cholesterol and has a body mass index of 31, making him obese. He has been prescribed a range of medications to treat his conditions but Aby feels that Ray could be supported to take a more active role in his disease management, including that of his diet. By his own admission, Ray has never really taken much interest in food, and as a life-long single man has not needed to cook for himself. Instead, he would and still does eat his main evening
meal at the local pub, along with a few pints of beer. Since his diagnosis, Ray has developed some of the symptoms of complications of diabetes, in particular, a lack of feeling in his toes and legs. This is a result of persistently high blood sugar. Although Ray realises the seriousness of this, he still does not entirely see the need to manage his diet more carefully. He has tried to eat more fruit and vegetables, but finds this hard because he does not like vegetables. Ray enjoys curries and ‘meat and two veg’ type meals, without the vegetables. Ray has stated that he would rather ‘live his life as he wants’ as opposed to conforming to someone else’s idea of a healthy lifestyle.

Points for reflection

- What impact is Ray’s diet having upon his glycaemic control?
- What knowledge does Aby need to have about the role of specific nutrients in Ray’s diet?
- What are the good and bad aspects of Ray’s diet?
- How can Aby work with Ray to help him have a healthier diet?

Ray’s attitude to food is, in part, shaping his attitude to the diabetes. Ray has viewed food as fuel, as a means to an end, rather than something to take a great interest in. Having not had a family, Ray has only had to please himself with regard to what he eats, and views shopping as a chore. Currently, he is aware that he needs to make changes to his diet and think more about ‘healthy eating’. However, it is likely that his understanding of what makes a diet healthy is sketchy, and he may lack the practical skills needed to turn knowledge of this into actual meals.

Ray’s diet is likely to be too high in saturated fat and salt. Pub meals are often made up by catering companies and reheated in the kitchen so Ray cannot know the nutrition content of his meals. Similarly, ready meals, which Ray may be tempted to eat for ease of use can contain 40% of the recommended daily intake of salt (FSA 2003). High salt intake could worsen Ray’s hypertension. His efforts to increase his intake of fruit and vegetables are to be commended; though making a substantial change to an aspect of lifestyle is often better done in small steps. In addition, although he does not need to stop drinking alcohol altogether, a high intake, over the current recommended guidelines, will also be adversely affecting his blood sugar.

Aby may need to go back to basics with Ray, to assess his understanding of diabetes, diet, and the development of secondary complications such as neuropathy. Ray may not clearly understand how these all link to each other. Once Aby has established Ray’s level of understanding, she will find it easier to select the correct information to educate Ray. Aby should also establish what Ray’s priorities are in relation to his health. If Ray does indeed not wish to alter his diet and lifestyle, although this will be frustrating to Aby, she will need to respect that it is his choice. Making changes to lifestyle does not happen in a linear fashion for most people, and they may not be ready to make a change, or may relapse after having made that change. Aby must not allow herself to become judgemental as this will reduce the trust that Ray has in their partnership.

Macronutrients

These are the broad food groups that most people are familiar with: carbohydrates, fats, and proteins.
Carbohydrates

Carbohydrates can be in simple or complex form, yet they are all made up of carbon, hydrogen and oxygen molecules. In their simplest form, carbohydrates are monosaccharides such as glucose, galactose or fructose. Glucose is the most common carbohydrate in the body, and is the primary fuel for organs such as the brain and nervous system. Because of its necessity, glucose is closely controlled within the body by hormones such as insulin and glucagon. Available from sweets, cakes, biscuits, ice creams and honey, intake of refined glucose should be limited; however, plant sources such as fruit and vegetables are encouraged for the other essential components of a healthy diet that they provide. For people with diabetes, intake of fruit and vegetables, and complex carbohydrates is recommended as the cornerstone of an appropriate diet. The reasons why carbohydrates are necessary are illustrated in Figure 1.2.

Disaccharides

Disaccharides are formed when monosaccharides pair up into sucrose, galactose and lactose. Lactose is milk sugar, and apart from milk, it is also present in any food containing milk powder such as some breakfast cereals, chocolate, instant mashed potato and creamed soups. Sucrose is what most people will recognise as sugar, the white crystalline form of which has been the subject of much discussion for its ‘bad’ properties. The idea that sugar is bad for health originated from thoughts that it provides no nutrition apart from energy, i.e. ‘empty calories’. People whose diet is high in sugary foods may consume many calories but will not gain much else nutritionally. However, this statement assumes that sugar is eaten in isolation from the rest of diet, yet studies have shown that where overall energy intake is high, a high intake of sugar may not lead to poor intake of other nutrients (Food and Agriculture Organisation of the United Nations (FAO) 1998). The problem arises for those whose overall energy intake is not so high, so overconsumption of sugar may well lead to imbalance and poor intake of other nutrients. However, the FAO (1998) state that there appears to be no direct link between consumption of sucrose and the development of heart disease. Current advice on sugar consumption favours more complex carbohydrates because of the stability they bring to blood sugar levels, but simple sugars such as sucrose are not necessarily banned, even for people with diabetes.
Oligosaccharides
Oligosaccharides are carbohydrates that are formed from fewer than ten monosaccharides. They are probably the least well known form of carbohydrate by name, yet are present in foods such as onions, leeks, garlic, artichokes, lentils and beans. Oligosaccharides are resistant to digestion in the upper gastrointestinal tract so once they reach the colon undigested, they can ferment. This causes the familiar problem of flatulence and bloating, which may cause some people to avoid these foods altogether. For people with bowel conditions such as Crohn's disease or diverticulitis, a low residue diet may be recommended. This diet aims to reduce the amount of undigested food in the digestive tract and, therefore, reduces the painful symptoms of abdominal cramps, bloating and flatulence. People on a low residue diet will try to avoid foods rich in oligosaccharides wherever possible.

Polysaccharides
Polysaccharides can be either starches or non-starch polysaccharides (NSPs). Obtained from plant sources, starches are the energy contained within the plant cells, whilst the NSPs are from the cell walls that make up the structure of the plant – also known as fibre. Familiar to all, carbohydrates can be found in bread, chapattis, potatoes, yams, beans – indeed anything of plant origin. NSPs have been of interest over the past 30 years due to evidence showing that a diet high in fibre may help prevent certain diseases of the gastrointestinal tract such as cancer (FAO 1998), and diverticular disease is treated with a high-fibre diet. Because there are many different forms of NSPs, Barasi (2003) argues that the term ‘high-fibre diet’ has no meaning scientifically; however, people seem to have an understanding of ‘high fibre’, and so it can be a useful way of encouraging a greater intake of fruit and vegetables.

Glycaemic index (GI)
Another term related to carbohydrates is ‘glycaemic index’ (GI). This index ranks carbohydrate-containing foods according to how quickly they cause the blood sugar level to rise. Foods with a high glycaemic index will cause blood sugar levels to rise rapidly, and include white bread, potatoes, soft drinks and bananas. Apples, beans, peaches and milk are digested and absorbed more slowly, and do not usually cause such a rapid rise in blood sugar. There is a lot of interest in low GI foods as it appears they can promote effective glucose and lipid control in people with diabetes. A recent Cochrane review (Thomas and Elliott 2009) of low GI (or low GI load) diets compared to high GI (or high GI load) diets, or other diets, found that among the 402 participants included in the review, those on the low GI diet showed a significant decrease in HbA1C with no increase in hypoglycaemic episodes. However, Diabetes UK, the leading organisation promoting information and resources for people with diabetes, does not currently recommend focusing exclusively on low GI diets as a way of managing carbohydrate, as there is not sufficient evidence of a long-term benefit (Nutrition Subcommittee of the Diabetes Care Advisory Committee of Diabetes UK 2003). Difficulties include the fact that GI values can vary even in the same food: for example, a banana will have a different GI depending on how ripe it is. Also, combining foods can alter their GI value, and most of us eat meals where foods are combined together in some sort of recipe!

Fats
Current dietary recommendations promote a low fat diet, both to maintain optimum health and as a method of weight loss in obesity. Consequently, there is much confusion over the role of fats in the diet, and this is compounded by terms such as saturated fat, Omega-3, fish oils, and so on. At its simplest, fat does not dissolve in water, and can be obtained as a hard fat or an oil. A diet that did not include any fat at all would not be healthy, as fats are essential elements in many functions of
Figure 1.3 Why are fats necessary?

The human body. See 'why are fats necessary' below (Figure 1.3). The most basic form of fat is called a triglyceride and there are many different types of triglycerides, yet they are all formed from a backbone of glycerol with three fatty acids attached. The fatty acids that form the triglyceride are further divided into the following categories that will be familiar to the reader:

- Saturated fatty acids
- Monounsaturated fatty acids
- Polyunsaturated fatty acids (PUFAs)

What makes a fat saturated?

Whilst most people will have heard of this term, not everyone will know what it means. All fats are made up of carbon, hydrogen and oxygen atoms, and all fatty acids have a carbon atom to which the other atoms are arranged in combination. Different combinations will form different fatty acids. Olive oil, for example, is mainly made up of three different fatty acids. A saturated fat is one where each carbon atom is attached to as many hydrogen atoms as is possible, hence, the carbon is 'saturated' with hydrogen. See Figure 1.4 for an example.

In a monounsaturated fat such as olive oil, two of the hydrogens are missing, so two carbons must form a double bond with each other instead. One double bond means that the fat is unsaturated in one place, i.e. 'mono'. See Figure 1.5 for an example.

Figure 1.4 Saturated fat.
Oleic acid, a monounsaturated fatty acid

Figure 1.5  Monounsaturated fatty acid.

A polyunsaturated fat like sunflower oil, therefore, has more than one double bond between carbons along its main carbon chain. See Figure 1.6 for an example.

Omega fatty acids
These double bonds are in very specific places, and the Omega system classifies fatty acids according to where the first double bond is. Omega fatty acids 3, 6 and 9, therefore, have their first double bond in a different place. Omega fatty acids are a hot health topic, with diets high in Omega-3 making claim to improve concentration and mental processing in children, as a natural cure for attention-deficit hyperactivity disorder (ADHD), and as an effective way of reducing the risk of heart attacks and strokes, for example. However, though fish oils may benefit people with known heart disease, there is little convincing evidence that it will prevent heart disease among those not already known to have this problem (NHS Choices 2009).

