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measurements of waist circumference are a useful proxy and can be especially helpful to identify people who are only moderately overweight (BMI 25–30 kg/m2) but at increased risk (Fig. 26.6.2.1). Once initiated, the progress of a weight management programme is most easily monitored by weight loss. Assuming protein intake is adequate, there is no evidence that specific dietary regimens alter the proportion of weight lost as fat or influence the site of fat loss. Physical activity can help attenuate losses of lean tissue and, if of sufficient duration and intensity, may increase the loss of fat from visceral fat deposits. Aetiology Obesity is caused by an excess energy intake relative to energy needs over a prolonged period. At a population level, an environ- ment in which food and drink are readily available in large por- tions at low cost fuels obesity. This availability of food is combined with social and cultural trends that reduce the energy costs of daily life; these include a reduction in manual labour, energy saving gadgets in the home, a rise in car ownership, and an increase in Men: <94 cm Women: <80 cm Men: 94–102 cm Women: 80–88 cm Men: >102 cm Women: >88 cm No increased risk No increased risk No increased risk Increased risk Increased risk Increased risk Very high risk Very high risk Very high risk Very high risk High risk High risk BMI Underweight (Not applicable) Underweight (Not applicable) Underweight (Not applicable) Healthy weight (18.5–24.9 kg/m2) Overweight (25–29.9 kg/m2) Obese (3034.9 kg/m2) Very obese (>40 kg/m2) Underweight (<18.5 kg/m2) Low High Very high Fig. 26.6.2.1 Identifying patients at increased risk of medical morbidity from obesity (NICE). Source data from Obesity: identification, assessment and management, NICE Guidelines, November 2014.

 the time spent in front of screens. Each kg of excess tissue contains approximately 7500 kcals, which provides a useful reminder of the likely rate of weight loss with dieting; a 500 kcal/d deficit produces a weight loss of around 0.5 kg per week. However, the basic law of thermodynamics is not especially helpful in understanding the causes of obesity for an individual patient as a precise measure of energy input and output is hard to achieve. Easier to measure are markers of high energy intake such as high consumption of sugary drinks or alcohol, regular takeaway foods and large portion sizes on the one hand, and markers of low output such as a sedentary occupation, a high level of leisure screen time, or use of a car for short journeys. There is a strong heritable component to obesity. Genetic effects may be manifest through differences in appetite control and energy intake. Some endocrine disorders also increase the likelihood of obesity. The Scottish Clinical Guidelines for obesity note that some drugs can have marked effects on body weight, with increases of a few kilograms over 12 weeks, including: • atypical antipsychotics, including clozapine • β-adrenergic blockers, particularly propranolol • insulin, when used in the treatment of type 2 diabetes mellitus • lithium • sodium valproate • sulphonylureas, including chlorpropamide, glibenclamide, glimepiride, and glipizide • thiazolidinediones, including pioglitazone • tricyclic antidepressants, including amitriptyline For fuller discussion of the aetiology of obesity, see Chapter 11.6. Health consequences of obesity Obesity places a mechanical strain on the body, increasing the risk of musculoskeletal problems and the need for knee and hip replace- ments. It also exerts metabolic effects on almost every organ system of the body. It is the principal nongenetic risk factor for the development of insulin resistance, with a roughly linear increase in risk of type 2 diabetes from a BMI of 22 kg/m2 upwards (Fig. 26.6.2.2). For women, a BMI of 30 kg/m2 confers a 40-fold risk of developing diabetes relative to a BMI of 22 kg/m2. A person who enters adulthood with a BMI of 30 has a lifetime probability of developing diabetes of over 70%. The increased risk of premature death associated with obesity is mainly due to its presumed causal connection to cardiovascular dis- ease. There is a linear association between BMI (as a proxy for body fat) and mortality from both ischaemic heart disease

and stroke. This association appears to be explained by the curvilinear associ- ation between raised body fat and higher low-density lipoprotein (LDL) and lower high-density lipoprotein (HDL), and the linear as- sociation between body fat and blood pressure (Fig. 26.6.2.3). Obesity increases the risk of most nonsmoking related cancers through mechanisms primarily relating to the products of adipose tissue, including raised levels of oestrogen, insulin-like growth fac tors, and inflammatory cytokines. Collectively, the increased incidence of cardiovascular dis- ease, diabetes and cancer reduce life expectancy by three years for someone with a BMI of 30–35 kg/m2 and by 10 years for someone with a BMI of 40–45 kg/m2. Obesity is also associated with an in- creased risk of needing social care in older age. This implies that it is associated with a longer period of ill health prior to death, and this is one of the costs of obesity to the economy. 100 90 80 70 60 50 40 30 20 10 22.0–22.9 BMI category (kg/m) Age-adjusted relative risk of diabetes 23.0–23.9 24.0–24.9 25.0–26.9 27.0–28.9 29.0–30.9 31.0–32.9 33.0–34.9 ≥35.0 0 Fig. 26.6.2.2 Body mass index (BMI) and risk of diabetes in women. Data from Colditz et al. 1995. Ann Intern Med, 122(7): 481–6.

