وزارة الصحة
Ministry of Health

SASMBS
SAUDI ARABIAN SOCIETY OF METABOLIC AND BARIATRIC SURGERY

SAUDI GUIDELINE ON THE PRVENTION AND MANAGEMENT OF OVERWEIGHT AND OBESITY

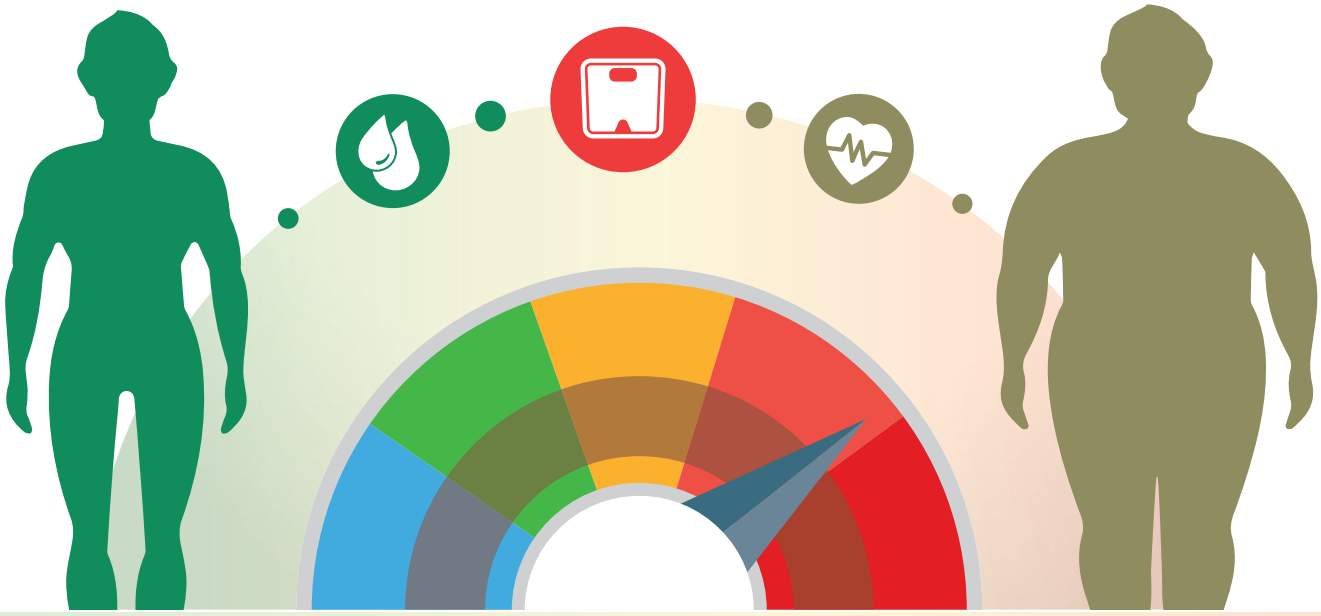

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Table of contents

Disclaimer

The Obesity Control Program in the General Directorate of Health Programs and Chronic Diseases developed the Saudi Guideline on The Prevention and Management of Overweight and Obesity.

The objective of this updated guideline is to provide practicing clinicians with the latest information regarding effective ways to care for and communicate with patients about weight loss; evidence-based guidelines for selecting weight management therapies; and information on the safety, efficacy, and adverse effects of weight loss medications and surgery.

This Saudi guideline on overweight and obesity is intended to address the use of effective tools for weight management interventions to assist health care practitioners based on the available international evidence and should not be used to replace clinical judgment.

