Clinical Practice Guidelines

on

Management of Obesity

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Preface

Malaysia is experiencing rapid industrialisation and urbanization in recent decades. This economic transition has led to 'westernization' of lifestyle leading to a rapid increase in prevalence and incidence of obesity in this country. The associated obesity–related morbidity and other chronic conditions imposes a heavy burden on health care systems and lowers the quality of life among obese subjects. Hence, a national strategy is required to tackle both dietary and physical inactivity which contributed to the excess weight gain of the population.

Based on published evidences, the prevalence of obesity in many Asian populations is lower than that in Caucasians. The health risks associated with obesity however, occur at a lower body mass index (BMI) in Asian populations, as evidenced by a high prevalence of type 2 diabetes mellitus and cardiovascular risk factors that occurred at BMI below 25 kg/m2. There is also evidence of higher percentage of body fat among Asians subjects at similar BMI cut-off point compared with Caucasians subjects. In view of these observations, the committee has decided to adopt new criteria in defining overweight and obesity in this region specifically Malaysia.

We believe that this guideline will strengthen obesity management and will be useful to all health professionals interested and involved in the diagnosis, management and prevention of obesity in Malaysia.

We would like to thank all members of the panel for their untiring efforts in producing this guideline and to the Secretariat for the services and support rendered.

Professor Ikram Shah Ismail
Chairman
Clinical Practice Guidelines on Management of Obesity

Section 1: Introduction
— Summary of Recommendations

- The BMI should be used to classify overweight and obesity and to estimate relative risk for disease compared to normal weight (Evidence Level B)

- The waist circumference should be used to assess abdominal fat content (Evidence Level B).

- Based on current evidence in adults, overweight is defined as BMI ≥ 23 kg/m^2 and obesity as BMI ≥ 27.5 kg/m^2 (See Table 3.1) (Evidence Level C)

- Current evidence suggests that waist circumference of ≥ 90 cm in men and ≥ 80 cm in women is associated with increased risk of comorbidities (Evidence Level C).

- In overweight and obese individuals, weight loss is recommended to (Evidence Level B):-

    o Lower elevated blood pressure

    o Lower elevated levels of total cholesterol, low-density lipoprotein cholesterol and triglycerides

    o Raise low levels of high-density lipoprotein cholesterol

    o Lower elevated blood glucose levels

1. Introduction

1.1. Background

The global burden of overweight (Body Mass Index (BMI) ≥25.0 kg/m^2) and obesity (BMI ≥ 30.0 kg/m^2) is estimated at more than 1.1 billion. There is evidence that the risk of obesity related diseases among Asian rises from a lower BMI of 23 kg/m^2 [1]. If this were adopted as a new benchmark for overweight Asians, it would require a major revision of approaches in the Asian sub-regions, where a significant proportion of the 3.6 billion populations already has a mean BMI of 23.4 kg/m^2. In Malaysia, the National Health and Morbidity Survey 1996 reported that in adult males, 15.1% were overweight and 2.9% obese while in adult females, 17.9% were overweight and 5.7% obese [2]. It was also reported that there was little difference between rural and urban populations and that there were more obese Malays and Indians as compared to Chinese.

The co-morbidities of obesity produce financial costs to the health economy of many developed countries. Similar demands in Malaysia will impose a huge burden on the human and economic resources and are liable to disturb priorities in the health care or other sectors [3]. As Malaysia proceeds rapidly towards developed economy status, there is a need to develop a national strategy to tackle both dietary and activity contributors to the excess weight gain of the population [4].

This guideline recommends a multi-disciplinary approach to manage overweight and obese patients in Malaysia. The guideline was initiated by the Malaysian Association for the Study of Obesity (MASO) and the Malaysian Endocrine and Metabolic Society (MEMS).

The objective of this Clinical Practice Guidelines is to assist healthcare providers to better diagnose and manage overweight and obese patients. Concern for effective clinical management of obesity has been growing internationally. This guideline is consistent with other similar guidelines and is developed with the expectation of improving the overall health care system in Malaysia.

The evidence presented in the guideline was collated from the following sources:
- Systematic review of relevant published literature (up to 2004) as identified by electronic (e.g. - Medline) search
- Reports of other relevant expert working groups as listed below:
  a. Obesity in Scotland – Integrating Prevention with Weight Management (SIGN) Scottish Intercollegiate Guidelines Network [5]
  b. National Institutes of Health: Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults – The Evidence Report [6].
  c. The Asia-Pacific perspective: Redefining obesity and its treatment [7].
  d. Obesity – Preventing and Managing the Global Epidemic [8].
  e. AACE/ACE Position Statement on the Prevention, Diagnosis and Treatment of Obesity [9]
  f. Report of a WHO Expert Consultation on appropriate BMI for Asian populations and its implications for policy and intervention strategies [10].

Treatment strategies have been graded based on the levels of evidence using the system outlined below (MOH):
  A. At least one meta analysis, systematic review, or randomized controlled trial, or evidence rated as good and directly applicable to the target population
  B. Evidence from well conducted clinical trials, directly applicable to the target population, and demonstrating overall consistency of results; or evidence extrapolated from meta analysis, systematic review, or RCT
  C. Evidence from expert committee reports, or opinions and/or clinical experiences of respected authorities; indicates absence of directly applicable clinical studies of good quality

This CPG is planned for a review at every five-year interval by the committee and appropriately updated if the need arises.

1.2. Definition of Obesity

Obesity is a complex, multifactorial condition characterized by excess body fat. It must be viewed as a chronic disorder that essentially requires perpetual care, support and follow-up. Obesity is associated with many other diseases, and it warrants recognition by health-care providers. Generally, men with >25% body fat and women with >35% body fat are considered obese.

1.2.1. Body Mass Index (BMI)

This is the most established and widely used measurement and is defined as:

$$BMI = Weight\ (kg)/Height^2\ (m)^2$$

The current WHO classification states that the cut-off points for overweight and obesity is 25 and 30 kg/m^2 respectively [8]. However, it has become increasingly clear that there is a high prevalence of type 2 diabetes mellitus and cardiovascular risk factors in parts of Asia below those cut-off points. Evidence from several Asian countries are now available including Hong Kong [11], Singapore [12], China [13-15], India [16, 17], and Japan [18] to show that the risk of co-morbidities begin to rise at lower BMI values. Many Asian populations have a higher body fat percent at similar BMI, compared with Caucasian/European populations [19-22]. In a recent WHO Consultation report, no attempt was made to redefine BMI cut-off points for Asian populations [10]. However, this report identified further potential public health action points along the continuum of previous BMI classifications [8] (Figure 1) at which to trigger policy action, to facilitate prevention programmes and to measure the effect of intervention [10].

Figure 1 : Body-mass index (BMI cut-off points for public health action (from Ref (10))

Based on current evidence, the following classification of weight by BMI according to risk of co-morbidities is recommended.

Table 1.1 : Classification of weight by BMI (Evidence Level C)

Classification	BMI (kg/m^2)	Risk of co-morbidities
Underweight	<18.5	Low (but increased risk of other clinical problems)
Normal range	18.5 - 22.9	Increasing but acceptable risk
Overweight:	≥23	
Pre-obese	23.0 - 27.4	Increased
Obese I	27.5 - 34.9	High
Obese II	35.0 - 39.9	Very High
Obese III	≥40.0	Extremely High

1.2.2. Waist circumference (WC)

Waist Circumference (WC) measurement is simple, reliable, and correlates well with abdominal fat content irrespective of the BMI. WC is also an independent risk factor for cardiovascular diseases. It is most useful in individuals who are in the normal and overweight categories of the BMI. In those with BMI >35 kg/m^2 it is unnecessary to measure WC as it looses its predictive value.

The current WHO recommendations (8) suggest that the WC of 94 cm and 80 cm is associated with an increased risk in man and woman respectively. However, it has become increasingly clear that there is a high prevalence of type 2 diabetes mellitus and cardiovascular risk factors in parts of Asia below those cut-off points. Evidence from several Asian countries are now available including Hong Kong (11), Singapore (12) and China (13-15).

Thus, based on current evidence, the following waist circumference is associated with an increased risk of co morbidities (Evidence Level C):
- Men ≥ 90 cm
- Women ≥ 80 cm

1.3. Complications of Obesity

1.3.1. Overall Mortality

Excessive weight is associated with increased risk of death. The relationship was maintained even after adjustment for other risk factors. The risk progressively increases with higher BMI (23).

1.3.2. Overall Morbidity

There are a variety of conditions associated with obesity as shown in Table 1.2.