Trans fats
Trans-fatty acids appear to compromise health by raising blood cholesterol (FSA 2007). It is the processing of the food that produces the trans-fats, present in some margarines, pastry, cakes, crisps and meat products. The processing adds hydrogen to polyunsaturated fats, which changes the shape of the molecule. In this way, the fat becomes ‘hydrogenated’. Some trans-fats can also occur naturally in the meat and dairy products of ruminants. Trans-fats are useful to the food industry as they tend to be hard at room temperature so make margarine less liquid. Also, hydrogenated fats tend to spoil more slowly, increasing the shelf-life of products. Current population-wide intakes of trans-fats do not exceed recommended maximum intakes in the United Kingdom (FSA 2007); however,
among certain sectors of the population, for example the economically disadvantaged, reliance on heavily processed foods may increase their intake to unhealthy levels. As food producers in the United Kingdom appear to be eliminating trans-fats from their products, the FSA (2007) argue that attention should be on total intake of saturated fat, which far exceeds recommended maximum intakes.

The role of fats in health

The role of fats in the diet, as mentioned, causes much debate and confusion. What is clear is that some polyunsaturated fatty acids are necessary for humans as they cannot be manufactured in the body from other dietary components. These essential fatty acids are linoleic acid (an Omega-6) and alpha-linoleic acid (an Omega-3). The current recommendations to ensure that diet contains enough of both of these are based on the fact that levels of Omega-3 in the diet appear to be declining at the expense of Omega-6 acids (British Nutrition Foundation 2010a). Omega-3 acids are important in the early stages of development of the child’s retina and nervous system, and for its subsequent healthy functioning. The current recommendations are based, therefore, on obtaining sufficient amounts of both to provide a balance. Omega-3 polyunsaturated fatty acids are found in dark green leafy vegetables, meat from grass-fed sheep and cows, and nuts and seeds. These provide short-chain fatty acids and the body will create the more useful long-chain ones from these; however, benefits from vegetable sources may not be as great as from fish. Oily fish such as mackerel, salmon and fresh tuna provide long-chain fatty acids that the body can easily use. Omega-6 polyunsaturated fatty acids can be found in meat, eggs, nuts, and oils such as sunflower, soya or sesame (Barasi 2003).

Cholesterol

Non-essential fats that can be made in the body are phospholipids and sterols. Phospholipids can be found in surfactants in the lung and in the myelin sheath around neurones. The most well-known sterol is cholesterol which has been the subject of an enormous amount of research due to its implications in cardiovascular disease. Cholesterol is obtained from meat and animal products, and a small amount is necessary in the diet as it has a role in cell membranes, ion transport, and the synthesis of hormones such as oestrogen and testosterone. Detailed discussion of cholesterol and its metabolism and regulation can be found in a text such as Barasi (2003).

Fats and coronary heart disease

The link between fats and coronary heart disease (CHD) has also been the subject of much research. The latest thinking on this indicates that the relationship between saturated/polyunsaturated fats and heart disease is too simplistic. Some saturated fatty acids have greater effects than others, while monounsaturated fatty acids may contribute to a lowering of cholesterol. The transport of cholesterol in the body also allows the introduction of two more terms that the reader may have encountered – low-density lipoproteins (LDLs) and high-density lipoproteins (HDLs). LDLs are responsible for carrying cholesterol to the tissues, while HDLs remove surplus cholesterol. Thus, lowering LDL cholesterol and raising HDL cholesterol has been the subject of much research, in order to prevent incidence of CHD. This includes the use of statins to lower LDL cholesterol (DH 2000). It also appears (Kris-Etherton and Yu 1997) that intake of cholesterol in food is not the main factor that leads to an increase in cholesterol in the blood. Rather, total intake of saturated fat from the diet is more closely linked to raised blood cholesterol, so general dietary advice would be to reduce total saturated fat intake.

Proteins

The basic building blocks of proteins are amino acids. Although there are only 20 different amino acids, they can be combined in thousands of different ways to create the millions of proteins found in nature. Proteins can be obtained from plant or animal sources. For the humans, eight proteins
Figure 1.7 Why are proteins necessary?

are termed ‘essential’ because they must be eaten and cannot be produced in the body from plant sources. The total amino acids in the body are termed the ‘amino acid pool’, as amino acids can either be used as they are in the case of essential, or dismantled and recycled to make others as required. Where insufficient amounts of a particular amino acid is available from the pool to the cells, the cell can either make less of the protein it requires or it can break down some of its own protein stores for the amino acids contained within. Neither of these situations is ideal though, and reduced protein intake over the long term can result in a deterioration of body function and chronic protein deficiency, which is one form of malnutrition. The reasons why proteins are essential are summarised in Figure 1.7.

Protein and renal disease

People with chronic kidney disease used to be advised to eat a reduced protein diet in order to slow deterioration of kidney function. However, this is not the case now. Improved treatments for blood pressure, for example, have reduced the effect low-protein diets can have, and the concern that malnutrition can result from many years of diets low in protein presents an unacceptable risk. People with chronic kidney disease are advised to eat a diet that is neither too low nor too high in protein, while those on peritoneal dialysis or haemodialysis may need a diet that provides a slightly higher protein intake to offset treatment effects (EdREN 2010).

Diet and mental health

The link between diet and mental health has also been the subject of investigation. A meta-analysis by Van der Does (2001) looked into the effects of tryptophan depletion on mood state. Tryptophan is an essential amino acid. People who had recovered from depression, were otherwise healthy but vulnerable or those who had seasonal affective disorder were found to respond to a tryptophan
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depletion challenge by showing low mood states. Van der Does (2001) hypothesised that dietary habits may affect tryptophan levels, but further research is needed. This has led to a number of claims encouraging people to eat foods containing tryptophan to boost mood; however, the link has not yet been demonstrated clearly.

Micronutrients

Micronutrients include vitamins and minerals. They are needed in very small quantities but are essential for normal functioning of the body and to maintain health. Many people take vitamins and minerals in the form of supplements; however, the Government argues that a healthy, balanced diet will provide all the micronutrients necessary. In fact, overdose of vitamins such as vitamin A can potentially be harmful in the long term as some research suggests that doses in excess of 1.5 mg daily, taken over many years, can mean bones may be more likely to fracture in old age (FSA 2009).

Vitamins

Vitamins can be divided up into fat or water soluble. Fat-soluble vitamins do not need to be eaten every day as they will be stored in body fat for use when needed. Water-soluble vitamins cannot be stored and so ideally should be eaten every day. Tables 1.1 and 1.2 summarise sources and functions of fat- and water-soluble vitamins, respectively.

Minerals

These are only required in very small amounts. Current guidelines for salt intake, for example, stand at 6 g per day (FSA 2010). There are many minerals needed by the body. Table 1.3 presents a summary of the most common ones.

How much do we need to eat?

In essence, the different macro- and micronutrients necessary for the body to function has led to recommendations in the United Kingdom about estimated average requirements. As no one type of food or food group can provide all the essential nutrients needed, a ‘balanced’ diet is important. A balanced diet means that no food will be excluded, even cakes or biscuits, because as long as they

Table 1.1  Fat-soluble vitamins

<table>
<thead>
<tr>
<th>Vitamin and name</th>
<th>Dietary source</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A (retinol)</td>
<td>Milk, butter, cheese, egg yolk, fish, liver, green and yellow vegetables</td>
<td>Maintains healthy skin Vision in dim light Strengthens immune system</td>
</tr>
<tr>
<td>Vitamin D (calciferol)</td>
<td>Fish, liver, oils, milk, cheese, egg yolk and sunlight</td>
<td>Healthy bones and teeth</td>
</tr>
<tr>
<td>Vitamin E (tocopherol)</td>
<td>Egg yolk, milk, butter, green vegetables and nuts</td>
<td>Good immune function</td>
</tr>
<tr>
<td>Vitamin K (Phylloquinone)</td>
<td>Fish, liver, fruit and green vegetables</td>
<td>Necessary for normal blood clotting</td>
</tr>
</tbody>
</table>

Table 1.2  Water-soluble vitamins

<table>
<thead>
<tr>
<th>Vitamin and name</th>
<th>Dietary source</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1 (thiamine)</td>
<td>Yeast, liver, nuts, pulses, legumes and egg yolk</td>
<td>Carbohydrate metabolism and nerve cell health</td>
</tr>
<tr>
<td>B2 (riboflavine)</td>
<td>Yeast, liver, eggs, green vegetables and milk</td>
<td>Carbohydrate and protein metabolism, and healthy skin</td>
</tr>
<tr>
<td>B6 (pyridoxine)</td>
<td>Meat, liver, beans, egg yolk and vegetables</td>
<td>Protein metabolism</td>
</tr>
<tr>
<td>B12 (cobalamin)</td>
<td>Milk, liver and egg</td>
<td>DNA synthesis</td>
</tr>
<tr>
<td>B (folic acid)</td>
<td>Liver, dark green vegetables and eggs</td>
<td>DNA synthesis, Haemoglobin production</td>
</tr>
<tr>
<td>B (niacin)</td>
<td>Pulses, yeast, fish and wholemeal products</td>
<td>Cell function</td>
</tr>
<tr>
<td>B (pantothenic acid)</td>
<td>Liver, yeast, egg yolk and vegetables</td>
<td>Metabolism of amino acids</td>
</tr>
<tr>
<td>B (biotin)</td>
<td>Liver, yeast, kidney, pulses and nuts</td>
<td>Metabolism of carbohydrates and fats</td>
</tr>
<tr>
<td>C (ascorbic acid)</td>
<td>Citrus fruits, berries, green vegetables, liver and potatoes</td>
<td>Healthy red blood cells, Collagen formation</td>
</tr>
</tbody>
</table>


are eaten in the context of an otherwise varied diet, they pose no risk. Problems arise of course when one food group becomes more dominant in the diet, such as energy-dense foods like those provided by fast food which tends to be high in fat. Conversely, elimination of a particular food group can also pose a short- or long-term risk such as that illustrated by vegan diets low in protein. The term ‘balanced’ can also be applied to the balance needed between energy input (howsoever derived) and energy expenditure, in order to maintain a stable weight.