Abbreviations

ACEI	Angiotensin-converting-enzyme inhibitor
ALT	Alanine aminotransferase
ARB	Angiotensin receptor blockers
AST	Aspartate aminotransferase
BID	Twice daily
BMI	Body mass index
CCB	Calcium channel blocker
CKD	Chronic kidney disease
DHEAS	Dehydroepiandrosterone
DM	Diabetes Mellitus
DVT/PE	Deep venous thrombosis/pulmonary embolism
ECG	Electrocardiogram
ECHO	Echocardiogram
GERD	Gastroesophageal reflux disease
GI	Gastrointestinal
GLP-1	Glucagon-like peptide1- receptor agonists
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
HbA1c	Hemoglobin A1c
HDL	High-density lipoprotein
HTN	Hypertension
ICSI	Institute for Clinical Systems Improvement
JVP	Jugular venous pulse
Kcal	Kilocalorie
Kg	Kilogram
KSA	Kingdom of Saudi Arabia
LDL	Low-density lipoprotein
LH/FSH	Luteinizing hormone/follicle stimulating hormone
MAOIs	Monoamine oxidase inhibitors
MEN 2	Multiple endocrine neoplasia type 2
NHMRC	National Health and Medical Research Council
NICE	National Institute for Health and Care Excellence
NSAIDs	Nonsteroidal anti-inflammatory drugs
OTC	Over the counter
OSA	Obstructive Sleep Apnea
PCOS	Polycystic ovarian syndrome
PICO	Population, Intervention, Comparison and Choice, Outcome
PTH	Parathyroid hormone
QD	Once daily
SAGES	Society of American Gastrointestinal and Endoscopic Surgeons
SASMBS	Saudi Arabian Society of Metabolic and Bariatric Surgery
SC	Subcutaneously
SFDA	Saudi Food and Drug Authority
SGLT-2	Sodium-glucose co-transporter 2
SHIS	Saudi Health Information Survey
SIGN	Scottish Intercollegiate Guidelines Network
SSRIs	Selective serotonin reuptake inhibitors
TDS	Three times a day
TSH	Thyroid-stimulating hormone
VA/DoD CPG	Veterans Affairs / Department of Defense Clinical Practice Guideline
WC	Waist circumference
Wk	Week

Word from Saudi Arabian Society of Metabolic and Bariatric Surgery

The SAMBS is quite privileged to participate in the development and issuance of the Second Edition of the Saudi Guidelines on the Prevention and Management of Overweight and Obesity.
The current guideline set a clear road map for those interested in the prevention and management of obesity, based on internationally recognized and practiced guidelines for management of obesity evidence based and continuously improved by practice.

We congratulate the Obesity Control program in the Ministry of Health for their strategic views and scientifically based procedures to create, develop and issue such a comprehensive document on the prevention and management of obesity.
The SASMBS is honored to be part of the production team.

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President SASMBS

Acknowledgment

First and foremost, we would like to express our sincerest gratitude to the Director General of the General Directorate of Health Programs and Chronic Diseases, who has supported us throughout the process of preparing and updating this guideline.

In addition, on behalf of the director, we would like to thank the Saudi Arabian Society of Metabolic and Bariatric Surgery (SASMBS) for their fundamental input and enriched evidence-based update. Special thanks are extended to the all members of the first edition of the "Saudi Guidelines on The Prevention and Management of Obesity" for their efficient efforts.

We would also like to express our appreciation to the guideline development team and our colleague from different governmental affiliations' for their constructive and comprehensive work in the updating of first edition of guideline. Finally, we would like to extend our thanks to the Obesity Program coordinators, physicians, and nurses in all regions of the Kingdom of Saudi Arabia for their dedicated work.

Guideline Team

وزارة الصحة
Ministry of Health

Guideline Development Process and Team

Scope of the guideline

This guideline addresses the following areas related to overweight and obesity in children and adults:

- Prevention of overweight and obesity through education and counseling.
- Prevention of overweight and obesity through the screening of high-risk individuals.
- Management of overweight and obesity in children and adults through lifestyle modification, drugs, and surgical interventions.

Aim of the guideline

This Guideline aims to provide health care professionals with the tools to effectively prevent and manage overweight and obesity among children and adults, based on current evidence for best practice suitable for our target population, culture, health care system, and resources.

Target audience

This guideline is intended for the use of health care professionals in primary and secondary health care settings. The targeted health professionals include physicians, nurses, dietitians, psychologists, and physiotherapists.

Clinical questions to be answered

The following six items (PICOTS) were used to define and cover different aspects:

(P) The Population concerned and characteristics of the disease condition:

The target population includes Patients aged 2 years and older for overweight and obesity.

(I) The Interventions of interest:

- Screening Patients for overweight and obesity.
- Psychological, dietary, and exercise interventions
- Referral to secondary care centers for further assessment and treatment.