Table 1.2: Health risks associated with obesity[1] (Evidence Level B)

Greatly increased (RR>3)	Moderately increased (RR 2-3)	Mildly increased (RR1-2)
Type 2 diabetes mellitus	Coronary heart disease	Cancer (breast endometrial colo-rectal, liver, prostate, gallbladder)
Hepatobiliary disease (Gallstone[2] and Fatty Liver[3])	Cerebrovascular Disease	Reproductive hormone abnormalities
Dyslipidaemia	Cardiac failure	Polycystic ovarian syndrome
Metabolic syndrome[4]	Left Ventricular Hypertrophy[7]	Impaired fertility (Anovulation, reduced testosterone levels)[8]
Breathlessness[5]	Hypertension	Low back pain
Sleep apnoea[6]	Osteoarthritis (knees and hips)	Increased anaesthetic risk
	Hyperuricaemia and Gout	Foetal defects associated with maternal obesity

RR = Relative Risks (Modified from (8))

Notes:
1. The risk of cardiovascular disease and its risk factors is greatest in patients with abdominal obesity
2. The increased cholesterol turnover (linearly related to body fat) may account for increased risk of gall stone in obese individuals.
3. Fatty liver (steatosis) is common due to deposition of triglycerides in hepatocytes. Obesity is the primary predictor of fatty liver. Nearly all morbidly obese individuals have fatty liver and compared to about 20% in general population. Insulin resistance is thought to play a key role in the pathogenesis of steatosis. Fatty liver is recently being recognized as part of Non Alcoholic

Fatty Liver Disease (NAFLD), which represents a broad spectrum of hepatic pathology ranging from simple steatosis without any evidence of inflammation, to severe inflammatory activity with significant fibrosis or even cirrhosis (24). Simple steotosis rarely progress to nonalcoholic steatohepatitis (NASH), however once NASH has been established, a significant proportions of patients may develop significant fibrosis and cirrhosis.

In obese patients, routine LFT test must be done. If AST / ALT or both is abnormal, perform ultrasound of liver. Other causes of abnormal AST/ ALT must be excluded (e.g: Viral Hepatitis, Metabolic Liver Diseases and Autoimmune liver diseases). Once the diagnosis of possible fatty liver is made, the patients should be on long term follow up.

If Liver enzymes are persistently elevated for more than 6 months, the patients should be referred to a Hepatologist / Gastroenterologist for further evaluation and treatment.

4. Metabolic syndrome is defined as glucose intolerance (IGT or diabetes mellitus) or insulin resistance, together with 2 or more of other components listed below (25) :-

   a. Impaired glucose tolerance (IGT) or diabetes

   b. Insulin resistance (under hyperinsulinaemic euglycaemic conditions, glucose uptake below lowest quartile for background populations under investigation)

   c. Raised arterial pressure ≥140/90 mmHg

   d. Raised plasma triglycerides ≥1.7mmol/L and/or low HDL-C <0.9 mmol/L (men); <1.0 mmol/L (women)

   e. Central obesity (Waist Hip Ratio : Men >0.9, Women >0.80) and/or BMI >30 kg/m^2

   f. Microalbuminuria (Urinary albumin excretion ≥20 µg/min or albumin creatinine ratio of ≥30 mg/g of creatinine)

5. Breathlessness is due to decrease in residual lung volume associated with increased abdominal pressure on the diaphragm.

6. Sleep apnoea, is due to increased neck circumference and fat deposits in the pharyngeal area.

7. Obesity is associated with eccentric ventricular hypertrophy which causes systolic and diastolic left ventricular dysfunction.

8. Obesity is often associated with anovulation cycles resulting in reduced fertility potential while in men it is associated with decreased testosterone level.

1.4. Economic cost of obesity

Overweight and obesity and the associated health problems have substantial economic consequences for the health care system. Direct health care costs includes preventive, diagnostic and treatment services while indirect costs refer to the value of salary lost by people unable to work because of illness or disability, as well as the value of future earnings lost by premature death (26).

Table 1.3 : Published costs of obesity

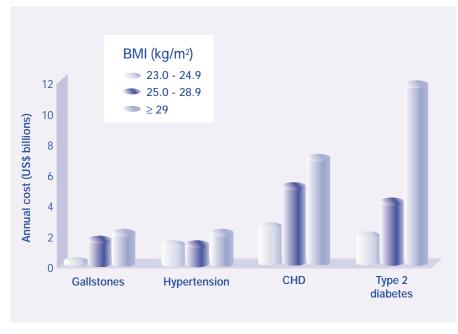|	Direct	Indirect
USA 1998	$ 51.6 billion (5.7%)	$ 47.6 billion
NZ 1996	$ 135 million (2.5%)	
France	FF12 billion (2%)	FF0.57 bilion
Netherlands 1995	DG 1 billion (4%) * 3% from BMI 25 - 30 kg/m^2	
Canada 1999	$1.8 billion (2.4%) BMI > 27 kg.m^2	
UK 1994	GBP 30 million	GBP 165 million
England 1999	GBP 130 million - overweight GBP 15 million - obese	

Source: Ref (27)

Figure 2 : Annual direct cost of disease in relation to BMI
Source: Ref (26)

1.5. Advantages of Weight Loss

Weight loss has advantages in reducing cardiovascular risk factors and other obesity associated diseases.

Table 1.4 Benefits of weight loss on health risks in obesity (Evidence Level B)

Health Risk	Benefits of 10 kg weight loss in a 100 kg subject
1. Blood Pressure	• 10 mmHg reduction systolic BP • 20 mmHg reduction diastolic BP N.B. • Weight loss also reduces the need for medication in hypertensive patients
2. Lipids	• 10% reduction in Total Cholesterol • 15% reduction in LDL-cholesterol • 30% reduction in Triglycerides • 8% increase in HDL-cholesterol
3. Diabetes	• >50% reduction in risk of developing DM (Weight loss of 6.8 kg is associated with 58% reduction in incidence of diabetes, at 3 years in the Diabetes Prevention Programme) (28) • 30-50% reduction in Fasting plasma glucose • 15% reduction in HbA_{1c}
4. Osteoarthritis	• Decrease BMI ≥2 kg/m^2 associated with more than 50% decreased risk for developing osteoarthritis (29)
5. Mortality	• 20 –25% reduction all – cause mortality • 30 – 40% reduction diabetes related death • 40 – 50% reduction in obesity-related cancer death

(Modified from (30))

Section 2: Diagnosis and Assessment of Obesity in Adults — Summary of Recommendations

Medical evaluation of an obese patient should include :-

• Assessment of the degree of obesity

• Identification of associated health risks

• Screening for possible underlying psychological disorders such as depression, substance abuse

• Identification of possible underlying endocrine, genetic or neurological disorders

• Planning the appropriate weight management strategies

2. Diagnosis and Assessment of Obesity in Adults

2.1. Diagnosis

The attending doctor should perform a comprehensive medical evaluation that includes the following:

2.1.1. Patient's History

- Assess eating habits including frequency, food choices, calories, snacking and abnormal eating behaviour (binging, nocturnal eating)

- Assess and categorise patient's habitual physical activities (Refer to Section 4.2 - Physical Activity)

- Family history of obesity, diabetes, hypertension, dyslipidaemia, cardiovascular disease, obesity-related cancer, and thyroid disease.

- Psychological Status Evaluation - Evaluate the state of the patient's self-image, assess mental health, and screen for eating disorder. Refer to a psychiatrist or psychologist if indicated. (See Appendix 1).

2.1.2. Physical Examination

Examination should include:-

- Assessment of degree of obesity and body fat distribution (See Section 2.2)

- Special attention to potential comorbidities especially evidence of metabolic syndrome (See Section 1.3 – Notes 4) and sleep apnoea.

- Use of an appropriate sized cuff to measure the blood pressure.

2.1.3. Laboratory Tests

The following investigations should be done:-

- Fasting blood glucose (FBG) and Oral Glucose Tolerance Test (if FBG is between 5.5 - 6.9 mmol/L)

- Fasting lipid profile (total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides)

- Biochemistry profile (uric acid, renal and liver function tests)

If indicated:

- Thyroid function tests (especially in those above 60 years old)

- Investigations to exclude Polycystic Ovarian Syndrome (PCOS)

- 24 hr urine free cortisol to screen for Cushing's syndrome

2.2. Measurement of Obesity and Body Fat Distribution

2.2.1. Body Mass Index (BMI)

This is the most established and widely used measurement and is defined as:

$$BMI = Weight\ (kg)/Height^2\ (m)^2$$

Routine weight measurement is helpful in following the progress of an individual's weight. BMI has its limitations in the estimation in the degree of obesity in the following circumstances:-

- Overestimates in very muscular individuals (e.g. athletes).
- Underestimates in individuals who have lost muscle mass (e.g. elderly)
- Exaggerated in individuals with extremes of body height (short and tall individuals)
- Exaggerated in the presence of oedema

The subject should be weighed in light robe or undergarments, with the shoes off, preferably using a beam-balance scale. The height should also be measured with the shoes off.

2.2.2. Waist Circumference (WC)

The BMI does not provide any indication of the distribution of fat in the body. Truncal distribution of adipose tissue (around and in the abdomen) has a particularly strong relationship with the adverse metabolic and vascular effects of obesity while fat deposited around the hips carries a much lower burden of disease.

2.2.3. Waist-Hip Ratio (WHR)

Waist Hip Ratio (WHR) is another simple measurement that has been used in epidemiological studies in the past but does not provide additional information compared to WC. The values that are associated with an increase abdominal fat and increased risk of hypertension, diabetes and ischaemic heart disease are (8)

- WHR > 0.90 for men
- WHR > 0.85 for women

However, waist circumference is the preferred measure of abdominal obesity compared to the WHR (8).

NB: When using circumference measurements it is important that standard anatomical locations are used. The WHO (31) recommended methods are as follows:-

1. Subject stands with feet 25 - 30 cm apart, weight evenly distributed.

2. Waist measurement is taken midway between the inferior margin of the last rib and the crest of the ilium in a horizontal plane. The measurer sits by the side of the subject and fits the tape snugly but not compressing soft tissues.