Table 1.3  Common dietary minerals

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Source</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Dairy products, eggs and green vegetables</td>
<td>Component of bones, Normal blood clotting, Muscle contraction</td>
</tr>
<tr>
<td>Iron</td>
<td>Liver, beef, egg yolk, wholemeal bread and green vegetables</td>
<td>Formation of haemoglobin</td>
</tr>
<tr>
<td>Potassium</td>
<td>Most foods</td>
<td>Muscle contraction, Transmission of nerve impulses, Electrolyte balance</td>
</tr>
<tr>
<td>Sodium</td>
<td>Fish, meat, eggs, milk and added as salt</td>
<td>Muscle contraction, Transmission of nerve impulses, Electrolyte balance</td>
</tr>
</tbody>
</table>

The eatwell plate

Use the eatwell plate to help you get the balance right. It shows how much of what you eat should come from each food group.

Section 1

The eatwell plate shows how much of what you eat should come from each food group. This includes everything you eat during the day, including snacks.

So, try to eat:

- plenty of fruit and vegetables
- plenty of bread, rice, potatoes, pasta and other starchy foods – choose wholegrain varieties when you can
- some milk and dairy foods
- some meat, fish, eggs, beans and other non-dairy sources of protein
- just a small amount of foods and drinks high in fat and/or sugar

Look at the eatwell plate to see how much of a whole day’s food should come from each food group and try to match this in your own diet.

Try to choose options that are lower in fat, salt and sugar when you can.

For more information on eating a healthy diet, visit: eatwell.gov.uk

Figure 1.8 The eatwell plate. (http://www.food.gov.uk/multimedia/pdfs/publication/eatwellplate0210.pdf.)

The Eatwell Plate

The Eatwell Plate (Food Standards Agency 2001) (see Figure 1.8 and Table 1.4) was devised after extensive consumer research to illustrate in a clear manner how a healthy diet could be envisaged. The diagram of the plate with the food groups divided up into proportions can be used by anyone involved in promoting a healthy diet. Its positive points include the following:

- It provides visually instant information on the proportions of various foods that make up a healthy diet.
Table 1.4  Proportions of the Eatwell Plate

<table>
<thead>
<tr>
<th>Food group</th>
<th>Recommended proportion of diet (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread, rice, potatoes and pasta</td>
<td>33</td>
</tr>
<tr>
<td>Fruit and vegetables</td>
<td>33</td>
</tr>
<tr>
<td>Meat, fish and alternatives</td>
<td>12</td>
</tr>
<tr>
<td>Milk and dairy foods</td>
<td>15</td>
</tr>
<tr>
<td>Fatty and sugary foods</td>
<td>8</td>
</tr>
</tbody>
</table>

- It can help all those involved in giving nutritional advice to send out a consistent message.
- It can be tailored to individual preferences of diet, cultural norms, availability of foods and cost of providing a flexible educational tool.

Using the Eatwell Plate

One method of assessing the balance of a person's diet is to find out what he eats on a typical day, or to be more accurate, a typical week. An example of a single day’s intake for a 40-year-old woman is shown in Table 1.5. In the left-hand column all the food eaten that day has been listed. In the right-hand column each food has been matched to its main group. This information can then be used to provide a rough total of each food group to see if the diet follows the FSA (2001) recommendations.

Table 1.5  Using the Eatwell Plate

<table>
<thead>
<tr>
<th>Daily intake</th>
<th>Food group from the Eatwell Plate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td></td>
</tr>
<tr>
<td>Two pieces of wholemeal toast with butter and marmalade</td>
<td>Bread × 2</td>
</tr>
<tr>
<td>Cup of tea</td>
<td>Fat and sugar</td>
</tr>
<tr>
<td>Glass of orange juice</td>
<td>Fruit</td>
</tr>
<tr>
<td>Snack</td>
<td></td>
</tr>
<tr>
<td>One banana</td>
<td>Fruit</td>
</tr>
<tr>
<td>Two chocolate biscuits</td>
<td>Fat and sugar</td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>A salmon sandwich made with two slices of wholemeal bread, canned salmon and cucumber</td>
<td>Bread × 2</td>
</tr>
<tr>
<td>One pot of low-fat yoghurt</td>
<td>Fish</td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
</tr>
<tr>
<td>Homemade Thai curry made with lean chicken, fresh herbs and coconut milk, tomato and cucumber salsa</td>
<td>Meat</td>
</tr>
<tr>
<td>Chocolate mousse</td>
<td>Vegetable × 2</td>
</tr>
<tr>
<td>Four additional cups of tea throughout the day made with semi-skimmed milk</td>
<td>Fat and sugar</td>
</tr>
<tr>
<td></td>
<td>Small amount dairy</td>
</tr>
</tbody>
</table>
20  Long-term Conditions

To calculate the proportions of each food group eaten, add up the total portions of all foods eaten from the right-hand column. In this case, it is 15 (4 + 3 + 4 + 2 + 2). Then, divide each individual portion per food group by 15:

- $4 \times \text{bread/cereal} \ (4 \div 15) = 27\%$
- $3 \times \text{fat and sugar} \ (3 \div 15) = 20\%$
- $4 \times \text{fruit or vegetables} \ (4 \div 15) = 27\%$
- $2 \times \text{dairy} \ (2 \div 15) = 13\%$
- $2 \times \text{meat or fish} \ (2 \div 15) = 13\%$

As can be seen, compared with the Eatwell Plate, the fat and sugar intake is too high, and the fruit and vegetable intake is too low. Nutritional advice to this woman would, therefore, include tips on how to alter these proportions in favour of a more healthy balance. Self-reporting is notoriously unreliable, however; people can tend to over- or under-estimate what they eat in terms of individual food groups or total intake, so other methods of assessment may be needed to supplement a food diary.

Healthy lifestyle

In addition to the Eatwell Plate, the FSA (2010) suggest the following guidelines that place a balanced diet into a healthy lifestyle:

- Base your meals on starchy foods.
- Eat lots of fruit and vegetables.
- Eat more fish.
- Cut down on saturated fat and sugar.
- Try to eat less salt – no more than 6 g per day.
- Get active and try to be a healthy weight.
- Drink plenty of water.
- Don’t skip breakfast.

Summary

Each nutrient has a specific role within the body. A balanced diet, therefore, is one that provides all these nutrients in sufficient quantity to meet an individual’s needs.

Assessing dietary intake

Before planning any dietary changes, it is necessary to try to assess what an individual is eating. This can be done in a number of ways, but as can be seen each method will have its own advantages and disadvantages. The choice of method will depend on several factors, such as the clinical setting. For example, an in-depth weighed inventory would not be appropriate for screening risk of nutritional deficiency due to the need to balance time and resource constraints with the sensitivity of the test in detecting those at risk. In an obesity clinic however, a detailed food intake assessment together with
information on exercise history and any co-morbidities would be needed, in order to pinpoint eating habits and establish where dietary changes may need to occur.

The weighed inventory

This method involves the individual patient/client weighing and recording all they have eaten in a week. The total intake of nutrients can then be calculated. The weighed inventory is considered to be the most accurate way of calculating nutrient intake, yet it can be subject to problems. Individuals need a good level of motivation to complete the task of weighing everything they have eaten over a week. Also, the method relies very much on the accuracy of reporting by the individual - they may not report the total of everything they have eaten either to hide intake of fat or sugar or because of forgetfulness. Lafay et al. (2000) found in a study of 1034 men and women using a three-day food record that the energy percentage of fat and carbohydrate was lower in under-reporters than in those that reported accurately, in contrast to protein intakes. Lafay et al. (2000) speculated that this was due to the perception of foods as being 'good' or 'bad', 'healthy' or 'unhealthy'. The weighed inventory is used mainly for assessing nutritional intake in order to manage obesity. The DH (2008a) show that obesity levels among people with no LTC is around 20% - this rises to over 30% in those with two or more LTCs. However, this method of would not be suitable for those without the necessary cognitive or physical capabilities to weigh and record their food intake. For example, people with dementia or acquired brain injury may not realise that their diet may be detrimental to their health, yet accurately assessing it can pose challenges if a clear picture of exactly what they are eating is hard to obtain.

Food diaries

Here, individuals are required to write down everything they consume over a week. Additional information such as portion sizes, recipes, makes of bought food and cooking methods will also be needed. From this information, the nutrient intakes can be calculated. Ways of increasing the accuracy of food diaries have been sought; for example, photographs of each meal can be taken. To make the task of calculating the nutrients easier, databases of portion sizes and information on common foods have been developed, including the DINER (Data Into Nutrients for Epidemiological Research) database (Welch et al. 2001). Again, however, food diaries can be subject to under- or over-reporting by the individual concerned with consequent loss of accuracy. Also, assuming accurate reporting, a seven day diary will be able to calculate energy intake to within 15-20% of the actual intake (Black 2001), whereas for some micronutrients such as vitamin C this figure is much lower due to it being found in fewer foods that may not be consumed as frequently.

Food frequency questionnaires

These are useful for studying the food intakes of a large number of people in a relatively inexpensive way. People are asked to remember what they have eaten and record this in a questionnaire. This can be difficult - can you remember how many times, for example, you have eaten fried food in the last week? Rather than looking at a person’s whole diet, these questionnaires may focus on a specific subset of foods, which will be less time consuming to undertake. Results may not be very accurate however, and as such are not the best method for estimating intake.
Table 1.6  Calculating BMI

The BMI calculation: $\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}}$

The dietary interview

This is commonly used by dieticians and nutrition specialists, and requires a good level of skill to be able to elicit helpful information. The individual being interviewed must respond to questions about their intake during a particular time frame, for example one day, yesterday or over a week. The interviewer must also establish portion sizes, though this carries the same risks for under- or over-reporting as the previous methods. Remembering intake for one day may also be inaccurate as that day may not have been a usual day, representative of the diet as a whole.

Assessing nutritional status

Body Mass Index (BMI)

This is a method that most readers will be familiar with. How to calculate it is shown in Table 1.6. Rather than focussing on diet, it establishes a figure based on a person’s weight and height. The result shows whether or not a person has an appropriate weight for their height. GP practices are required to maintain a register of adults over 16 who have a BMI of 30 or more as part of the Quality and Outcomes Framework (DH 2004). The classifications of BMI are shown in Table 1.7.