(C) Comparison

- The best measurement tool
- The appropriate intervention plan

(O) The expected Outcomes including patients, public, and system:

- To reduce the prevalence of overweight and obesity and their comorbidities
- To reduce expenditure on the health system
- To decrease clinical practice variation

(T) Timing (intervention period):

- Short term, ≤ 6 months
- Intermediate term, > 6 to ≤ 12 months
- Long term, > 12 months

(S) The health care Setting and context in which the guidelines are to be implemented:

Primary health care centers and hospitals

Development process:

- The Director General of the General Directorate of Health Programs and Chronic Diseases constituted a team to updating the First Edition of Saudi Guideline on The Prevention and Management of Obesity. The team operated under supervision of the Director General and headed by the Director of Obesity Control Program (members of the team are listed at Appendix 3)

- The guideline team reviewed the First Edition of Guideline and also adapted the grading of evidence used by different guidelines used in this document (Appendix 2)

- Different grades are used in the document based on the source of evidence. In order to effectively use the document, the reader should refer to (Appendix 1), which summarizes the grade of evidences used by different source quoted in this document.

- The second edition was updated upon evidence-based process, systematic literature search, critical appraisal, and evidence synthesis. In addition to identifying recently published guidelines that met the above standards, key questions that were missing in the first edition of the guidelines was addressed (Appendix 2).

- The final draft of the second edition of the guideline was reviewed by the Saudi Arabian Society of Metabolic and Bariatric Surgery (SASMBS) and their recommendations were included.

Future update of the guideline:

Guideline update interval: will be considered every 3 - 5 years.

Introduction

Obesity is “a chronic, relapsing, multifactorial, neurobehavioral disease, wherein an increase in body fat promotes adipose tissue dysfunction and abnormal fat mass physical forces, resulting in adverse metabolic, biomechanical, and psychosocial health consequences.” According to the Obesity Medicine Association.[1]

Obesity is one of the most common public health problems affecting people of both sexes and all age groups. Adult obesity and overweight are more common globally than under-nutrition; worldwide obesity prevalence has nearly tripled since 1975. They affect almost over one-third of the adult population; 1.9 billion adults were suffering from overweight. Of those, 650 million were obese according to the latest World Health Organization report (2016).

In addition, over 340 million children and adolescents aged five to nineteen years and 38.2 million children under the age of five were suffering from overweight or obesity in 2020.[2] These figures are predicted to increase two points; seven billion adults will be overweight, over one billion will be affected by obesity, and 177 million will be severely affected by obesity by the year 2025.[3]

Obesity and overweight are a major risk factor for several different chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension and some cancers.[4] Obesity is also associated with functional and psychosocial disabilities that affect the population in all age and socioeconomic groups.[5] Therefore, improving obesity management in primary-care settings is essential to reduce comorbidities and increase quality of life.

A comprehensive lifestyle intervention involving nutritional behavior, physical activity, and behavioral changes is the first approach towards weight loss and, if indicated, coupling the lifestyle treatment with other interventions, such as very-low-energy diets, medication, and bariatric surgery to reach the optimum long-term management of obesity.[6]

Overweight and Obesity in Saudi Arabia

In Saudi Arabia, obesity has become one of the most common public health problems affecting people of both genders and all age groups.

Table 1: Overweight and Obesity Prevalence by Gender in Saudi Arabia (2005-2019) [7 - 9]

Year	2005 [a]	2013 [b]	2019 [c]
Overweight and obesity	72.4%	59.4%	58%
Overweight	36.9%	30.7%	38%
Obesity	35.5%	28.7%	20%
Males Prevalence of obesity Prevalence of overweight	 26.4% 42.4%	 24.1% 33.4%	 19% 43%
Females Prevalence of obesity Prevalence of overweight	 44% 31.8%	 33.5% 28%	 21% 33%

a Sample including population aged from 30-70 years old

b Sample including population aged from 15 years old and above

c Sample including population aged from 18 years old and above

Health Risks Associated with Overweight and Obesity if Untreated

There is increasing evidence that overweight and obesity are associated with the incidence of a range of comorbidities (Table 2)[10,11]

Table 2: Comorbidities and consequences of Obesity [11]