3. Circumference is measured to the nearest 0.1 cm.

4. For hip circumference the measure is taken around the pelvis at the point of maximal protrusion of the buttocks.

Table 2.1: **Classification Of Overweight And Obesity By BMI, Waist Circumference And Associated Disease Risk***

Classification	BMI (kg/m^2)	Risk of co-morbidities	
		Waist circumference	
		<90 cm (men) <80 cm (women)	≥90 cm (men) ≥80 cm (women)
Underweight	< 18.5	Low (but increased risk of other clinical problems)	Increased
Normal range †	18.5 - 22.9	Increased but acceptable risk	Increased
Overweight : BMI ≥ 23.0			
Pre-Obese	23.0 - 27.4	Increased	High
Obese I	27.5 - 34.9	High	Very High
Obese II	35.0 - 39.9	Very High	Very High
Obese III	≥ 40	Extremely High	Extremely High

* Disease risk for type 2 diabetes, hypertension, and CVD.

† Increased waist circumference can also be a marker for increased risk even in persons of normal weight.

2.3. Assessment and Identification of patients at high risk

Obesity-associated diseases and risk factors contribute to an added risk of cardiovascular morbidity and mortality and will require aggressive intervention. Identifying these risk factors will provide an additional guide to the need and intensity of any weight-reducing intervention.

2.3.1. Coronary Heart Disease (CHD) equivalents

a) Established Ischaemic Heart Disease

b) Other atherosclerotic diseases e.g. Cerebrovascular accidents, Peripheral Vascular Diseases

c) Type 2 diabetes mellitus

2.3.2. Cardiovascular Risk Factors

a) High LDL-C (> 4.13 mmol/L)

b) Low HDL-C (< 0.9 mmol/L)

c) High TG (> 2.26 mmol/L)

d) Hypertension

e) Impaired Fasting Glycaemia and Impaired Glucose Tolerance

f) Cigarette smoking

g) Family history of premature IHD (First degree relative with onset before age 55 for males, and 65 for females)

h) Age (Male ≥ 45, Female ≥ 55 or postmenopausal)

2.4. Assessment and identification of other related diseases

Obese patients are at increased risk for several medical conditions that require detection and appropriate management as listed:-

    i. Gynaecological abnormalities

    ii. Osteoarthritis

    iii. Gallstones

    iv. Stress incontinence

2.5. Assessment and identification of underlying aetiology of Obesity

Obesity results from interaction between underlying genetic predisposition and environmental factors. These factors should be identified and managed appropriately.

2.5.1. Social and Behavioural Factors

1. Positive behaviour is essential to ensure effective weight management. Long-term management will be more successful with sufficient continued support. Thus, assessment of behavioural (Refer Appendix 1) and social factors are important.

2. Weight gain is very common when people stop smoking. This is thought to be mediated at least in part by nicotine withdrawal.

2.5.2. Sedentary Lifestyle

1. Enforced inactivity (postoperative)

2. Elderly

2.5.3. Iatrogenic Causes

1. Drugs and hormones

2. Hypothalamic surgery

2.5.4. Endocrine Obesities

1. Hypothalamic syndrome

2. Hypothyroidism

3. Polycystic Ovarian syndrome

4. Cushing's Syndrome

5. Acromegaly

6. Hypothalamic disorders

7. Growth hormone deficiency

8. Pseudohypoparathyroidism

9. Hypogonadism e.g – Klinefelter's syndrome and Kallman's syndrome

2.5.5. Genetic Obesities

1. Autosomal recessive traits

2. Autosomal dominant traits

3. X-linked traits

4. Chromosomal abnormalities

Section 3: Therapy: Overall Approach — Summary of Recommendations

- The initial goal of weight loss therapy is to reduce body weight by approximately 10% from baseline. Further weight loss can be attempted, if indicated (Evidence Level B).

- Weight loss should be about 0.5 to 1 kg/week for a period of 6 months, with the subsequent strategy based on the amount of weight lost (Evidence Level B).

- People suffering from obesity should have long-term contact with, and support from, health professionals (Evidence Level B).

3. Therapy : Overall Approach

3.1. Goals For Obesity Therapy

The general goals are:-
• Achieve weight loss
• Maintain lower body weight
• Prevent further weight gain
• Treat comorbidities / underlying causes
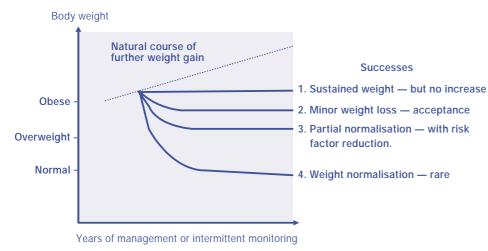
3.1.1. Achieve Weight Loss

Figure 3 : Possible long-term weight-loss scenarios

Figure 3 shows the possible scenarios in a weight-loss program. The dotted line represents the normal course of weight gain, suggesting that even sustained weight represents a degree of success. Partial normalisation, with a 5 to 10 per cent loss, can result in metabolic improvements but total normalisation is likely to be the exception rather than the rule.

• *Target levels for weight loss (Evidence Level B) (32)*
Aim for 10% reduction from baseline weight as this can significantly decrease the severity of obesity associated risk factors. This is a realistic and achievable target that can be maintained over time. Further weight loss can be considered after this initial goal is achieved and maintained for 6 months.

• *Rate of weight loss (Evidence Level B) (6)*
A reasonable goal is a 10% weight reduction from baseline over 6 months of therapy. A calorie deficit of 500 to 1000 kcal/day can result in weight loss at a rate of 0.5 to 1 kg/week. Rapid weight reduction may lead to increased risk of gallstones, electrolyte abnormalities and weight regain.

3.1.2. Maintain Lower Body Weight (Evidence Level B) (6)

The rate of weight loss often declines after the initial 6 months of weight reduction after which weight maintenance should then be the priority (defined as a weight regain of < 3 kg in 2 years and a sustained reduction in waist circumference of at least 4 cm). The combined modalities of therapy (diet, physical activity and behaviour therapy) must be continued indefinitely to ensure weight maintenance. Drug therapy is helpful in the weight maintenance phase.

3.1.3. Prevent Further Weight Gain

If significant weight reduction is not achievable, prevention of further weight gain becomes an important goal as it does not exacerbate the disease risk. Prevention of further weight gain can be considered as partial therapeutic success for many patients.

3.2. Overall Approach for the Treatment of Overweight and Obesity in Adults

Table 3.1: Recommended treatment options for different levels of BMI and other risk factors.

	Lifestyle changes (Diet, Physical activity, Behaviour therapy)	Anti-Obesity Drug	Very-Low-Calorie-Diet (VLCD) (with supervision)	Surgery
BMI 18.5 - 22.9 kg/m^2 with Increased WC*	√			
BMI 23.0 - 24.9 kg/m^2	√			
BMI 25.0 - 27.4 kg/m^2 No additional risk Increased WC* / DM/CHD/HT/HL	√ √	√ (consider in the presence of ≥ 2 risk factors)		
BMI 27.5 - 34.9 kg/m^2	√	√	√ (consider in the presence of ≥ 2 risk factors) (Refer Section 4.1.3)	
BMI 35.0 - 39.9 kg/m^2 No additional risk Increased WC* / DM/CHD/HT/HL	√ √	√ √	√ (Refer Section 4.1.3) √ (Refer Section 4.1.3)	√ (consider in the presence of ≥2 risk factors)
BMI ≥ 40.0 kg/m^2	√	√	√ (Refer Section 4.1.3)	√

Key: DM: Type 2 diabetes mellitus   CHD: coronary heart disease
     HT : Hypertension   HL : Hyperlipidaemia
     * Waist circumference > 90 cm (men), > 80 cm (women)

3.3. Benefits of Frequent Contact

Frequency of treatment contacts and the longer weight loss is maintained are major determinants of successful weight control. Regular consultations (initially weekly to biweekly; subsequently monthly) for at least 1 year are recommended. These visits should include physician and other members of the multi-disciplinary teams. It is important to provide supportive environment by the following:

- Education of lifestyle modification (diet, physical activity and behaviour therapy)
- Increasing the number of visits
- Reviewing food and activity logs
- Monitoring exercise regimes
- Monitoring diet structure and use of portion-controlled foods.

If a long-term approach is taken, a successful outcome is more likely.

Section 4: Therapy: Lifestyle Advice — Summary of Recommendations

- A calorie deficit of 500 to 1000 kcal/day from maintenance requirement (Low Calorie Diet) is important for weight loss and prevention of weight regain (Evidence Level A).

- Reducing fat as part of a low calorie diet is a practical way to reduce calories (Evidence Level A).

- Very Low Calorie Diet (200 to 800 kcal/day) may be indicated for moderately to severely obese patients (BMI > 30 kg/m^2) (Evidence Level B). It can result in quick, short-term weight losses, but medical supervision is required (Evidence Level C).

- All weight management strategies should include education in healthy eating habits (Evidence Level B).

- Physical activity should be an **integral** part of weight loss therapy and weight maintenance because it contributes to weight loss, decreases abdominal fat and increases cardio-respiratory fitness (Evidence Level A).

- For weight loss and weight maintenance, individuals require 45 - 60 minutes per day of moderate intensity activity or lesser amounts of vigorous intensity activity (Evidence Level C).

4. Therapy: Lifestyle Advice

4.1. Dietary Therapy

The goal of the treatment of obesity is to achieve weight loss through a decrease in calories consumed and an increase in energy expended.