The BMI is not without its problems however. Very muscular individuals would obtain a high BMI, but could not be termed ‘obese’. The BMI, therefore, does not give an accurate idea of body composition. Also, it has been argued that this calculation does not take into account the different body composition of people from ethnic groups other than the white Europeans upon whom the BMI tables are based (Deurenberg and Deurenberg-Yap 2001). It also makes the assumption that people who are obese are unfit and unhealthy while people who have a lower BMI (in the ‘normal’ category) are naturally healthier. Of course, this may not be the case. Difficulties can occur too with obtaining the measurements needed. Where it is difficult to obtain an accurate weight or height, the mid-arm circumference or upper arm bone length can be used to establish muscle wasting or fat instead.

Table 1.7  Classifications of BMI

<table>
<thead>
<tr>
<th>BMI</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>40+</td>
<td>Morbidly obese</td>
</tr>
<tr>
<td>35-39.99</td>
<td>Obese class 2</td>
</tr>
<tr>
<td>30-34.99</td>
<td>Obese class 1</td>
</tr>
<tr>
<td>25-29.99</td>
<td>Overweight</td>
</tr>
<tr>
<td>18.5-24.99</td>
<td>Normal</td>
</tr>
<tr>
<td>&lt;18.5</td>
<td>Underweight</td>
</tr>
</tbody>
</table>

Source: NHS 2006.
Nutrition

Skinfold thickness measurements

When done by a trained person, these measurements can provide reasonably accurate estimates of body fat. By pinching up and measuring body fat at the mid-biceps, mid-triceps, subscapular or supra-iliac sites, the skinfold thickness, three measurements are taken and the results averaged.

Waist-hip ratio

This is becoming increasingly popular as a method that anyone can do, so can be used by people at home. It is recommended by the NHS (2006) for primary care clinicians in conjunction with other assessments of body weight and shape. Tape measures for this have been issued by the British Diabetes Association, for example. The measurement of waist around the umbilicus is divided by the measurement around the hips at the widest part of the buttocks. This central fat deposition has been shown by Yusuf et al. (2005) to be a more accurate predictor of myocardial infarction than BMI in a case-control study of 27,000 subjects from 52 different countries. This method accounts for different distributions of body fat and more muscular physiques, unlike the BMI.

Biochemical markers

Albumin levels have been used for assessing overall nutritional status. However, it is not a particularly reliable method as many other factors can affect albumin levels, for example liver disease and severe illness.

Summary

Nutritional status of patients/clients can be assessed by a variety of methods. Each has its advantages and disadvantages, and choice will depend on the client and location of use.

Nutrition problems in long-term conditions

Now that we have looked at what nutrition is and how a healthy diet is made up, the next part of this chapter will look at disorders of nutrition, specifically obesity and undernutrition. As will be seen, both can be defined as states of malnutrition yet have very different aetiologies. Both states, however, are interlinked with LTCs either as a cause of disease in the case of obesity and poor diet, for example, or caused by disease in the case of undernutrition.

Obesity

Obesity is the public health issue that is currently dominating policy and research. Case study 1.2 illustrates some of these issues surrounding obesity.
Case study 1.2  John

John is a 34-year-old man who is in a rehabilitation unit after sustaining a head injury in a motorbike accident. John now has acquired brain injury (ABI) and, as a result, he is wheelchair bound. John becomes easily frustrated, has a short attention span and becomes easily tired. He also becomes argumentative at times. John can swallow normally and has good upper body strength. Prior to the accident, John had bouts of depression for which he was prescribed fluoxetine. John is not married but has a girlfriend with whom he lives in a flat. His parents live nearby and visit every day. John worked in an office in a desk job, and played rugby every Saturday until a minor knee injury forced him to give it up. According to his girlfriend, John had intended joining a local gym but somehow never got round to it. Accordingly, John was roughly four kilograms overweight at the time of the motorbike accident. However, since the brain injury John’s weight is now such that his weight is 95 kg and his height is 1.75 m. For the staff of the unit, his food appears to have become a bit of a battleground. John’s family insists on bringing him chocolates and biscuits, which he loves. They do this because they feel helpless in the face of John’s injury and this is something they feel they can do to make him happy. The staff, however, can see that this is contributing to John’s weight gain as he eats these foods in preference to proper cooked meals. John’s weight gain is starting to hinder his rehabilitation programme, in particular work on mobility.

Points for reflection

- What is John’s BMI?
- What factors are contributing to John’s weight gain?
- How could staff manage the situation to establish a healthier diet?
- How would a healthier diet benefit John?

John’s weight gain is not a new phenomenon, but had started before his accident. However, since the accident John has a cluster of factors that are making him gain more weight. His mobility is reduced at the moment, and unfortunately this is getting progressively worse as he puts further weight on. Additionally, John’s temperament is labile due to the ABI, and this makes communication with him difficult at times, particularly for the family. They will need support and information on how to deal with this, as John’s rehabilitation continues. Because the family don’t wish to upset John, they continue to bring him the biscuits, sweets and cakes that he loves, yet as these foods are high in fat and sugar they will contribute not only to further weight gain but to reduced intake of other nutrients by displacing other food groups from John’s diet.

Staff looking after John needed to agree on a new approach to managing his diet. This would involve two things: agreeing with the multidisciplinary team about a common approach to understanding John and his family’s views about nutrition, and its role in John’s recovery. When people are ill, it is common for relatives to provide treats to stimulate a jaded appetite; however, John’s family need to see that John is not “ill” per se, but needs to undergo rehabilitation to be able to live as independently as possible.
Nutrition

After discussion with John’s family and girlfriend about how they view his accident and rehabilitation, John’s named nurse was able to establish that indeed, they believed they were showing their love for him by providing food that he enjoyed. Through careful listening to their concerns, the named nurse was able to agree to a shared understanding about the role of nutrition in John’s recovery. The family agreed that they would limit their provision of cakes and biscuits to John, and that they could instead provide carefully and attractively prepared fruit instead, to tempt John.

As John was not filling up on fatty, sugary foods, he became hungry and this was a chance to encourage him to choose a variety of foods. John’s weight loss was gradual; however, as he was able to mobilise more with the help of the physiotherapists, his self-care abilities improved and this had a positive effect on John overall.

Why is obesity a public health issue?
The reasons for the current policy and research into obesity are the following:

- The effects on the obese individual in terms of development of obesity-related disease, mortality and psychosocial problems leading to reduced quality of life.
- The cost of treating obesity and its related problems in an NHS that has finite resources: Peters et al. (2002) suggest that the cost may overwhelm the healthcare systems of some countries. (This thinking, of placing a cost on a disease is controversial to some, as it implies blame. For example, such figures are not so often encountered for other conditions, for example cancer or mental health illnesses).

The decision by the WHO to classify obesity as a disease has generated much controversy. However, moving obesity away from a purely aesthetic concern to one that has clinical implications is a deliberate strategy that is intended to underline the serious consequences of rising weight, both for the individual and society as a whole.

Prevalence of obesity
Taking all age groups together, overall a quarter of adults in England in 2007 were obese, though clearly differences can be seen between different age groups. Two-thirds of men and just over half of women were classified as overweight, including obese (Figure 1.9).

Trends in obesity
Although the overall trend is towards rising levels of obesity, there are demographic variations. In 2007, the Health Survey for England (HSE) (NHS Information Centre 2007) used equivalised household income, where the number of people in the household is taken into account. They found the following:

- No difference in mean BMI by equivalised income was found among men.
- Among women, those in the lowest income households were more likely to have a higher BMI.
- However, there was no clear relationship between income and BMI for men.
- Prevalence of high BMI was lower for women in managerial, professional and intermediate households compared with routine and manual households.
- Men who were married or cohabiting were more likely to be obese than single men.
- Bangladeshi and Chinese men were least likely to be obese.
- Among women, Chinese women had the lowest levels of obesity.
Why do people become obese?

Current thinking into the reasons for rising obesity levels has moved away from blaming the failure of biological mechanisms within the body. In previous times, the availability of food was not as assured as it is now. Human physiology developed in response to a need for high levels of physical exercise to find food and of periodic famine. It has been suggested that the usual diet of pre-agricultural people was made up of berries, some meat and fish, and wild plants and was, by comparison with today’s diet, low in carbohydrates (Westman et al. 2007). Because of the need to ensure a sufficient energy intake for survival and reproduction, human physiology developed the ability to slow down the metabolism during periods of famine. Additionally, Peters et al. (2002) state that when physical activity was not needed, the body probably developed a bias towards conserving energy. If we transpose these innate states, developed as humans evolved, into the environment of today, then we can easily see how obesity can occur. Dietary intake no longer relies on foods relatively low in energy. Because of the easy and cheap availability of high-energy foods laden with fat, sugar and processed carbohydrate, it is not hard to consume much more than what is required physiologically. Levels of activity have also plummeted; the use of labour-saving devices and dominance of motorised transport, for example, have meant that useful levels of daily activity are not needed. Whereas before the main driver of appetite was to ensure that energy intake matched physical activity, now we find that energy intake can be very high and that the body does not have a mechanism that makes us engage in greater levels of activity to counterbalance the high-energy intake. Nearly every aspect of the modern lifestyle predisposes us to obesity - this is termed the ‘obesogenic environment’ (Foresight 2007). Maintaining a healthy body weight is no longer driven instinctively by physiology; rather it has become an activity that has to be thought about and planned.