Category	Conditions /Complications	Category	Conditions /Complications
Cardiovascular	• Hypertension • Heart failure • Coronary artery diseases • Varicose veins • Pulmonary embolism	**Neoplasms**	• Breast cancer • Uterine cancer • Colonic cancer
Endocrine	Metabolic syndrome • Diabetes type 2 • Dyslipidemia • Polycystic ovarian syndrome • Reduced fertility and menstrual disorders • Pregnancy complications	**Respiratory**	• Dyspnea • Obstructive sleep apnea • Hyperventilation syndrome • Pick wickian syndrome • Asthma
Genitourinary	• Urinary stress incontinence • Obesity related glomerulopathy	**Gastrointestinal**	• Gastro-esophageal reflux diseases, • Fatty liver disease • Cholelithiasis, • Hernias • Pancreatitis
Neurologic	• Stroke • Idiopathic intracranial hypertension • Meralgia parasthetica • Dementia	**Surgical**	• Increased surgical risk • Increased post-operative complications
Psychological	• Depression/ low self-esteem • Body image disturbances • Social stigmatization	**Musculoskeletal**	• Osteoarthritis (knee and hip) • Immobility, • Low back pain • Hyperuricemia and gout
Cutaneous	• Stretch marks • Status pigmentation of legs • Lymph edema • Cellulitis • Intertrigo and carbuncles • Acanthosis nigricans • Skin tags		

Obesity Causes and Risk Factors

The etiology of weight gain and obesity is multi-factorial (Table 3), encompassing hereditary, metabolic, and drug-related conditions. The principal cause of obesity is an imbalance between calories consumed and calories expended as a result of an increased intake of energy-dense foods that are high in fat, salt and sugars but low in vitamins, minerals and other micronutrients as well as a decrease in physical activity due to the increasing sedentary lifestyles.[10]

Table 3: Risk Factors associated with weight gain and /or obesity

Category	Condition/Disease	Category	Condition/Disease
Neuroendocrine	• Cushing syndrome • Hypothalamic obesity • Hypothyroidism • Polycystic ovary syndrome • Growth hormone deficiency	**Biochemical**	• Genetics • Metabolism • Injury • Mobility issues • Intrauterine growth
Congenital	• Prader-Willi syndrome • Alström Syndrome • Bardet-Biedl Syndrome • Beckwith-Wiedemann Syndrome • Börjeson-Forssman-Lehmann Syndrome • Cohen Syndrome • Pseudohypoparathyroidism type 1A • Turner Syndrome	**Lifestyle**	• Sedentary lifestyle • Decreased physical activity • Sleep deprivation • Smoking cessation • Pregnancy/post-pregnancy • Poor diet • Skipping meals • Snacking • Sugary soft drinks
Certain drugs	• Antipsychotics • Antidepressants • Anticonvulsants • Corticosteroids • Antihyperglycemics • Antihypertensives • Hormonal replacement therapy • Antihistamines	**Dietary**	• Overeating relative to energy expenditure • Increased dietary fat intake • Frequent fast-food consumption • Night-eating syndrome
Psychatic / Psychologial	• Eating disorders • Seasonal affective disorder • Depression / anxiety	**Socioeconomic determinants**	• Education • Low income

Chapter 1

Prevention of Obesity in Children, Adolescents, and Adults

Prevention of Obesity

This can be considered in individual adults who are overweight and at risk for developing obesity, through interventions aimed at attaining a healthy weight or preventing weight gain[10]. This is done by regular assessment of lifestyle factors (e.g., diet, exercise, sleep); (UMHS, level II, Category C).[12]

Preventive lifestyle changes are also important for children, the most effective approach is to modify unhealthy habits of the entire family (Table 4). (UMHS, level II, Category B).[12]

Table 4: Recommendations for the Prevention of Obesity [12]

Lifestyle Assessment Related to Obesity Risk	• Assess BMI at least annually, and monitor for increasing BMI or BMI percentile. • Review dietary and physical activity habits in addition to sleep duration. • Review other obesity risk factors such as medical comorbidities, familial obesity, medication profile, lack of nutrition knowledge or food preparation skills.	**Counseling and Approaches**	• Provide healthy lifestyle promotion messages to all patients. • Discuss weight control interventions for overweight patients to prevent the progression to obesity. • Use patient-centered counseling techniques to improve weight-related attitudes and behaviors. • Encourage a self-management approach, including setting goals for healthy lifestyle habits.
Physical Activity and Exercise	• Encourage adults and children to engage in regular physical activity and decrease sedentary activities.	**Eating Patterns**	• Promote consumption of a variety of nutritious foods. • Limit unhealthy food (high calorie foods and sugar-sweetened beverages). • Address environmental and family factors associated with eating. • Encourage and support breastfeeding during infancy. • Encourage families to create a healthy eating environment that is responsive to hunger and fullness cues. • Discuss ways to access affordable healthy foods. • Promote family meals; limit eating out and fast food. • Limit children's screen time and exposure to food and beverage marketing.
Sleep	• Promote age-appropriate sleep durations.	**General Advice for Children and Adolescents**	• Promote a healthy diet and lifestyle with focus on following the 5-2-1-0 rule: (five servings of fruits and vegetables, less than two hours of screen time, more than one hour of exercise, zero sweetened beverages consumption). • Educate parents about importance of parental role modeling for a healthy lifestyle and parental controls. • Avoid food as a reward.