4.1.1. Low Calorie Diet

Low Calorie Diet (LCD) provides a calorie deficit of 500 to 1000 kcal/d from maintenance requirement and is important for weight loss and prevention of weight regain. LCDs reduce total body weight (average of 8-10% over 6 months) and waist circumference. Weight loss usually consists of about 75% fat (mainly abdominal fat) and 25% lean tissue (33). Mean weight loss of up to 11kg, and a concomitant reduction in waist circumference of 1.5 to 9.5cm may be achieved after 6 to 12 months (34, 35). Evidence Level A.

A moderate reduction in caloric intake, which is individually designed to achieve a slow, but progressive weight loss is recommended. The rate of weight loss is directly related to the difference between the patient's energy intake and energy requirements.There is wide variability because sex, age and genetic factors influence energy requirements:

- Men lose more weight than females of similar height because they have more lean body mass and therefore higher energy expenditure.
- Older patients of either sex have lower lean body mass and physical activity; metabolic rate declines by approximately 2 percent per decade. Therefore they lose weight slower than younger subjects.

To estimate energy requirement for weight reduction and weight maintenance, a simplified formula as in Table 4.1 may be used.

Table 4.1: Quick Formula for calculating calorie requirements for weight reduction* and weight maintenance**

Activity Status#	Overweight & Obese* (BMI > 23 kg/m^2)	Normal Weight** (BMI 18.5 – 22.9 kg/m^2)
Sedentary	20 - 25 kcal/kg	30 kcal/kg
Moderate activity	25 - 30 kcal/kg	35 kcal/kg
Marked activity	30 – 35 kcal/kg	40 kcal/kg

Adapted from (36)

Refer to Appendix 3 for details of activity status.

Weight for calculation: Use current body weight for all except in the obese (BMI > 27.5 kg/m^2) and underweight (BMI < 18.5 kg/m^2), calculate using acceptable weight instead i.e. BMI 22 kg/m^2.

In general, LCDs containing 1,000 to 1,200 kcal/day should be selected for most women; a diet between 1,200 kcal/day and 1,500 kcal/day should be chosen for men and may be appropriate for women who weigh 75 kg or more, or who exercise regularly. If the patient is unable to lose weight on 1,500 kcal/day diet, a 1,200 kcal/day diet may be tried. (Please refer Appendix 2 for sample diets and 3 for food exchanges list.)

Care should be taken to ensure that all of the recommended dietary allowances are met. The composition of the diet should be modified to minimise other cardiovascular risk factors such as hypercholesterolaemia and hypertension (37).

4.1.2. Lower-Fat Diet

Lower-fat diets provide 25 to 30% of calories from fat. They produce weight loss primarily by decreasing caloric intake. However, lower-fat diets with total caloric reduction produce greater weight loss compared with lower-fat diet alone (38). Evidence Level A

4.1.3. Very Low-Calorie Diet (VLCD)

VLCD (200 to 800 kcal/day) (39) is often in a form of liquid nutritional supplement and results in the most rapid weight loss. It is appropriate only when the patient faces a major health risk and the physician has determined that such a diet can be used safely. Patients treated under medical supervision using a very-low-calorie diet (400 to 800 kcal/d) lose approximately 20 kg in 12 to 16 weeks and maintain one half to two thirds of this loss in the following year (40) Evidence Level B.

VLCDs are not usually recommended for weight loss therapy because:-

- It results in nutritional inadequacies unless it is supplemented with vitamins and minerals.
- It is not sustainable over long period
- It increases serum uric acid concentrations
- It results in muscle breakdown and protein loss

Contraindications to VLCD

- Recent myocardial infarction
- Cardiac conduction disorder
- History of cerebrovascular, renal or hepatic disease
- Type 1 diabetes mellitus
- Major psychiatric disorders
- Gallbladder disease

VLCD may be indicated for moderately to severely obese patients (BMI > 30 kg/m^2) who are highly motivated but have failed with more conservative methods, or in patients with a BMI of 27 to 30 kg/m^2 who have medical conditions that might respond to rapid weight loss (41) Evidence Level C.

4.1.4. High-Protein Low-Carbohydrate Diet

High Protein diets with low carbohydrates restrict food choices and overall nutrient adequacy. There is insufficient evidence to make recommendations for or against the use of low-carbohydrate diets, particularly among those aged more than 50 years, for use longer than 90 days or for diets of ≤20 g carbohydrates per day. Participants' weight loss while using low-carbohydrate diets was principally associated with decreased caloric intake and increased diet duration but not with reduced carbohydrate content (42). Evidence Level A

4.1.5. Dietary Education

All weight management strategies should include education in healthy eating habits. Patients should avoid 'fad' diets. Dietary education is necessary to assist in the adjustment to an LCD. Educational efforts should pay particular attention to the following topics (6):

- Energy value of different foods
- Food composition - fats, carbohydrates (including dietary fiber), and proteins
- Evaluation of nutrition labels to determine caloric content and food composition
- Development of preferences for low-calorie foods
- Reduction of high-calorie foods (both high-fat and high-carbohydrate foods)
- Food preparation – limiting fats and oils during cooking
- Maintenance of adequate water intake
- Reduction of portion sizes; and
- Limiting alcohol consumption

Long-term changes in food choices are more likely to be successful when the patient's preferences are taken into account and should include behaviour therapy (Refer to Section 4.3)

Periodic review on the progress of the weight loss therapy should be carried out. Optimally, dietary therapy should last at least 6 months. Shorter periods of dietary therapy usually result in lesser weight reductions

4.2. Physical Activity

Physical activity should be an integral part of weight loss therapy and weight maintenance (Evidence Level A) (6). It contributes to weight loss by altering energy balance. It favourably changes body composition, decreases risk for disease, and improves quality of life.

Before the patient starts an exercise programme, the attending doctor must give medical clearance based on patient's age, symptoms, concomitant risk factors and physical examination.

In choosing an appropriate exercise programme, the FITT criteria should be considered:

F = Frequency
I = Intensity
T = Time (duration)
T = Type of exercise

All exercise programmes should be introduced gradually. Patients should be advised on the possible abnormal responses to exercise (chest pain, excessive breathlessness). Thirty minutes of regular moderate intensity physical activity, preferably all days of the week, can limit health risks for chronic diseases including coronary heart disease and diabetes. However, to prevent weight regain for formerly obese individuals requires 60 – 90 minutes per day of moderate intensity activity or lesser amounts of vigorous intensity activity. (43) (Evidence Level C).

A regimen of daily walking is an attractive form of physical activity for those who are overweight or obese. Initially the patient can start by walking 10 minutes, 3 days a week, and can build to 30 to of 45 minutes more intense walking at least 3 days a week and increase to most, if not all, days (6). The exercise can be done all at one time or accumulated over the day. Extremely obese persons may need to start with simple exercises that can be intensified gradually. Some of the examples of physical activity are shown below :-

Light:
Slow walking (15 min/km or 4 km/hr), tai chi, house cleaning, and golf (no buggy)

Moderate:
Brisk walking (10 min/km, or 6 km/hr), active gardening, cycling (2.5min/km, or 24 km/hr), badminton, swimming and aerobic exercise/dancing.

High:
Jogging (6 min/km or 10 km/hr), walking with load uphill, basketball, climbing and football.
In addition to intensity, the following should also be encouraged (8):

- flexibility exercises to attain full range of joint motion,
- strength or resistance exercises and
- aerobic conditioning.

Each level of intensity and duration should be maintained for at least 1 to 2 weeks. Care must be taken to avoid injury. Progressing too rapidly will result in muscle soreness, fatigue, increased cardiac risk, and decreased motivation. Each exercise period should include warm-up and cool-down periods. Drink plenty of water before, during and after exercise to prevent dehydration In addition, patients should be encouraged to adopt strategies to increase physical activity in daily life, e.g. taking the stairs instead of the lift and reducing sedentary time (e.g. watching television) by undertaking frequent, less strenuous activities.

4.3. Behaviour Therapy

Behaviour therapy is a useful adjunct when incorporated into the treatment for weight loss and weight maintenance. The goal of behaviour therapy is to alter the eating habits of an obese patient. Weight loss is more likely to be achieved and maintained by behaviour modification techniques that focus on lifestyle and attitude. Behaviour therapy strategies include (44);

- **Counselling** for lifestyle changes is important as it enables patients to evaluate and modify eating practices, habits of physical activity and emotional responses to weight.

- **Self-monitoring** is an essential component of a lifestyle change program and patients should be encouraged to keep daily records of physical activity, food intake and problems.
- **Portion control** to gauge size portions eaten.
- **Stimulus control** to identify and avoid environmental cues associated with unhealthful eating and sedentary lifestyle e.g. snacking while watching television.
- **Contingency management** includes the use of rewards for positive lifestyle changes.
- **Stress management**, which include meditation, relaxation techniques and regular physical activity to cope with stress.
- **Cognitive-behavioural strategies** to change a patient's attitudes and beliefs about unrealistic expectations and body image.
- **Weight loss support groups** to reduce uncertainty about self-worth. Helps to sustain weight loss behaviour.

No single method of behaviour therapy appears superior to any other in its effect on weight loss; rather, multiple strategies appears to work best and those interventions with the greatest intensity appears to be associated with the greatest weight loss. Long-term follow-up of patients on behaviour therapy show weight regain to baseline in most patients in the absence of continued behavioural intervention.