Health risks associated with obesity

To what extent does obesity present a risk factor in the development of chronic disease? There is an increasing body of evidence linking obesity to many non-communicable diseases. Research into obesity has shown that fat cells have an endocrine function, and that the release of free fatty

Figure 1.9  Proportion of adults in England who are overweight including obese, by age and gender, 2007. (NHS Information Centre 2007.)
acids may be the most important factor in disease development (Bray 2004). However, there is also much evidence exploring the links between poor diet and disease, and it must be remembered that although obesity would appear to be a very visual indicator that a person’s diet is poor, there are many people who are not obese whose poor diet can predispose them to disease. Conversely, it must not be assumed that because someone is obese they must necessarily be unhealthy. Nonetheless, Bray (2004) shows that evidence finds the following:

- Type 2 diabetes is strongly associated with obesity in both genders across all ethnic groups (Bray 2004). Insulin resistance occurs when body cells do not respond to its action and this can result in Type 2 diabetes. Syndrome X or metabolic syndrome is characterised by a combination of obesity, insulin resistance, abnormal blood fats and hypertension. People with Syndrome X are three times more likely to die from cardiovascular disease than those without (British Nutrition Foundation 2005).
- Obese people are estimated to be five times more likely to develop hypertension.
- Obesity appears to be correlated with raised incidence of gall bladder disease, particularly gall stones.
- Coronary artery disease and stroke are strongly linked to obesity. Adipose tissue has been found to secrete substances linked with a number of processes that contribute to the development of cardiovascular disease (British Nutrition Foundation 2005).
- Cancer risk is increased, though for individual cancers this is variable. 10% of deaths from all cancers are associated with obesity; this rises to 30% for endometrial cancer. The relative risk of developing colon cancer increases by 2.7 times in those who are obese.
- There is association between obesity and the development of osteoarthritis, though it is possible that the lack of mobility caused by arthritis may contribute to the obesity.
- Reproductive function is reduced: 6% of infertility in females has been attributed to obesity.
- Liver disease and obesity are linked: 40% of non-alcoholic steatohepatitis (fatty liver) is found in obese people.
- Obese people are more likely to have mental health problems such as depression, and suffer stigmatisation and discrimination.

The cost of obesity
The cost of obesity in terms of treatment and secondary effects is illustrated in Table 1.8.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2015</th>
<th>2025</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>2.0</td>
<td>2.2</td>
<td>2.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>3.9</td>
<td>4.7</td>
<td>5.5</td>
<td>6.1</td>
</tr>
<tr>
<td>Stroke</td>
<td>4.7</td>
<td>5.2</td>
<td>5.6</td>
<td>5.5</td>
</tr>
<tr>
<td>Other related diseases</td>
<td>6.8</td>
<td>7.4</td>
<td>7.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Total</td>
<td>17.4</td>
<td>19.5</td>
<td>21.5</td>
<td>22.9</td>
</tr>
<tr>
<td>Percentage of NHS budget</td>
<td>6.0%</td>
<td>9.1%</td>
<td>11.9%</td>
<td>13.9%</td>
</tr>
</tbody>
</table>

*Source: Foresight 2007.*
Interventions

Because the problem of obesity is rooted in many factors, any Government strategy to improve health has to be multifactorial, and a summary of such interventions is outlined below (NICE 2006a). For clinicians working in practice, a care pathway has also been developed to aid clinicians in managing obesity. See Figure 1.10.

Community-based interventions

These are aimed at empowering people to be able to make healthy choices in an otherwise obesogenic environment. The following are some of these interventions:

- **Raising awareness of obesity by promoting health**: The NHS Change4Life campaign, for example, is aimed at families (http://www.nhs.uk/change4life/Pages/Default.aspx). A website is available for families to register with, and it contains such tips as ‘five a day’, ‘me-sized meals’, ‘snack check’ and ‘sugar swaps’. Leaflets are distributed to children via schools, and posters are displayed in public places. The effectiveness of such campaigns, however, remains to be seen.

- **Improving access to healthier foods**: These local initiatives involve multi-agency working, including primary care trusts, trade and retail associations, local residents and community organisations. Food mapping can be part of this, and it involves pinpointing everywhere within a certain locality that a particular food can be obtained from. This gives valuable information on the types of food available locally, its cost, distance to residential areas, transport links, and so on. For those with LTCs, transport and relative poverty may be issues, and an awareness of where people purchase food can help understand the difficulties they face when trying to eat healthily.

- **Restricting the promotion of unhealthy foods to children and improving nutrition in schools**: The aim here is to prevent the ‘upstream’ effects of poor diet on health.

Organisational interventions

These are aimed at getting organisations such as workplaces or local councils to explore how they can promote a healthier lifestyle. These measures can include the following:

- Promoting healthy foods in canteens or healthy food for meetings.
- Encouraging employees to cycle or walk to work by offering support for purchase of bicycles or providing showers at work.
- Where employee health checks are offered, weight, diet and activity should be addressed. The occupational health nurse clearly has a role here.
- Making available time for physical activity or work on healthy eating.

Social networking

Here, opportunity is provided for people to be healthy and perhaps learn with other people:

- Walking clubs
- Healthy lifestyle self-help groups, for example meal preparation

Individual interventions

These are aimed at reducing a person’s overall BMI. It is not necessary to try to get weight within the normal range, and in practice this is rarely achieved (Wilding 2007). Even relatively small reductions
Assessment of weight/ 
BMI in adults

BMI > 30 or ≥28 with related co-morbidities or relevant ethnicity?

Yes

No

Raise the issue of weight

Ready to change?

Yes

No

Previous literature provided?

Ready to change?

Yes

No

Offer lifestyle advice, provide Your Weight, Your Health booklet and monitor

Provide Why Weight Matters card and discuss value of losing weight; provide contact information for more help/support

Offer future support when ready

Repeat previous options and, if available, refer to specialist centre or surgery

Weight loss?

No

Yes

Maintenance and local support options

Assessment: BMI; waist circumference; eating and physical activity; emotional/psychological issues; social history (including alcohol and smoking); family history, e.g. diabetes, heart disease; underlying causes, e.g. hypothyroidism; associated co-morbidity, e.g. diabetes, heart disease, sleep apnoea

Figure 1.10 Adult care pathway. (NHS 2006.)
Figure 1.11  Factors affecting choice of intervention. (NICE 2006a.)

of 5–10% in weight can bring about measurable health benefits. It is thought that this is due to loss of visceral fat which is found around the heart, lungs, liver, pancreas and intestines. Loss of visceral fat improves a person’s metabolic profile as a whole (remember that this fatty tissue is thought to have an endocrine function of its own), regardless of ideal body weight, and as such can improve health by reducing the risk of developing the non-communicable diseases indicated earlier.

Choice of intervention is dependent on several factors, as illustrated in Figure 1.11.

Dietary advice
Current NICE (2006a) guidelines recommend that weight loss should be sustainable using a 600 kcal per day deficit. This will provide a diet that is not too restrictive in terms of variety of foods eaten. Low calorie (1000–1600 kcal/day) and very low calorie diets (VLCDs) (<1000 kcal/day), whilst not forbidden, are not felt to be sustainable as they could be limited nutritionally and are difficult for the individual to maintain unless highly motivated. Ayyad and Andersen (2000) conducted a systematic review of research into the long-term efficacy of diets and found that VLCDs were associated with only a 15% median success rate after at least 3 years follow-up. Given a figure such as this, it is questionable whether it is ethical to recommend VLCDs. Weight cycling, where individuals lose weight initially then put it back on in an up-and-down cycle, can lead to feelings of frustration and lack of motivation to lose weight in future. Perhaps a more useful approach would be to encourage healthy eating overall, with a healthy attitude to food and appetite rather than encouraging individuals to develop a fetishistic approach to eating.
Commercial/community/self-help weight management programmes

If these are to be effective, they should offer not just dietary advice but also more holistic approaches, including exercise and lifestyle factors. Techniques for managing difficult situations should also be discussed, for example how to manage when eating out, or how to deal with temptation or lapses. For example, in a randomised, unblinded controlled trial of four commercial weight loss programmes in the United Kingdom, Truby et al. (2006) compared Dr Atkins’ New Diet Revolution, Slim-Fast Plan, Weight-Watchers Pure Points Programme, Rosemary Conley’s Eat Yourself Slim Diet and Fitness Plan to see how effective they were. All four diets resulted in weight loss over a six-month period, with the Atkins’ Diet showing the greatest weight loss in the first four weeks. By the end of the trial period however, it was no more or less effective than the other three. One of the challenges of weight loss, however, is maintaining it and so healthy eating rather than dieting is argued to be better. People become used to the pleasurable taste of commercially sweetened or fattened foods, and diet products can do nothing to undo this.

Diet and exercise

The NICE (2006a) guidelines recommend increasing levels of exercise for overweight people even if this does not result in weight loss. Exercise has been found to increase levels of high-density lipoproteins, and irrespective of weight, has been shown to confer a relative reduction in risk of hypertension and cardiovascular events. Release of endorphins during exercise may also promote a sense of well-being. Shaw et al. (2006) conducted a review of exercise for overweight and obesity for the Cochrane Database, and they concluded that exercise is associated with reduced cardiovascular disease risk even if no weight was lost. When combined with a weight loss intervention, exercise was shown to be effective particularly when combined with dietary intervention. They also found that of the trials included in their review, the type of exercise (high or low intensity) was not important.

Exercise that can be easily included in everyday life, such as using the stairs instead of the lift, walking or cycling instead of driving where possible, can be a good starting point for increasing activity levels. Clearly, for people with LTCs current activity and physical fitness levels need to be taken into account before any programme of exercise can be recommended. However, exercise has been shown to have positive psychological as well as physical outcomes for people with LTCs. For example, Neuberger et al. (2007) found that compared with a control group, a sample of 220 adults with RA showed a decrease in symptoms of pain, fatigue and depression following a low-impact aerobic exercise programme. Although this is a small study, there is a growing body of evidence in the value of exercise for other conditions as well as RA. Even adults with LTCs that appear to mitigate against any form of exercise can benefit; for example, pulmonary rehabilitation programmes are designed to improve exercise tolerance through exercise training in people with chronic lung disease. Improved exercise tolerance will mean that those with chronic lung disease can manage their own activities of daily living more independently, and a positive cycle may improve feelings of self-efficacy. In turn, this may encourage people to improve other aspects of their lifestyle including nutrition. Exercise can now be prescribed as part of a range of interventions to help people maintain healthy weight.

Behavioural approaches

These include behaviour and cognitive behavioural therapy. These aim to increase the ability of the person to show restraint in their eating patterns and to be motivated to be more physically active. They can also help develop coping skills to manage temptation such as emotionally laden situations that would normally send the individual to overeat. Such approaches can also help the individual to
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sustain a healthy lifestyle once the initial period of euphoria has worn off. In contrast, group therapies are widely used in commercial diet programmes and self-help groups, and their purpose is to provide social support, problem solving and encouragement to continue. Generally, behavioural approaches such as these can be successful when combined with other approaches such as dietary management. Dansiger et al. (2007), in a meta-analysis of dietary counselling (advice to limit fat or calorie intake) compared to a control intervention of no or minimal input found that modest weight loss could be achieved.