Chapter 2

Diagnosis and Assessment of Obesity in Children, Adolescents, and Adults

Assessment of overweight and obesity in children and adolescents (aged 2-19 years)

• Overweight and obesity should be assessed by measure height, weight, and calculate BMI , and plot BMI by use the Saudi sex specific BMI for age percentile chart among children and adolescents (see Appendix 4)[13] at every visit in primary and consultative care and in every hospital admission.

• The Growth Chart for Saudi children and adolescent categorizes overweight as between 85th and 94.99th percentile and obesity is equal to or greater than 95th percentile. (Table 5) [16-18]

• There is insufficient evidence regarding the utility of waist circumference measurement in children and adolescents to predict future health risks.[14]

• Presence of parental history of obesity, type 2 diabetes, and cardiovascular disease, which are strong predictors of a child's weight and comorbidities (ICSI, Strong Recommendation, High Quality Evidence) [15]

• Assess child developmental history, physical and mental health, and laboratory investigations and diagnostic tests for current health problems, comorbidities (e.g., raised blood pressure, joint pain, gastrointestinal symptoms, insulin resistance, and dental health), and risks for future disease (ICSI,Strong Recommendation, High-Quality Evidence) [15] (see Appendices 5-3/5-4/5-6) [16,19,20]

Assessment of overweight and obesity in adults

• There are several screening methods for assessing obesity and overweight. While methods include waist to hip and waist to height ratios, the two main methods used in practice are BMI and waist circumference (WC).

• Measure height, weight and calculate Body Mass Index (weight in kilograms divided by height in meters squared) to assess overweight and obesity in adults (Canadian, Level 2a, Grade B)[16] (weight categories based on BMI cutoffs is presented in Table 5)[16-18]

• Measure waist circumference (BMI 25–35 kg/m^2) in addition to BMI to assess for abdominal fat and risk of obesity related comorbidities particularly cardiovascular disease and diabetes (Canadian, Level 2b, and Grade B) .(method for accurately measuring WC is outlined in Appendix 5-1)

• Men with a WC ≥ 102 cm and women with a WC ≥ 88 cm are at increased risk for obesity-related health problems (ICSI, Strong Recommendation, High Quality Evidence)[15]

• Recommended waist circumference cutoff values for both gender depending on ethnicity presented in (Appendix 5-2)[16].

• The BMI has certain limitations that need to be recognized by clinicians using it: [16]
  - BMI is not a direct measure of body fat, cardiovascular risk, or health.
  - BMI can overestimate body fat in muscular individuals.
  - BMI can underestimate body fat in people who have lost muscle mass.
  - BMI does not distinguish between gender or ethnicity.
  - BMI is less accurate in certain populations like the elderly people with physical disabilities.

• Classification of obesity based on specific BMI cutoffs is presented in (Table 5).

Table 5: Weight Classification using BMI Percentile (Pediatric) and BMI (Adult) [16-18]

Pediatric (Age from 2 - 18) BMI percentile classification		Adults BMI (kg/m^2) classification		
			Populations	
Weight Category	Percentile	Weight Category	Caucasian, Europid, Middle-Eastern, Sub-Saharan African	East Asian, South Asian, and Southeast Asian
Underweight	< 5th	**Underweight**	< 18.5	< 18.5
Normal weight	5th – 84 th	**Normal weight**	18.50 – 24.99	18.5 – 22.99
Overweight	85th – 94 th	**Overweight**	25.00 – 29.99	23.0 – 27.4
Class I Obesity	BMI <120 % of the 95th percentile or BMI < 35 kg/m^2	**Class I Obesity**	30.00 – 34.99	27.5 – 32.4
Class II Obesity	BMI ≥ 120 % - < 140 % of the 95th percentile or BMI ≥ 35 kg/m^2	**Class II Obesity**	35.00 – 39.99	32.5 – 37.4
Class III Obesity	BMI ≥ 140 % of the 95th percentile or BMI ≥ 40 kg/m^2	**Class III Obesity**	≥ 40.00	≥ 37.5