Section 5: Pharmacotherapy and Surgical Therapy — Summary of Recommendations

- Pharmacotherapy can be a useful adjunct to lifestyle changes to induce weight loss in some patients with a BMI greater than 27.5 kg/m^2 and in patients with a BMI greater than 25 kg/m^2 with co-morbidities (Evidence Level A).

- Drugs should be used only under careful medical supervision and in the context of a long-term treatment strategy (Evidence Level A).

- Surgery is an option in selected patients with morbid obesity (BMI ≥ 40 kg/m^2 or between 35 and 40, with major weight related comorbidities) when less invasive methods have failed and the patient is at high risk for obesity associated morbidity or mortality (Evidence Level B).

5. Therapy: Pharmacotherapy and Surgical Therapy

5.1. Pharmacotherapy

Pharmacotherapy may be considered in addition to diet, exercise and behaviour modification. The decision to initiate drug therapy in overweight subjects should be made only after a careful evaluation of risks and benefits. It should be part of a long-term management strategy for obesity. A patient may require drug therapy:-

- to aid compliance with dietary restriction
- to augment diet-related weight loss
- to achieve weight maintenance after satisfactory weight loss.

The risks to a patient from continuing obesity need to be balanced against the risks from therapy, and doctors need to be aware of possible side-effects.

5.1.1. Indications for Pharmacotherapy

Pharmacotherapy must not be used simply for cosmetic purposes or when weight loss can be achieved and maintained without it. Overweight subjects should only receive anti-obesity drugs if they have had a reasonable trial of diet and exercise for 6 months and have:

1. BMI between 25 and 27.5 kg/m^2, and at least two of the following conditions:

- Type 2 diabetes mellitus
- Coronary heart disease
- Cerebrovascular disease
- Hypertension
- Hyperlipidaemia
- Waist circumference >90 cm for men, >80 cm for women

2. BMI ≥27.5 kg/m^2 .

3. Symptomatic complications of obesity such as severe osteoarthritis, obstructive sleep apnoea, reflux oesophagitis, and the compartment syndrome.

5.1.2. Goals of Pharmacotherapy

The goal of therapy must be realistic. Therapy is considered effective if weight loss exceeds 2 kg during the first month of therapy and decreases more than 5% by 3 to 6 months, with no weight regain. Therapy must be reviewed after a month of initiation to assess response and compliance.

5.1.3. Types of anti-obesity drugs

Anti-obesity drugs can be classified into two groups, those acting on the:

- Gastrointestinal system to reduce fat absorption
- Central nervous system to suppress appetite.

5.1.3.1. Drugs acting on the gastrointestinal system

1. Orlistat

Orlistat is the only non-systemically acting drug available for the long-term treatment of obesity. It is a pancreatic lipase inhibitor which produces a dose-dependent reduction in dietary fat absorption by about 30%. In the 2-year European Study, patients treated with orlistat showed a reduction of 10.2% in weight compared to 6.1% in the placebo group at the end of one year. Weight loss at one year varied from 5.5 to 6.6% of initial body weight in the placebo group and 8.5 to 10.2% in the orlistat group. In diabetic patients, orlistat resulted in 6% reduction in weight compared with 4.3% in placebo after one year (45).

- **Other beneficial effects :-**
  - Improves certain serum lipid values more than can be explained by weight reduction alone (46-48). (Probably related to fecal fat loss)
  - Improvements in glycaemic control and blood pressure have also been noted with orlistat (45). These changes may result from decreases in body weight alone.
  - Orlistat plus lifestyle changes resulted in greater reduction in the incidence of type 2 diabetes among obese subjects with impaired glucose tolerance (IGT) (49).

- **Side effects:**
  Orlistat is generally well-tolerated. Known side effects are intestinal borborygmi and cramps, flatus, fecal incontinence, oily spotting, and flatus with discharge (45). These are usually mild and subside after the first several weeks of treatment provided fat intake is reduced.

  Absorption of vitamins A and E is reduced in some patients receiving orlistat. It is advisable to take multi-vitamin supplement at least 2 hours before or after the dose of orlistat.

5.1.3.2. Drugs acting on the central nervous system

1. Sibutramine

Sibutramine specifically inhibits serotonin and noradrenaline re-uptake without affecting their release. It enhances post-ingestive satiety and increases resting metabolic rate. Sibutramine typically induces weight loss of 5-8% compared with 1-4% in placebo treated groups. In a randomised, double-blind trial to assess the usefulness of sibutramine in maintaining substantial weight loss over 2 years, 43% of treated subjects maintained their reduced weight, compared with 16% in the placebo group (50).

- **Other benefits:**
  Sibutramine induced weight loss is associated with improvements in
  - Hyperlipidaemia and hyperuricaemia (51)
  - Glycaemic control in type 2 diabetic patients (52)

- **Side effects:**

  Sibutramine increases blood pressure (1-3 mmHg) and pulse rate (4 - 5 bpm). Thus, it should be given cautiously in subjects with uncontrolled hypertension. Other adverse reactions include dry mouth, headache, insomnia and constipation.

- **Contraindications:**
  - Subjects receiving a monoamine oxidase inhibitor or selective serotonin reuptake inhibitor
  - Concomitant use with drugs metabolized by the cytochrome P450 enzyme system isozyme (CYP3A4) e.g. - erythromycin and ketoconazole
  - Uncontrolled hypertension

2. Phentermine

Phentermine is an amphetamine derivative that suppresses appetite. It induces moderate weight loss of 2 to 10 kg. Phentermine should only be used short-term (≤3 months) because of their stimulant action on the central nervous system.

- **Side effects:**

  Include insomnia, dry mouth, constipation, euphoria, palpitations and hypertension.

5.1.4. Other Drugs that favour weight loss

The following drugs are not approved for the treatment of obesity but may induce weight loss when used for their specific indications.

Metformin may be useful in managing obesity in those with type 2 diabetes, polycystic ovarian syndrome (PCOS), and impaired glucose tolerance. Care should be taken with its use in subjects with cardiac, renal or hepatic decompensation as it may result in lactic acidosis. Side effects include nausea, flatulence, bloating and diarrhoea. *Fluoxetine*, a serotonergic anti-depressant, has modest effects on appetite and weight. It can be used as a surrogate anorectic agent in depressed obese patients. Side effects include anxiety, drowsiness, insomnia and nervousness.

5.1.5. Agents not appropriate for the treatment of obesity

There is no evidence that any alternative therapies/proprietary medicines such as cellulite treatments, dietary supplements (e.g. chitosan, fibre capsules), or herbal preparations are effective. Adequate clinical trials have not been performed.

Guar gum preparations derived from the Indian cluster bean has been promoted as weight reduction agents. In a meta-analysis of 20 clinical trials guar gum was not effective for weight loss (53).

Diuretics, laxatives (including 'slimming tea'), human growth hormone (HGH) are ineffective and should not be used. Treatment with amphetamine, dexamphetamine and thyroxine may be dangerous and these agents must not be used to achieve weight loss.

5.1.6. Antiobesity agents under development

5.1.6.1. Leptin

Leptin is a peptide produced primarily in adipose tissue (54). Leptin deficiency is a rare cause of obesity. In these patients, physiological doses of leptin decreases food intake and causes weight loss (55). Most obese subjects appear to have leptin resistance. In a study of 47 obese subjects given placebo or varying doses of recombinant human leptin for 24 weeks, there was a weakly dose-dependent decrease in body weight (56). The decrease in weight was due mostly to loss of fat. A long-acting leptin preparation had similar effects (57).

5.1.6.2. Neuropeptide-Y

Neuropeptide-Y is one of the most potent stimulators of food intake. It appears to act via Y-5 receptors, although Y-1 receptors may also transmit feeding effects. Antagonists to these receptors may block the action of neuropeptide-Y, and thereby decrease food intake.

5.1.6.3. Glucagon and glucagon-like peptide-1

Pancreatic glucagon causes a dose-related decrease in food intake. A fragment of glucagon (amino acids 6-29) called glucagon-like peptide-1 when given parenterally reduced food intake (58).

5.1.6.4. Beta-3 adrenergic receptor agonists

Blockade of the thermogenic part of sympathetic nervous system reduces the thermic response to a meal. Noradrenaline may decrease food intake by acting on beta-2 or beta-3 adrenergic receptors. Several synthetic beta-3 adrenergic agonists have been developed, but clinical responses have been disappointing.

5.1.7. Contra-indications to the use of anti-obesity drugs

Anti-obesity drugs are not recommended for certain sub-groups:-.

- Children. There are insufficient data about their effects during the peri-pubertal period and for longer term, on eating behaviour.
- Patients who have previously suffered adverse effects from drugs in this category
- Pregnant and lactating women

Combination pharmacotherapy for the treatment of obesity cannot yet be recommended outside clinical trials.