Medications

There are now a number of medications that can promote significant weight loss, such as Orlistat and Sibutramine. Orlistat works by reducing the amount of fat absorbed in the gut, and as such have side effects of fat in the stools, abdominal discomfort, and potentially embarrassing uncontrolled loss of loose stool. Sibutramine acts centrally to decrease appetite. These medications are controversial however. In promoting the idea that weight loss is the primary goal in a healthy lifestyle, and that a taking a pill can help this, it can be argued that they are unhelpful in prevention and treatment of obesity. The issue of how pervasive the notion of weight loss is, particularly among women, is reflected in the fact that of 33,000 women polled in an American survey, 75% reporting feeling too fat. The Centres for Disease Control (Berg 1993) found that 62% of women who were trying to lose weight were not overweight to begin with. Larger people are now subject to discrimination. Gortmaker et al. (1993) compared indicators of socio-economic status between women who were overweight, of average size and those who had chronic disease. Of the three groups, the women who were overweight were less likely to be married, have completed fewer years of school, and had lower household incomes than the women from the other two groups. Obesity is also associated with blame. In a study of medical students and physicians, obese people were felt to be ugly, sad, lacking in self-control, bad and difficult to manage (Rothblum 1992). The concept of an ideal weight may itself be flawed, as weight cycling with its unhealthy consequences and the negative health consequences of some diets (loss of bone mass, obsession with food) continue to promote poor health. Many now feel that focus should now be on a person’s overall health behaviours including plenty of fresh fruit and vegetables, exercise, low salt, low sugar and a positive self-image. The taking of a tablet to reduce weight, therefore, can continue in this destructive cycle of poor self-image and lack of attention to healthy behaviours. These medications can have a positive role however, for example to promote rapid weight-loss before surgery.

Bariatric surgery

This can include such measures as gastric banding, gastric balloons or stomach stapling to reduce the volume of the stomach, and promote a feeling of fullness on very small amounts of liquid food. They are only recommended for treatment of severe obesity in the United Kingdom. Studies have shown that surgery can have significant effects in terms of weight loss, yet quality of life after treatment remains to be adequately explored. O’Brien et al. (2006) conducted a study comparing surgery with non-surgical methods of weight control in mild to moderately obese people. The non-surgical intervention comprised an intensive period of very low calorie diet (500 to 550 kcal/day) of one to three packets of Optifast (Novartis, Fremont, MI, USA) per day for three months, followed by a combination of some very-low-calorie meals and 120 mg of Orlistat before higher-calorie meals for one month, and 120 mg of Orlistat before all meals for the next two months. After the intensive period, patients continued to take very-low-calorie meals or Orlistat as tolerated. All patients were encouraged to follow good eating habits and exercise for \( \geq 200 \) min/week. O’Brien et al. (2006)
found that the surgical intervention was most effective in producing weight loss at the end of the trial period. However, the following questions can be raised about the philosophy of such a study, in comparing surgical methods of weight loss with very restrictive diets:

- Were the non-surgical interventions in the control arm likely to produce a sustainable weight loss?
- What might the long-term effects of such a restrictive diet be on physical, psychological and social outcomes?
- Were the patients on low-calorie diets likely to become hungry?
- How can patients on low-calorie diets be motivated to continue?

### Summary

Obesity is a condition that has clear links to a variety of diseases. Management of obesity has to take into account many factors, not just diet, and the overall aim of any management plan has to be to improve lifestyle as a whole.

Having explored obesity and its links to chronic disease, the final section of this chapter examines undernutrition and its treatment.

### Undernutrition

For most people, the term 'malnutrition' conjures up images of undernutrition. The British Association for Parenteral and Enteral Nutrition (2009: 4) define malnutrition as:

...a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein, and other nutrients causes measureable adverse effects on tissue/body form (body shape, size and composition and function, and clinical outcome.

This definition is broad, and includes obesity as well as states of undernutrition. Within this section on undernutrition, malnutrition will be the term used to be consistent with BAPEN, however the meaning should be taken to be undernutrition rather than obesity. Malnutrition can occur in two forms:

- where the diet provides enough energy from carbohydrate but lacks protein, or
- where there is a deficiency in both energy and protein.

Both of these states imply that a diet is not healthy, and with loss of these vital macronutrients a consequent lack of micronutrients is also highly likely. A BMI of $< 18 \text{ kg/m}^2$ is used as a measurable parameter for undernutrition (BAPEN 2009).

### Who becomes malnourished?

BAPEN (2009) estimate that over three million adults in the United Kingdom are undernourished or at risk of malnutrition. The majority of these people (93%), perhaps surprisingly, are living at home in the community, with 2–3% of these in sheltered housing, 5% in care homes and just 2% in hospital. Those most vulnerable to become undernourished are the elderly, those with LTCs, those recently
discharged from hospital, and those who are poor and socially isolated. The population is set to age over forthcoming decades. Because of this, the number of people likely to have an LTC in England alone will rise by 23% over the next 25 years (DH 2008a).

Factors leading to malnutrition
As with obesity, the factors that contribute to malnutrition are varied. Eating is not just about the acquisition of nutrients, and for many with LTCs a combination of both the disease process itself and social variables will affect the diet eaten. These are summarised in Figure 1.12. Case study 1.3 illustrates some of the difficulties faced by people with LTCs, in particular the elderly.

Case study 1.3  Mrs James
Mrs James is a 72-year-old lady who has been admitted to hospital from a nursing home. Mrs James has had COPD for 10 years for which she takes inhalers. Her last exacerbation was 8 months ago following a severe cold. She was in hospital for three weeks, during which she ate little, according to her relatives. Mrs James also had a fall 18 months ago and has mobilised little since. She now has a pressure sore on her sacrum and appears very thin. After a thorough assessment, her BMI is found to be 14. The nursing home states that Mrs James’s dietary intake is non-existent apart from ice cream, a Vanilla Build-Up and a few spoons of soup per day.

Prior to the fall, Mrs James was living at home with the help of her two daughters. Having COPD made it difficult for her to get to the supermarket as it involved catching a bus or relying on her daughters to take her. As she valued her independence, she did not like being a burden to her daughters. She began to shop at the local corner shop more and more as this was easier to manage. Gradually, however, her disease state worsened and she became more and more apathetic, preferring to stay in and watch television. Her daughters tried to ensure that Mrs James had at least one decent meal a day by cooking something for her and taking it round. However, as both daughters had young families of their own, this became increasingly difficult to manage.

Points for reflection
- How does having COPD predispose people to undernourished states?
- What are the early signs of malnutrition?
- What other co-factors are there that will alter Mrs James’ nutritional requirements?
- What is the safest way for Mrs James to gain weight?

Mrs James started with one LTC that affected her ability to obtain adequate nutrition. Having COPD, for example, can predispose people to malnutrition for the following reasons:

- Food intake can be limited to avoid a stifling feeling of fullness that makes it difficult to breathe.
- As it is difficult to eat and breathe at the same time, food intake can be low.
- Treatment effects, such as taking steroids, which alter appetite, or antibiotics that can induce nausea may cause food intake to be limited.
- Mucus production can alter taste and be off-putting.
Figure 1.12 Factors leading to malnutrition. (Adapted from Pollard et al. (2002).)
As malnutrition becomes established, apathy takes hold and a spiral of decline follows that is hard for the individual to reverse alone. The good news is that malnutrition can be halted at any point in its development. However, carers, both formal and informal, need to know how to spot the early signs of malnutrition.

Like many who start off with one LTC, age can tend to mean that others become superimposed. The effects of multiple LTCs are compounded – Mrs James pressure sore will also be altering her nutritional requirements as the body attempts to heal the chronic wound. Her energy needs will increase slightly, and she needs adequate intake of protein, vitamins A, B, and C, and essential fatty acids too.

Due to the chronic nature of Mrs James malnutrition, she will need to be reintroduced to feeding very slowly, beginning with enteral feeding. The risk of refeeding syndrome (see below) is very real, yet the temptation is to provide a full range of nutrients and energy to improve her condition quickly.

Gradually, the nutrition team were able to increase Mrs James feeding regime and she started to gain weight. With careful attention from the nursing staff, her wound also began to heal. Mrs James is now able to take diet orally. This is carefully planned to accommodate her COPD, and she also has sip feeds to complement her diet as needed. Her daughters are delighted that their mother is now strong enough to sit up in bed.

**Disease-related malnutrition**

In addition to psychosocial factors that affect people’s food intake, the presence of disease itself can affect nutrition. McLaren (2009) helpfully divides these disease-related factors up into the following:

- Those causing decreased dietary intake
- Impaired gastrointestinal function
- Altered metabolism

**Decreased dietary intake**

Neurological disorders such as stroke, dementia, and Parkinson’s disease can cause a variety of problems for the individual including loss of taste, progressive dysphagia, taste changes and depression. Anorexia (loss of appetite) is a common feature of many LTCs, and may be related to pain from arthritis, cancer, renal disease, or mental health problems such as depression, alcoholism or drug addiction. Poor dentition and presence of mouth ulcers can affect dietary intake too. People with COPD or cardiac failure may fear eating meals that are too large as the feeling of fullness affects their ability to breathe. Drugs such as digoxin and fluoxetine can reduce appetite.

**Impaired gastrointestinal function**

Conditions such as Crohn’s disease or ulcerative colitis can reduce absorption of nutrients. Ulcerative colitis and coeliac disease can cause protein to be lost from the bowel, whereas liver disease and the presence of fistulas can cause losses of various nutrients from the gut. Periods of diarrhoea and pain will also reduce food intake.