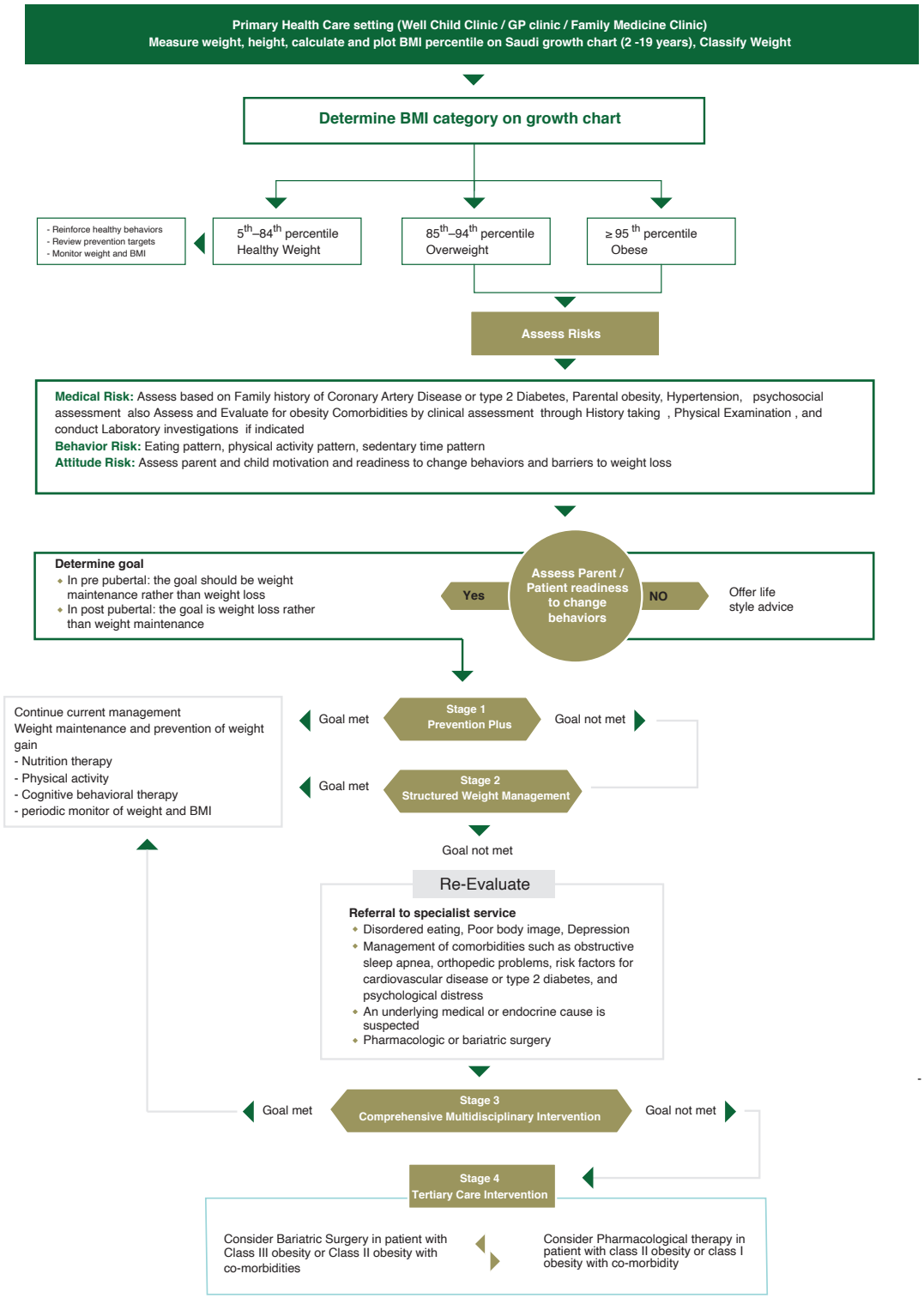
• Patients with a raised BMI (< 35 kg/m^2) and an elevated WC are at an increased risk of developing cardio-metabolic risk factors such as type 2 diabetes and hypertension. However, those with a BMI > 35 kg/m^2 are likely to be at an increased risk of cardio-metabolic risk factors irrespective of their WC (see Appendix 5-5). [16]