Table 5.1 : Drugs used in the treatment of obesity

Drug	Action	Adverse effects	Dosage	Contraindication
Orlistat	Peripherally acting pancreatic lipase inhibitor, decreases fat absorption	Loose stools, malabsorption of fat-soluble vitamins	120 mg 3 times/day with each main meal containing fat (during or up to 1 hour after the meal); omit dose if meal is missed or contains no fat	• Chronic malabsorption syndrome • Cholestasis
Sibutramine	Centrally acting via serotoninergic and noradrenergic pathways, not recommended for those with severe hepatic disease	Increase in blood pressure and heart rate, nausea, insomnia dry mouth, rhinitis, constipation	Initial: 10 mg once daily; after 4 weeks may titrate up to 15 mg once daily as needed and tolerated	• Subjects receiving a monoamine oxidase inhibitor or selective serotonin reuptake inhibitor • Concomitant use with drugs metabolized by the cytochrome P450 enzyme system (isozyme CYP3A4) e.g.-erythromycin and ketoconazole • Uncontrolled hypertension
Phentermine	Centrally acting via noradrenergic pathways	Increase in blood pressure, insomnia, nervousness	8 mg 3 times/day 30 minutes before meals or food or 15-30 mg/day before breakfast or 10-14 hours before retiring to bed	• Pulmonary artery hypertension • Existing heart valve abnormalities or heart murmurs • Moderate to severe arterial hypertension; cerebrovascular disease • Severe cardiac disease including arrhythmias, advanced arteriosclerosis • Known hypersensitivity to sympathomimetic drugs • Hyperthyroidism • Agitated states or a history of psychiatric illnesses including anorexia nervosa and depression • Glaucoma • History of drug/alcohol abuse or dependence; concomitant treatment with MAOIs or within 14 days following their administration

Table 5.2 : Other Drugs that Favour Weight Loss

Drug	Action	Adverse effects	Dosage	Contraindication
Fluoxetine (Prozac)	Anti-depressant, appetite suppressant and a selective serotonin re-uptake inhibitor. Not specifically approved for weight loss	Anxiety, drowsiness insomnia, nervousness	20 mg/day in the morning; may increase after several weeks by 20 mg/day increments; maximum: 60mg/day	• Hypersensitivity to fluoxetine • Concomitant treatment with MAOIs (selective MAOI eg - selegiline and RIMA eg – moclobemide) including within 14 days of discontinuation treatment with MAOI or RIMA, and 5 weeks of discontinuation treatment with fluoxetine.
Metformin	This may be useful in managing obesity in the Type 2 diabetic patient, although efficacy is not proved or licensed for obesity	Nausea, flatulence, bloating, diarrhoea, lactic acidosis (rare)	500 – 1000mg 2-3 times/day with meals	• Hypersensitivity to metformin HCl or any excipients • Patients with diabetic ketoacidosis, diabetic pre-coma; renal failure or renal dysfunction (eg. – serum creatinine levels >135μmol/L in males and >110μmol/L in females) • Acute conditions with the potential to alter renal function eg – dehydration, severe infection, shock, intravascular administration of iodinated contrast agents. • Acute or chronic disease which may cause tissue hypoxia eg - cardiac or respiratory failure, recent myocardial infarction, shock, hepatic insufficiency, acute alcohol intoxication, alcoholism • Lactation

5.2. Surgery for Weight Loss

Surgery is an option for weight reduction for some patients with severe and resistant morbid obesity. It should be reserved for patients with severe obesity, in whom efforts at other therapy have failed, and who are suffering from serious complications of obesity. Surgical approaches can result in substantial weight loss i.e. - from 50 kg to as much as 100 kg over a period of 6 months to 1 year. Compared to other interventions available, surgery has produced the longest period of sustained weight loss. In a recent retrospective study, obese patients with Type 2 diabetes who underwent surgery had a decrease in mortality rate for each year of follow up (59). Assessing both peri-operative risk and long-term complications is important and requires assessing the risk/benefit ratio in each case. A multidisciplinary team should follow patients opting for surgical intervention.

5.2.1. Criteria for Surgical Therapy (60)

- Patients aged 18 or older with morbid obesity (BMI ≥40 kg/m² or between 35 and 40, with major weight related comorbidities)
- Patients who have already had intensive management in specialized clinics with interest in obesity.
- Patients who have failed to maintain weight loss after trying appropriate non-surgical measures.
- Patients with no clinical or psychological contraindications to anaesthesia or surgery
- Patients who understand and are committed to long term follow-up.

5.2.2. Surgical Techniques in Current Use

The aim of surgery is to modify the gastrointestinal tract to reduce net food intake. Commonly used surgical interventions in Malaysia include gastric partitioning (Vertical gastric banding) and gastric bypass (Roux-en-Y). Another procedure is the biliopancreatic bypass procedure, which involves transection of the stomach and anastomosis of the proximal part with a segment of ileum. This operation results in malabsorption, but avoids the complications of a blind loop associated with earlier intestinal bypass procedures (61). (See Appendix 5). Another gastric restriction procedure is laparoscopic insertion of a gastric ring with an inflatable pouch placed subcutaneously (62). The degree of gastric constriction can be increased or decreased by changing the volume in the subcutaneous reservoir that leads to the ring encircling the stomach. The United States Food and Drug Administration has approved the use of one system (Lap-Band Adjustable Gastric Banding System, Cio-Enterics Corp, Carpinteria, CA) for use in severely obese patients.

Liposuction is not a treatment for generalised obesity, but may be used for unsightly local collections of fat.

5.2.3. Complications of Surgical Therapy

- Potential nutrient deficiencies e.g. vitamin B_{12}, folate, and iron.
- Gastrointestinal symptoms such as "dumping syndrome" or gallstones.
- Postoperative mood changes or presurgical depression symptoms may not be improved by the achieved weight loss.

Complications related to specific surgical techniques are shown in Table 5.2
Lifelong medical and nutrition surveillance after surgical therapy should include monitoring of indices of inadequate nutrition and modification of any preoperative disorders.

Table 5.3: Complications of Gastric Reduction Surgery

Complications	Gastric bypass, percent	Gastroplasty, percent
Death	<1	<1
Technical / metabolic	7	7
Anemia	3	
Stenosis		4
Weight loss (percent initial weight)	30 to 25	20 to 25
Surgical Failure (20 percent weight loss)	5	20
Surgical revision needed	5	10

Section 6: Childhood and Adolescent Obesity — Summary of Recommendations

- Currently, BMI is being used to evaluate childhood and adolescent obesity. The IOTF BMI cut-off points and CDC BMI growth chart are available as valid references (Evidence Level C).

- The components of obesity management in children and adolescents are dietary modification, increasing physical activities, behaviour modification and family involvement (Evidence Level C).

6. Childhood and Adolescent Obesity

Several reports show already high and increasing rates of overweight and obesity preschool children living in developing countries (8, 63, 64). Children become overweight for a variety of reasons. The most common causes are unhealthy eating patterns, lack of physical activity, genetic factors, or a combination of these factors. In rare cases, a medical problem, such as an endocrine disorder, may cause a child to become overweight.

6.1. Evaluation of Obesity

BMI is the best simple way to measure obesity, though imperfect. BMI cut-off points based on national centiles are useful clinically. Recently, the International Obesity Task Force (IOTF) has adopted cut-off points of BMI for overweight and obesity in children to standardize the assessment of obesity worldwide, based on 6 large national BMI surveys. For each of the surveys, centile curves were drawn that passed through the cut-off points of 25 and 30 kg/m^2 for adult overweight and obesity at age 18 years. The resulting curves were averaged to provide age- and gender-specific cut-off points for overweight and obesity from two to 18 years (65) (Appendix 6). In addition, the United States Centers for Disease Control and Prevention (CDC) BMI growth chart can also be used. Data documenting associations between comorbidities are not available for children, and overweight is arbitrarily defined as a BMI greater than the 85th percentile and obesity as a BMI greater than the 95th percentile. These charts can be downloaded from http://www.cdc.gov/growthcharts/ (Appendix 7 and 8).

Evaluation of obesity in children and adolescents is important for several reasons:-
- Prevent the progression of the condition and its related co morbidities into adulthood.
- Genetic and hormonal causes of obesity warrant consideration, although rare.
- Prevention of psycho-social problems e.g. low self-esteem.
- To instill healthy lifestyle in children and their families throughout their life.

Obese children must be evaluated for associated morbidity as they develop similar complications as for adult (see section 1.3). In particular, childhood obesity is associated with the increase in prevalence of Type 2 diabetes at a younger age.

Factors determining persistence of obesity into adulthood (66) :-
- Onset of obesity after the age of three. The likelihood of obesity persisting increases with advancing age and 70-80% of obese adolescents will remain so as adults.
- Degree of obesity.
- Presence of obesity in at least one parent.

6.2. Management of Childhood Obesity:

The overriding aim is to reduce the amount of body fat. Children who are growing, and thus gaining both height and weight, often do not need to lose weight. They can maintain their weight and be allowed to "grow into" it. Older adolescents who have attained their final height should make efforts to lose excess weight.

The components of obesity management in children and adolescents are: (67) (see Table 6.1)
- Reduction of energy intake by dietary modification, and using conventional foods.
- Increase energy expenditure by increasing physical activities and decreasing physical inactivity.
- Behaviour modification associated with eating habits and activity pattern.
- Involvement of the family in the process of change.

Table 6.1 : Components of a Successful Weight Loss Plan

Reasonable weight-loss goal

o Prolonged weight maintenance is recommended.
o If weight loss is indicated, initially to lose 2-4 kg, or a rate of 1/2 to 2kg per month.

Dietary management

o Provide dietary prescription specifying total number of calories per day and recommended percentage of calories from fat, protein and carbohydrates.

Physical activity

o Start according to child's fitness level, with ultimate goal of more than 60 minutes per day of moderate exercise including family-oriented outdoor activities, organised sports, swimming, cycling, martial arts.
o Limiting television viewing and playing video and computer games appears to compel the choice of other pastimes.