**Altered metabolism**

This can be due to the presence of infection, which raises metabolic rate. COPD is known to increase energy requirements because of the increased respiratory muscle activity. People with Parkinson’s disease also have increased energy requirements particularly in the early stages of the disease.
Table 1.9  Drug–nutrient interactions

<table>
<thead>
<tr>
<th>Drug</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antacids</td>
<td>Reduced absorption of iron</td>
</tr>
<tr>
<td>Sulphasalazine</td>
<td>Reduced folic acid absorption</td>
</tr>
<tr>
<td>Anti-convulsants</td>
<td>Disturbed vitamin D metabolism</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>Folic acid antagonist</td>
</tr>
<tr>
<td>Long-acting antibiotics</td>
<td>Destruction of gut flora</td>
</tr>
<tr>
<td>Short-acting antibiotics</td>
<td>Nausea</td>
</tr>
<tr>
<td>H2 antagonists</td>
<td>Reduced vitamin B12 absorption</td>
</tr>
<tr>
<td>Vitamin E supplements</td>
<td>Increased bleeding tendency</td>
</tr>
<tr>
<td>Fish oil supplements (not oily fish)</td>
<td>Increase effects of anticoagulants</td>
</tr>
</tbody>
</table>

Source: Mason 2002a.
Note: The opinion of a pharmacist should always be sought before recommending any supplements if a patient is on any medication, prescribed or otherwise.

Serious insults to the body such as major surgery, sepsis, trauma or pressure ulcers alter nutritional requirements towards needing more energy to enable the body to repair and for the various metabolic processes involved in maintaining homeostasis.

For those with LTCs, the presence of a disease may predispose them to malnutrition, as seen above. The disease itself may require treatment with drugs which may in turn affect acquisition, absorption or metabolism of nutrients. This is a ‘double-whammy’ effect that means people with LTCs may be especially prone to malnutrition. Some examples of drug effects are presented in Table 1.9.

Conversely, some drugs are dependent on limiting or elimination of certain foods from the diet in order to work properly (Mason 2002b). Absorption of biphosphonates, used for osteoporosis, can be markedly altered by any food, even mineral water, and so must be taken with plain water half to one hour before anything is consumed. Foods high in vitamin K such as broccoli, kale, spinach and sprouts can decrease clotting times in those taking warfarin. Grapefruit juice inhibits enzymes that metabolise many drugs including triazolam, calcium channel blockers, cyclosporine, oral contraceptives, and certain statins such as atorvastatin, lovastatin and simvastatin. Severe headaches and a potentially fatal increase in blood pressure can occur in people taking MAO inhibitors if they eat foods containing tyramines. These are found in many cheeses, yoghurt, cured meat products (for example salami), avocados, bananas, marmite, soy sauce, red wine and caffeinated products. Finally, for those with Parkinson’s disease, levodopa absorption can be affected by protein, and so must be taken 45 minutes before consuming such foods.

What are the effects of malnutrition?

The effects of malnutrition are many and varied. It is a progressive condition and at first may go unnoticed. However, it is closely entwined with LTCs and care must be taken not to consider malnutrition as an unavoidable side effect of disease or of ageing. The effects of malnutrition, according to BAPEN (2009), are shown in Figure 1.13.

Apathy can be the first effect of malnutrition but because it is hard to separate the problems associated with the burden of disease from poor diet it can easily go unnoticed. Once apathy sets in then a gradual spiral of decline can occur with multiple disease states existing simultaneously.
The hospital experience
Many people with LTCs experience varying disease trajectories. A smooth trajectory, whereby the course of the disease is predictable, is not always possible particularly for conditions such as COPD or cardiac failure. These diseases are characterised by periods of quiet, where the symptoms appear to be manageable and under control. However, exacerbations of the disease can mean sudden hospital admission and treatment, often as an emergency. This leads to a further opportunity for malnutrition, and the experience of people in hospital has led to high-profile campaigns such as the Royal College of Nursing’s Nutrition Now or the Age Concern’s Hungry to be Heard. Reasons for worsening of malnutrition in hospital can be seen in Table 1.10.

Metabolic stress
Clearly, people must go into hospital for treatment of serious conditions that could not otherwise be managed at home. Sepsis, trauma (including burns) and surgery are such problems; however, they are serious in that they can lead to a state of metabolic stress. This is a state whereby the
Why do people become malnourished in hospital?

- Effects of the disease itself. For example, severe breathlessness and lack of appetite
- Poor mealtime practices where activities like tests, visits from staff and so on interrupt eating or may mean meals are missed altogether
- Practical issues such as food being placed out of patients' reach
- Unpleasant sights or smells
- Anxiety related to diagnosis or treatments
- Treatment-related factors that may cause nausea, vomiting or other unpleasant symptoms
- Failure of staff to identify malnutrition
- Failure of staff to treat identified malnutrition

The body tries to adapt to the insult it has experienced and it enters a protective mode that involves most of its metabolic pathways. The process of metabolic stress is divided into two phases – the ebb and flow. The ebb phase lasts about 12–24 hours, and is followed by the flow phase where the body starts to fight back and, among other things, mobilise nutrients to cope with the insult. The metabolic characteristics of each phase are shown in Table 1.11.

### What are the implications of metabolic stress for the patient?

This metabolic stress state and starvation are not the same, and have different responses within the body. Undernourished states are characterised by decreased energy expenditure, and use of body protein and fat for energy. In stress states, the body enters a hypermetabolic state, and the stress causes accelerated energy expenditure and glucose production. Hyperglycemia can occur either from insulin resistance or excess glucose production via gluconeogenesis, and muscle breakdown is also increased. The aim of nutritional support in hypermetabolic states is to provide enough energy but not too much, and to prevent catabolism if possible. Enteral nutrition may well be required as nutrients and fluids can be controlled to respond to the patient's needs. For those caring for patients with LTCs, transfer of relevant information on discharge to those continuing care is essential, as is provision of information to the patient and relatives on how best to maintain adequate nutrition in the recovery phase. Advice from nurse specialists and community dieticians would be useful here.

### Table 1.10 Why do people become malnourished in hospital?

<table>
<thead>
<tr>
<th>Why do people become malnourished in hospital?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Effects of the disease itself. For example, severe breathlessness and lack of appetite</td>
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<td>• Unpleasant sights or smells</td>
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</tr>
<tr>
<td>• Treatment-related factors that may cause nausea, vomiting or other unpleasant symptoms</td>
</tr>
<tr>
<td>• Failure of staff to identify malnutrition</td>
</tr>
<tr>
<td>• Failure of staff to treat identified malnutrition</td>
</tr>
</tbody>
</table>

### Table 1.11 The phases of metabolic stress

<table>
<thead>
<tr>
<th>Ebb phase</th>
<th>Flow phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypovolaemia</td>
<td>Increased cardiac output begins</td>
</tr>
<tr>
<td>Shock</td>
<td>Increased body temperature</td>
</tr>
<tr>
<td>Tissue hypoxia</td>
<td>Increased energy expenditure</td>
</tr>
<tr>
<td>Decreased cardiac output</td>
<td>Total body protein catabolism begins</td>
</tr>
<tr>
<td>Decreased oxygen consumption</td>
<td>Marked increase in glucose production, circulating insulin/glucagon/cortisol</td>
</tr>
<tr>
<td>Lowered body temperature</td>
<td>Sodium and fluid retention</td>
</tr>
<tr>
<td>Insulin levels drop and glucagon is elevated leading to hyperglycaemia</td>
<td></td>
</tr>
</tbody>
</table>
Screening for malnutrition

In addition to the methods of establishing dietary intake mentioned above, BAPEN recommend that risk of malnutrition should be calculated. They argue that this should not just be for people traditionally considered to be high risk such as those in hospital. Care homes, sheltered housing schemes and GPs all have a responsibility to screen for malnutrition - remember that most people with it are free-living in the community. Table 1.12 summarises who should be screened according to NICE Guidelines (2006b).

The Malnutrition Universal Screening Tool (MUST)

The Malnutrition Universal Screening Tool (Elia 2003) is a validated tool that screens for risk of impaired nutritional status using the following three questions:

1. BMI calculation
2. Recent unplanned weight loss
3. Presence of acute illness

These questions are used because they are felt to be the most useful indicators of potential for malnutrition, and can be combined to produce a tool that is quick and easy to use. Each of these questions is given a score depending on the severity of the risk and so overall risk can be calculated. See Table 1.13 for actions to take depending on risk (Elia 2003).

Local guidelines on how to address the malnutrition risk can then be implemented in the care plan. The MUST is available for download from the BAPEN website, along with further advice on how to use it effectively.

There are other tools available to calculate risk for malnutrition; for example, the Mini Nutritional Assessment Short Form (Rubenstein et al. 2001) or the Nutrition Risk Score (Reilly et al. 1995). To use these effectively, staff need to be trained in how to use them, and clear policies and plans should

Table 1.12 Who should be screened for malnutrition?

- All hospital inpatients on admission
- All outpatients at their first appointment
- All people in care homes on admission
- All people on registration at GP surgeries
- All people where there is clinical concern, for example unintentional weight loss, fragile skin, poor wound healing, wasted muscles and impaired swallowing

Table 1.13 Actions to take after assessment with the MUST

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>Repeat screening. Hospital weekly, care homes monthly, community annually for those aged 75 or over.</td>
</tr>
<tr>
<td>Medium risk</td>
<td>Observe and record dietary intake for three days if patient is in hospital or care home. If there is improvement or adequate intake, then follow local policy and repeat screen. If concern, then follow local policy.</td>
</tr>
<tr>
<td>High risk</td>
<td>Treat unless detrimental to do so. Refer to dietician. Improve and increase dietary intake. Repeat screening.</td>
</tr>
</tbody>
</table>
be available to help provide the nutritional support needed by the client. Any tool used for screening nutritional status must be validated for its ability to recognise abnormalities, and must also be reliable so that the same score would be obtained by different users on the same client (inter-rater reliability).

**Risk of malnutrition: whose responsibility is it?**
For the best assessment of risk of malnutrition, communication needs to be improved between carers, clients and healthcare staff. Some individuals may be at risk of malnutrition and not be aware of it, for example those with cognitive impairment such as dementia. Communicating a need for nutritional support can also be impaired. Simple questions from carers or relatives such as ‘what did you eat today?’ or a quick look in the cupboards or fridge can reveal a lot about how a person is managing their diet. Each member of the multidisciplinary team shares responsibility to assess, plan and implement care related to malnutrition.