26.6.2 Obesity and weight management 6531 Epidemiology Worldwide, obesity has almost doubled since 1980 and today an esti- mated 600 million people are obese. Although it is more prevalent in high-income nations, the rapid rate of increase in low and middle- income countries is putting a particular strain on their healthcare resources. In the United Kingdom over a quarter of adults are obese (defined as a BMI >30 kg/m2), and this proportion is even greater in certain groups. For example, it is higher among women of black Caribbean, black African, and Pakistani ethnicities, compared to the other ethnic groups, and is more common in those of low socioeconomic status. These differences underpin some of the in- equalities in life expectancy and disease patterns. Treatment Behavioural weight management programmes Most overweight people who present to general medical services do not receive any support to reduce weight. The reasons for this in- clude sensitivities in raising the issue, patchy provision of services, and lack of confidence in the effectiveness of interventions. Clinical guidelines in most countries identify a series of steps in an obesity care pathway (Fig. 26.6.2.4, recognizing that these dif- ferent steps need to operate as a coherent whole. There is emerging evidence that a simple prompt by a doctor can stimulate effective self-management of obesity. A systematic review of self-help interventions found that many are effective, at least in the short term. Signposting patients to the 12-week online behavioural weight loss programme offered by NHS Choices represents a minimal cost option. Most behavioural programmes are based on dietary change. The most effective, especially in the medium to long term (more than one year), are those that also incorporate support for increased physical activity. There is little evidence to suggest that diets with a specific macronutrient composition (e.g. low fat, low carbohydrate, or high protein), are associated with greater long-term weight loss. Early differences in weight loss relate to differences in adherence, suggesting that diet should be tailored to personal preferences and circumstances. There is no evidence that exercise-only programmes are effective for weight loss. A review of weight loss interventions specifically suitable for use in a general medical context found that support provided by a non- specialist healthcare professional was ineffective. However, for people seeking help to lose weight, referral to a community-based open-group weight loss programme, such as WeightWatchers or Slimming World, led to a mean weight loss of approximately 2.5 kg at one year. The largest study to directly compare these two ap- proaches found weight losses of -1.77 kg and -4.06 kg, respectively, in those referred to a practice nurse or a commercial provider (Fig. 26.6.2.5). Many areas of the United Kingdom now offer referral programmes funded by the NHS. Patients welcome the greater frequency of con- tact with a community group and perceive these groups as more motivating than

the information-based approach usually offered in primary care. A recent trial has shown that a brief intervention by a health professional offering referral to these weight loss services leads to significantly greater weight loss at one year than advice only. This represents a cost-effective first-line option for people who are overweight or obese and, if offered routinely, could reduce the population prevalence of obesity and comorbid conditions. Very low energy diets There is evidence that very low energy diets, providing less than 800 kcals/d, in combination with a behavioural programme achieve 160 5 4 3 2 1 0 140 120 100 80 15 25 35 50 15 25 35 50 Diastolic Systolic Blood pressure Baseline BMI (kg/m2) Adjusted for age, smoking, and study Cholesterol Blood pressure, cholesterol and BMI F F F F F M M M M Non-HDL-C Ratio of means (non-HDL-C/HDL-C) HDL-C M mm Hg mmol/litre (or ratio) Fig. 26.6.2.3 Relationship between BMI and blood pressure or cholesterol. Reprinted with permission from Elsevier (The Lancet, 2009; 373: 1083−96).

SECTION 26 Psychiatric and drug-related disorders 6532 more than 4 kg greater weight loss at one year than a behavioural programme alone. At present, the National Institute for Health and Care Excellence (NICE) recommends these only for patients who would benefit from acute weight loss, for example, ahead of knee surgery or fertility treatment, because of concerns that they may be associated with later rapid weight gain. However, there is no good evidence that this concern is justified, and recent trials show they are safe, acceptable and effective in routine care. Cognitive behaviour therapy Specialist medical weight management services will sometimes include interventions using cognitive behavioural therapy, but there are few high quality trials of this approach and there is little evidence of effectiveness. In a subgroup of obese people identified as having binge eating disorder, cognitive behavioural therapy can reduce the symptoms of binge eating, but is ineffective for weight loss. Drug treatments for obesity There has been limited success in developing drugs to treat obesity and no centrally acting compounds are licensed for the treatment of obesity in the United Kingdom. Orlistat, a gastrointestinal lipase inhibitor, reduces the absorption of dietary fat by approximately 30%. It is essential that patients using this follow a low fat diet in order to avoid adverse gastrointestinal side effects (steatorrhoea), and this dietary change is likely to account for as much as 50% of the observed weight loss. Patients who fail to make dietary changes will usually experience adverse events, leading to poor medication adherence and minimal weight loss. Others can be successfully maintained on orlistat for periods of one year or more with clin- ically significant weight loss. In a trial over four years, people with impaired glucose tolerance randomized to receive orlistat plus be- havioural support lost 6 kg compared to a group receiving similar behavioural support plus placebo treatment, who lost only 3 kg. This greater weight loss was associated with a 37% reduction in the incidence of diabetes. Orlistat is also available from pharmacists in a reduced (half) dose with proportionally lower rates of weight loss, but substantially fewer adverse effects. For patients with impaired glucose tolerance, metformin can be prescribed. Indirect comparisons suggest that the reduction in weight appears smaller than with orlistat but the reduction in the incidence of diabetes is comparable. New injectables used in patients with diabetes, such as liraglutide, are also associated with significant weight loss but are not appropriate for routine treatment of obesity. Surgery NICE recommends that patients who have a BMI greater than 35 kg/m2 with obesity-related comorbidities, or those who are severely obese Specialiist MDT services for severe & complex obesity, including bariatric surgery Primary care specialist services, including pharmacotherapy and referral to dietitian Community/primary care behavioural weight management services Primary prevention e.g. workplace interventions, active travel, food skill training, mass media information and advice Fig. 26.6.2.4 Outline obesity care pathway. 88 –1.59 kg –4.03 kg P < 0.001 86 84 82 80 78 Baseline 2 4 6 9 12 Treatment duration (months) Body weight (kg) weight Watchers Standard

care Fig. 26.6.2.5 Treating obesity in primary care: practice nurse vs. referral to commercial provider (n = 772). Jebb et al. 2011. Lancet, 378, 9801: 1485–1492.

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