Behavior modification

o Self-monitoring, nutritional education, stimulus control, modification of eating habits, physical activity, attitude change, reinforcements and rewards.

Family involvement

o The best and most effective way to treat children with obesity is to treat the family and not the child alone, by encouraging increased daily activity and healthy eating habits.
o Review family activity and television viewing patterns; involve parents in nutrition counselling.

The currently available VLCD, pharmacotherapeutic agents and surgery generally have no place in the management of childhood obesity (67). In the United States orlistat has been approved for use in obese (BMI greater than the 95th percentile) adolescents aged 12 to 16 years.

6.3. Prevention of Obesity

The best way to significantly affect the prevalence of obesity is to prevent it. (See Table 6.2)

Table 6.2 : Tips for Parents for Prevention of Obesity

- Respect your child's appetite: children do not need to finish every bottle or meal.
- Avoid pre-prepared and sugared foods when possible.
- Limit the amount of high-calorie foods kept in the home.
- Provide a healthy diet, with 30 percent or fewer calories derived from fat.
- Provide ample fiber in the child's diet.
- Skimmed milk may safely replace whole milk at 5 years of age.
- Do not provide food for comfort or as a reward.
- Do not offer sweets in exchange for a finished meal.
- Limit amount of television viewing and computer games.
- Encourage active play.
- Establish regular family activities such as walks, ball games and other outdoor activities.

Section 7: Appendices

Appendix 1: A Brief Behavioural Assessment

Clinical experience suggests that health care practitioners briefly consider the following issues when assessing an obese individual's readiness for weight loss.

1. "Has the individual sought weight loss on his or her own initiative?"

The initiation to lose weight should arise from the patients' self-awareness of obesity as a health problem.

2. "What events have led the patient to seek weight loss now?"

This provides information about the patients' motivation and goals for weight loss. Certain events may have prompted the patients to seek medical advice for weight loss.

3. "What are the patient's stress level and mood?"

Individuals with high stress levels may not be able to focus on weight control. Treatment should commence after the stress has been resolved. Major depression has to be excluded before undertaking weight reduction measures.

4. "Does the individual have an eating disorder, in addition to obesity?"

Binge eating involves irregular meal plan and uncontrolled eating of unusually large amount of food and experiencing loss of control while overeating. Ask patients which meals they typically eat and the times of consumption. These patients may need psychological and nutritional counselling.

5. "Does the individual understand the requirements of treatment and believe that he or she can fulfill them?"

Practitioner and patient together should select an individually tailored course of treatment and identify the changes in eating and activity habits that the patient wishes to make. It is important to select activities that patient believe they can perform successfully.

6. "How much weight does the patient expect to lose? What other benefits does he or she anticipate?"

Practitioners must help patients understand that modest weight loss frequently improved health complications of obesity.

Adapted from (6)

Appendix 2 : Sample Menu Plan (50% CHO, 20% Protein and 30% Fat)

Food Exchanges	1200 kcal			1500 kcal		
	No of Exchanges	Food Portion*	Sample Menu	No of Exchanges	Food Portion*	Sample Menu
BREAKFAST						
Cereal/Grains	2	2 pcs bread	2 pcs sardine sandwich	2	1 cup meehoon	1 bowl of meehoon soto with shredded chicken
Fish/Lean Meat	1	1/2 palm size		1	1/2 palm size	
Fat	1	1 tsp margarine		1	1 tsp oil	
Skim Milk	1/2	1/2 cup	Coffee / tea with skim milk	1/2	1/2 cup	Coffee / tea with skim milk
LUNCH						
Cereal/Grains/ Starchy Vegetables	2	1 cup rice	1 cup rice	3	1 1/2 of cup rice	1 1/2 cup of rice
Fish	2	1 palm size	1 palm size fish asam pedas	3	1 1/2 palm size	1 1/2 palm size ikan kembong with asam gravy
Fat	2	2 tsps oil	1/2 cup stir fried ladies fingers	2	2 tsps oil	1/2 cup stir-fried spinach
Vegetables	1 1/2	3/4 cup (cooked)	1/2 cup ulam with sambal	1 1/2	3/4 cup (cooked)	1/2 cup ulam with sambal
Fruit	1	1/2 guava	1/2 pc of guava Plain water	1	1 banana	1 banana Plain water
SNACK						
Cereal/Grains	1	6 pcs of small crackers	6 pcs of small crackers	1	3 pcs biscuit	3 pcs of wholemeal crackers
Skim Milk	1/2	1/2 cup	Coffee/tea with skim milk	1/2	1/2 cup	Coffee/tea with skim milk

Appendix 2 : Sample Menu Plan (50% CHO, 20% Protein and 30% Fat) - cont.

Food Exchanges	1200 kcal			1500 kcal		
	No of Exchanges	Food Portion*	Sample Menu	No of Exchanges	Food Portion*	Sample Menu
DINNER						
Cereal/Grains/ Starchy Vegetables	2	1 cup rice	1 cup rice	3	1 1/2 cup rice	1 1/2 cup of rice
Lean Meat	2	1 palm size	1 palm size chicken tomyam	2	1 palm size	1 palm size chicken stew
Fat	2	2 tsps oil	2 tsps oil	3	3 tsps oil	
Vegetables	1 1/2	3/4 cup (cooked)	3/4 cup stir-fried kangkung	1 1/2	3/4 cup (cooked)	3/4 cup stir-fried sawi
Fruit	1	1 star fruit	1 whole star fruit Plain water	1	1 slice of papaya	1 slice of papaya Plain water
Summary of Total Food Exchanges						
Cereal/Grains/ Starchy Vegetables		7			9	
Fish		3			3	
Lean Meat		2			3	
Skim Milk		1			1	
Fat		5			6	
Vegetables		3			3	
Fruit		2			2	

Samples of Food exchanges:
- 1 cup size refers to 200 ml cup (tea cup size)
- 1/2 cup rice can be exchanged for 1 slice of bread or 1/2 cup noodles or 3 pieces of crackers
- 1 fruit refers to 1 hawker-size slice of papaya/watermelon/pineapple or 1 medium size orange/apple/pear
- 1/2 palm size lean meat or fish can be exchanged for 1 matchbox size of lean meat or fish or 1 egg.
- Encourage mainly low fat cooking (e.g.– steamed, grilled, baked, boiled)

* For more examples of food exchanges, refer Appendix 3 Food Groups and Exchange List.

Appendix 3 : Food Groups and Exchange Lists

a. Cereals, Grain Products and Starchy Vegetables
Each item contains 15 g carbohydrate, 2.0 g protein, 0.5 g fat and 75 calories

Rice, white or unpolished (cooked)	$^1/_2$ cup or $^1/_3$ chinese rice bowl

Can be exchanged for

i. Cereals, Grain & Bread	Quantity
Rice porridge	1 cup
Kway teow	
Mee hoon	
Tang hoon	$^1/_2$ cup or $^1/_3$ chinese rice bowl
Spaghetti	
Macaroni	
Mee, wet	$^1/_3$ cup
Idli	1 piece (60 g)
Putu mayam	1 piece (40 g)
Thosai, diameter 20 cm	$^1/_2$ piece
Chappati, diameter 20 cm	$^1/_3$ piece
Bread (wholemeal, high fiber, white/brown)	1 slice (30 g)
Plain roll	1 small (30 g)
Burger bun	$^1/_2$ piece
Pita bread, diameter 6"	$^1/_2$ piece
Oatmeal, cooked	$^1/_4$ cup
Oats, uncooked	3 rounded tablespoons
Muesli	$^1/_4$ cup
Flour (wheat, rice, atta)	3 rounded tablespoons
Biscuits (plain, unsweetened) e.g. cream crackers, Ryvita	3 pieces
Small thin, salted biscuits (4.5 x 4.5 cm)	6 pieces

ii. Starchy vegetables	Quantity
*Baked beans, canned	$^1/_3$ cup
*Lentils	
Corn kernel (fresh/canned)	$^1/_2$ cup
Peas (fresh/canned)	
Sweet potato	
Tapioca	$^1/_2$ cup (45 g)
Yam	
Breadfruit (sukun)	
Pumpkin	1 cup (100 g)
Corn on the cob, 6 cm length	
Potato	1 small (75 g)
Potato, mashed	
Water chestnut	4 pieces

* Contains more protein than other foods in the list i.e. 5 g/serve
1 cup is equivalent to 200 ml in volume
1 cup = $^3/_4$ chinese rice bowl (11.2 cm in diameter x 3.7 cm deep)
Tablespoon refers to dessertspoon level (equivalent to 2 teaspoons)

Appendix 3 : Food Groups and Exchange Lists - cont.

b. Fruits
Each item contains 15 g carbohydrate and 60 calories

Orange	1 medium

Can be exchanged for

Fruits	Quantity
Banana	1 small (60 g)
Apple	
Custard apple (buah nona)	
Star fruit	
Pear	1 medium
Peach	
Persimmon	
Sapodilla (ciku)	
Kiwi	
Hog plum (kedondong)	6 whole
Mangosteen	2 small
Plum	2 small
Duku langsat	
Grapes	
Langsat	8 pieces
Longan	
Water apple (jambu air), small	
Lychee	5 whole
Rambutan	5 whole
Pomelo	5 slices
Papaya	
Pineapple	1 slice
Watermelon	
Soursop (durian belanda)	
Guava	$^1/_2$ fruit
Cempedak	4 pieces
Jack fruit (nangka)	4 pieces
Prunes	3 pieces
Dates (kurma), dries	2 pieces
Raisin	20 g
Durian	2 medium seeds
Mango	$^1/_2$ small

c. Lean Meat, Fish and Meat Substitute

Each serving of meat and substitutes contains 7 g protein. These foods contain varying amounts of fat and energy, but negligible carbohydrate.