**Treating malnutrition**
The aim here is firstly, where possible, to promote increased intake through healthy eating. Confusion around healthy eating can be a problem though; for example, the standard messages about low fat diets may not apply to someone who is undernourished, and they need to be reassured that it is OK to add energy to their diet. Initial management to maximise energy and protein in food may include steps such as those found in Table 1.14.

**Sip feeds**
If oral intake remains low, and improvement in the patients nutritional status does not appear to have improved when rescreened, then sip feeds can be introduced. These are for patients who come into one or other of the following ACBS (Advisory Committee on Borderline Substances) categories (NICE 2006b), and they must be prescribed:

- Short bowel syndrome
- Intractable malabsorption
- Preoperative preparation of patients who are malnourished
- Proven inflammatory bowel disease
- Total gastrectomy

**Table 1.14  Ways of increasing energy and protein intake**

- Each day have three meals and two to three nourishing snacks.
- Use at least one pint of full cream milk daily (silver top, sterilised or UHT), with food or as milky drinks.
- Have at least six to eight cups of fluid each day; try water, fruit juice, fruit squash, soups, milky drinks, tea and coffee.
- Try not to drink too much liquid before meals, since this may reduce appetite.
- Include a serving of meat, chicken, fish, eggs, cheese, yoghurt, nuts, beans or lentils, at least twice a day.
- Have at least one helping of bread, potatoes, rice, pasta or chapattis at breakfast, lunch and evening meal.
- Aim for at least five portions of fruit and vegetables daily (i.e. two portions of fruit and three servings of vegetables).
- If you can only manage small serving of vegetable or fruit, include a glass of fruit juice or squash which has added vitamin C.
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- Dysphagia
- Disease-related malnutrition (this can incorporate a range of conditions and is open to interpretation)

Sip feeds are designed to complement oral food intake, and cannot be used to replace food entirely. They come in various flavours and may be juice or milkshake in style. The use of sip feeds needs to be monitored, however, as patients can become reliant on them. Patients need to be advised to continue to try to eat as healthily as possible regularly, and not rely on these sip feeds for all their nutrition. Nutritionally complete sip feeds are available, and these can be used in place of diet in short term.

Once an agreed target has been reached, for example a certain amount of weight gain, then the feeds can be stopped. Monitoring of the patient must continue however, to avoid relapse.

Enteral nutrition

For some patients, taking adequate nutrition orally is not possible. In the management of LTCs, the reasons for this are shown in Figure 1.14.

If no nutrition intake is likely for more than 5 days, then enteral feeding should be considered.

Enteral feeding provides nutrition either via a nasogastric or nasojejunal tubes, or via percutaneous gastrostomy (PEG) or jejunostomy (PEJ) tubes. This type of feeding uses the bowel rather than feeding directly into a vein; this has benefits as rates of infection are lower and using the bowel maintains its health. Where feeding is likely to be prolonged (more than four to six weeks), PEG

![Figure 1.14 Reasons for needing enteral nutrition.](image-url)
feeding is recommended as this is generally tolerated better than nasal tubes – they don’t fall out, cannot be seen and are more comfortable. Any decision to feed a patient enterally must be taken with involvement of the multidisciplinary team, and of course must be acceptable to the patient and their carers. Many patients now continue with enteral feeding at home – in 2007, 21,858 people were registered with the British Artificial Nutrition Survey (BAPEN 2008) as having this treatment. Discharge plans must include involvement of the patient, carers, community nurses, community dieticians and GPs. Training in pump use, infection control, feeding, stoma care, management of complications, and lists of who to contact must be available and reinforced with written information. Also, it must be noted that enteral administration of drugs may not be straightforward: elixirs or solutions are preferred as the crushing of tablets or breaking open capsules means that the drug is not being used according to its license. Responsibility for the actions of the drug administered under these conditions then becomes that of the prescriber and person administering it.

### Complications of enteral feeding

Enteral feeding is considered to be a medical intervention, and enabling a person to take in adequate nutrition and hydration is a basic duty for healthcare staff. However, as with any intervention informed consent must be obtained and it must be understood that the procedure is not without risks. These can include the following:

- **Nasal insertion problems:** Nasal damage, intracranial insertion, bronchial placement.
- **PEG/PEJ insertion problems:** Bleeding, intestinal perforation.
- **Post-insertion trauma:** Discomfort, erosions, fistulae, strictures.
- **Displacement:** Tube falling out, bronchial placement of feed.
- **Reflux:** Oesophagitis, aspiration.
- **GI intolerance:** Nausea, bloating, pain, and diarrhoea related to the feed used.
- **Metabolic problems:** Refeeding syndrome, hyperglycaemia, fluid overload, electrolyte disturbance.
- **Administration problems:** Tube blockage, infection via sets and feeds.


Aside from the physical complications, the ethical concerns of any type of artificial feeding must be taken into account. Case study 1.4, about Mr Patel, vividly highlights some of the dilemmas surrounding enteral feeding; these can also be applied to parenteral feeding.

### Refeeding syndrome

This is a potentially fatal disorder of metabolism, and appears to be related to adaptations made by the body when in a state of malnutrition. In this syndrome, cells leak electrolytes such as potassium and calcium and water leaks into the cell. If feed is administered too quickly these processes are suddenly reversed, and insulin, secreted again after an absence, causes movement of these electrolytes into the cells. Consequent falls in circulating levels and alterations in extracellular and circulating fluid levels can precipitate respiratory failure, cardiac arrest, lethargy, confusion, coma and death. For this reason, feeding after a period of no or very little nutritional intake (more than 5 days) must be commenced very slowly and gradually increased.

### Parenteral feeding

For those unable to take nutrition via the gut, either orally or enterally, parenteral nutrition (PN) can be considered. This is where predigested food is given via an intravenous line. Candidates for
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PN include those whose illness is severe, who have a poor tolerance of long-term enteral feeding, or who have gastrointestinal disorders such as Crohn’s disease or short bowel syndrome (NICE 2006b). Parenteral feeding, like enteral feeding, can be done at home and this is becoming increasingly common as support networks become established. There are various solutions available for PN, and the choice of which to use depends on the exact needs of the individual. PN is not without complications however, and catheter-related infection is common. Because of the high concentration of the solutions used, PN must be given into a large vein such as the vena cava. Metabolic complications can also occur, such as fluid or electrolyte shifts as nutrients are introduced (see ‘Refeeding syndrome’).

Case study 1.4  Mr Patel

Mr Patel has had an anterior cerebral haemorrhage two weeks ago, which has left him with a right-sided hemiplegia, hemianopia, dysphasia and dysphagia. Because of this, he is being fed via a PEG tube. Mr Patel appears depressed and wants the tube removed. He has pulled one PEG tube out, despite the stitch keeping it in place. However, his family are keen for him to continue with the feeding via the tube.

Points for reflection

- Who decides whether the PEG tube should remain in situ?
- What other clinical factors need to be taken into account when considering artificial feeding?
- How might Mr Patel feel about not being able to eat?
- What ethical issues might arise should Mr Patel’s condition deteriorate?

The insertion of the tube should have been carried out after full discussion of the implications of the treatment with Mr Patel and the family. However, research by Brotherton et al. (2007) suggests that where patients lack capacity to give informed consent, the views of the family may not closely represent those of the patient. In this small study, there appeared to be disagreement between patients and carers as to whether they had a choice to have PEG feeding or not. Interestingly, there seemed to be greater agreement between nurses and patients than relatives and patients on aspects of PEG feeding.

After one month, only 2% of people will experience dysphagia following a stroke. It may be beneficial for Mr Patel to continue the PEG feeding in order to prevent malnutrition during this period. Mr Patel may express his dissatisfaction with the PEG tube by pulling it out. If he is deemed competent to make decisions then this action is a clear statement of intent and should be respected. However, the emotional and cognitive effects of the stroke may mean that he is not deemed competent at this time and so any care given must be in his best interests. Once malnutrition becomes established, Mr Patel will enter the spiral of decline and his condition will further deteriorate.

Mr Patel may not accept that he will have a quality of life with a PEG feed. Ability to eat forms part of a person’s body image and is inextricably linked to their perceptions of their mind, body and life itself. Mr Patel may wish to take in nutrition orally despite the risks of aspiration pneumonia; if he is competent then his wishes must be respected after ensuring that he does understand the risks of doing this.
If Mr Patel’s condition deteriorates and he is dying, then the presence of the PEG feed raises other ethical problems about prolonging survival and withdrawal of treatment. In this case, under English law, relatives cannot make decisions on behalf of an adult patient and so cannot override the decisions of the doctor in charge of the care.

Summary

Malnutrition is of great concern, and its causes are many. Treatment depends on assessment of risk and consequent active management.

Conclusion

This chapter has been presented in three sections. The first section explored what nutrition is and the building blocks of a healthy diet. For people with LTCs, a healthy lifestyle, including diet, can promote well-being and empower them to look after themselves to maximize health. Healthcare staff can use this information to enhance their own understanding of nutrition and so counsel patients/clients effectively.

The section on obesity provides a summary of the latest guidelines and research in its treatment, again to enable the healthcare practitioner to deliver care that is accepting of different sizes while at the same time helping patients to lose weight.

Finally, the section on malnutrition allows healthcare staff to reflect on how easily it can occur in people with LTCs, and how their disease trajectory may cause still further opportunities for weight loss and altered metabolism.

References


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Lafay, L., Mennen, L., Basdevant, A., Charles, M.A., Borys, J.M., Eschwège, E., Romon, M. and the FLVS Study Group (2000) Does energy intake underreporting involve all kinds of food or only specific food...


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Resources

In addition to the references provided throughout, the following websites are worth visiting for more specific information on nutritional needs of patients with various LTCs. These are by no means exhaustive, and the reader is encouraged to seek out more information from other sites as required.

Alzheimer’s Society Available at: www.alzheimers.org.uk

British Association for Parenteral and Enteral Nutrition Available at: www.bapen.org.uk

British Dietetic Association Available at: www.bda.uk.com

British Nutrition Foundation Available at: http://www.nutrition.org.uk/

British Lung Foundation Available at: http://www.lunguk.org

Food Standards Agency Available at: www.fsa.gov.uk

Parkinson’s Disease Society Available at: www.parkinsons.org.uk

Further reading