	CHO (g)	Protein (g)	Fat (g)	Energy (kcal)
Lean meat / Meat substitute	0	7	4	65
Fish / Shellfish	0	7	1	35

Chicken (raw, without skin)	$^1/_2$ drumstick

Can be exchanged for

i. Lean meat	Quantity
Lean meat (all varieties)	1 small serve (40 g)
Poultry (young)	40g raw / 30g cooked
Egg (hen)	1 medium
Soya bean curd (taukua)	$^1/_2$ piece (60 g)
Soya bean curd (soft, tauhoo)	$^3/_4$ piece (90 g)
Fucuk	$1^1/_2$ sheets (30 g)
Tempeh	1 piece (45 g)
Cheese, cheddar	2 thin slices (30 g)
Cottage cheese	$^1/_4$ small cup

ii. Fish, Shellfish	Quantity
Fish (e.g. ikan kembong, selar)	$^1/_2$ piece (40 g)
Fish cutlet	$^1/_4$ piece (40 g)
Squid	1 medium (40 g)
Crab meat	
Lobster meat	$^1/_4$ cup
Prawn meat	
Cockles	20 small
	6 medium

* Beans & lentils are good sources of protein but they also contain carbohydrate.

d. Milk

These foods contain varying amount of carbohydrate, fat and protein depending on which type of milk is chosen.

	CHO (g)	Protein (g)	Fat (g)	Energy (kcal)
Skim (1% fat)	15	8	trace	90
Low fat (2% fat)	12	8	5	125
Full cream	10	8	9	150

Milk	Quantity
Fresh cow's milk	1 cup (240 ml)
UHT fresh milk	1 cup (240 ml)
Powdered milk (skim, full cream)	4 rounded tablespoons or 1/3 cup
Yogurt (plain/ low fat)	$^3/_4$ cup
Evaporated (unsweetened)	$^1/_2$ cup

e. Fat

Each item contains 5 g and 45 calories. Some of the foods in the list, e.g. nuts and seeds also contain small amount of carbohydrate and protein besides fat.

Oil (all types)	1 level teaspoon (5 g)

Can be exchanged for

Fat	Quantity
Butter, margarine	
Mayonnaise	1 level teaspoon
Shortening, lard	
Peanut butter (smooth or crunchy)	2 level teaspoons
Cream, unwhipped (heavy)	
Cream cheese	1 level tablespoon
Salad dressing	
Cream, unwhipped (light)	
Coconut, shredded	
Coconut milk (santan)	2 level tablespoons
Non dairy creamer, powder	
Almond	6 whole
Cashew nut	6 whole
Walnut	1 whole
Peanut	20 small
Sesame seed	1 level tablespoon
Watermelon seed (kuachi) with shell	$^1/_4$ cup

Appendix 4: Determination of activity status for calculating calorie requirements for weight reduction and weight maintenance

• Sedentary

This refers to persons who spend most of their work sitting with regular upper body movements and those who spend much of their time on their feet but who carry only light loads. Not usually enough to cause shortness of breath.

Example: Office workers, teacher, nurse, students, housewives without mechanical appliances, musicians, hawker, sales/shop assistant, taxi/bus driver, tailor, waiter, factory worker, machine operator, electrician, etc.

• Moderate activity

This refers to persons whose jobs involve some lifting and carrying, shovelling etc, which will, at least several times a day, result in some shortness of breath and perspiration.

Example: Carpenter, mechanics, plumber and some electrical workers; gardener/farmer, cleaners, fishermen.
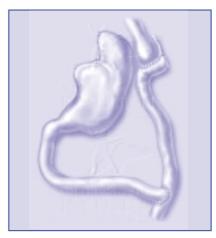
• Marked activity

This applies to those in jobs consistently require them to carry/lift heavy loads or move vigorously such they are regularly short of breath and perspiring or with regular daily physical exercise programs.

Example: Labourer, construction worker, house painter, heavy industry machine operator, professional sports person, army cadet, etc.
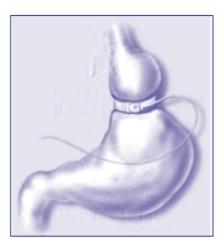
Appendix 5 : Surgical interventions in obesity (Evidence Level B)
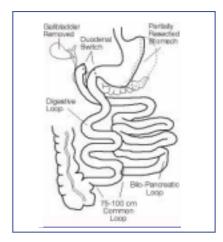

Vertical Gastric Banding
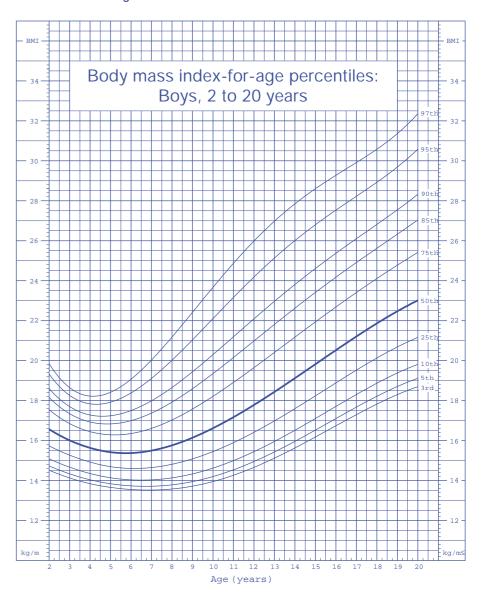

Roux-en-Y

Laparoscopic gastric banding

Bilio-Pancreatic Bypass Procedure

Appendix 6 : The IOTF cut-off points of BMI for overweight and obesity by sex from 2 – 18 years
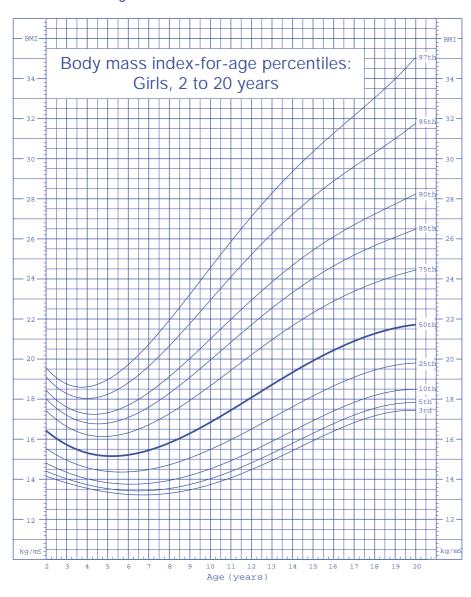
Age (yrs)	Body Mass Index 25 kg/m²		Body Mass Index 30 kg/m²	
	Males	Females	Males	Females
2	18.41	18.02	20.09	19.81
2.5	18.13	17.76	19.80	19.55
3	17.89	17.56	19.57	19.36
3.5	17.69	17.40	19.39	19.23
4	17.55	17.28	19.29	19.15
4.5	17.47	17.19	19.26	19.12
5	17.42	17.15	19.30	19.17
5.5	17.45	17.20	19.47	19.34
6	17.55	17.34	19.78	19.65
6.5	17.71	17.53	20.23	20.08
7	17.92	17.75	20.63	20.51
7.5	18.16	18.03	21.09	21.01
8	18.44	18.35	21.60	21.57
8.5	18.76	18.69	22.17	22.18
9	19.10	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15	23.29	23.94	28.30	29.11
15.5	23.60	24.17	28.60	29.29
16	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18	25	25	30	30

Appendix 7 : Body mass index-for-age percentiles, boys, 2 to 20 years, CDC growth charts: United States

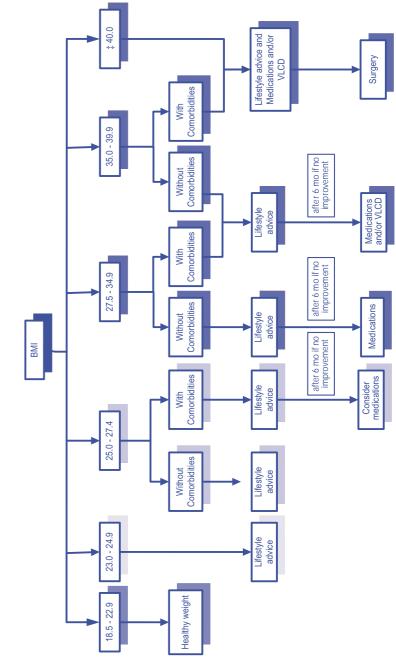Body mass index-for-age percentiles: Boys, 2 to 20 years

Source: Developed by National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

**Appendix 8 : Body mass index-for-age percentiles, girls, 2 to 20 years,
CDC growth charts: United States**

Body mass index-for-age percentiles:
Girls, 2 to 20 years

Source: Developed by National Center for Health Statistics in collaboration with the National Center for
Chronic Disease Prevention and Health Promotion (2000).

Appendix 9: Management Strategy for Obesity

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