• Assess patients with obesity by complete history, physical examination, laboratory investigations and diagnostic tests(see Appendices 5-3/5-4/5-7) [16,19,21] to identify root causes of weight gain as well as complications of obesity and potential barriers to treatment be included in the assessment (Canadian, Level 4, Grade D). [16]

Chapter 3

Weight Management Plan in Children, Adolescents, and Adults

Figure 1: Algorithm for Assessment and Management of Overweight and Obesity in Children 2 years and older [18,22]



This Algorithm was Adapted from 2015 American Academy of Pediatric – Institute for Healthy Childhood Weight

Weight Management Plan

• The primary goal of any intervention is behavior change that results in healthy eating and regular physical activity.[14]
• Obesity and overweight can be managed in primary care by a motivated, well-informed multidisciplinary team.[23]
• weight loss may help control diseases worsened by overweight and obesity and may also decrease the likelihood of developing these diseases.[23]

Weight Goals for children and adolescents

•Use clinical judgment to set weight goals for growing children, depending on the degree of obesity, presence of comorbidities, and stage of growth and development (Table 6).[14,18,19]
•Patients should start at the least intensive stage and advance through the stages based upon the response to treatment, age, BMI, health risks and motivation.[19]

Recommended weight management plan for children and adolescent

•An early start of weight management is recommended for children and adolescents.
•Target weight management for the child or adolescent through a family approach addressing healthy lifestyle behaviors of the whole family (ICSI, Strong Recommendation, High-Quality Evidence [15], and NHMRC, evidence grade PP [24]).
•Frequent contact with health professionals is recommended for children and adolescents (NHMRC, evidence grade B). [24]
•Consider the child's preference, abilities, and strength when choosing lifestyle activities.
•In children and pre-pubertal adolescents, the goal should be weight maintenance rather than weight loss. Maintaining weight during growth will result in a declining BMI and will prevent potential adverse effects.
•In post-pubertal adolescents the goal is weight loss rather than weight maintenance.
•Sustained behavioral changes are essential to achieve weight maintenance and/or weight loss in children (SIGN, evidence grade D). [23]

Table 6: Weight Goals and Intervention Stages According to Age and BMI Categories for Children and Adolescents [14,18,19]

Age group	BMI percentile [1]	Comorbidity [2]	Weight Goal	Intervention treatment Stage [3,4,5,6]
2–5 years	85th–94th percentile	No health risks	Prolonged weight maintenance	Prevention counseling
	85th–94th percentile	Health risks	Prolonged weight maintenance	Stage 1 Prevention Plus [3]
	≥ 95th percentile	No health risks	prolonged weight maintenance or weight loss	Stage 1 Prevention Plus
	≥ 95th percentile	Health risks	Gradual weight loss (not lose more than 0.45 kg per month)	Stage 1 Prevention Plus
6–19 years	85th–94th percentile	No health risks	prolonged weight maintenance or weight loss	Prevention counseling
	85th–94th percentile	Health risks	Weight maintenance or gradual weight loss (not lose more than 0.45 kg per week)	Stage 1 Prevention Plus or Stage 2 Structured Weight Management [4]
6–19 years	95th–98th percentile	Health risks	weight loss (not lose more than 0.45 kg per week)	Stage 1 Prevention Plus or Stage 2 Structured Weight Management or Stage 3 Comprehensive Multidisciplinary Intervention [5]
	≥ 99th percentile	Health risks	Weight loss (not lose more than an average of 0.9 kg per week)	Stage 1 Prevention Plus or Stage 2 Structured Weight Management or Stage 3 Comprehensive Multidisciplinary Intervention Stage 4 Tertiary Care Intervention [6]

1 The BMI percentile indicates the relative position of the child's BMI among children of the same age and gender.

2 Comorbidities include mild hypertension, dyslipidemias, insulin resistance, pseudo tumor cerebri , sleep apnea, obesity hypoventilation syndrome, fatty liver, and orthopedic problems.

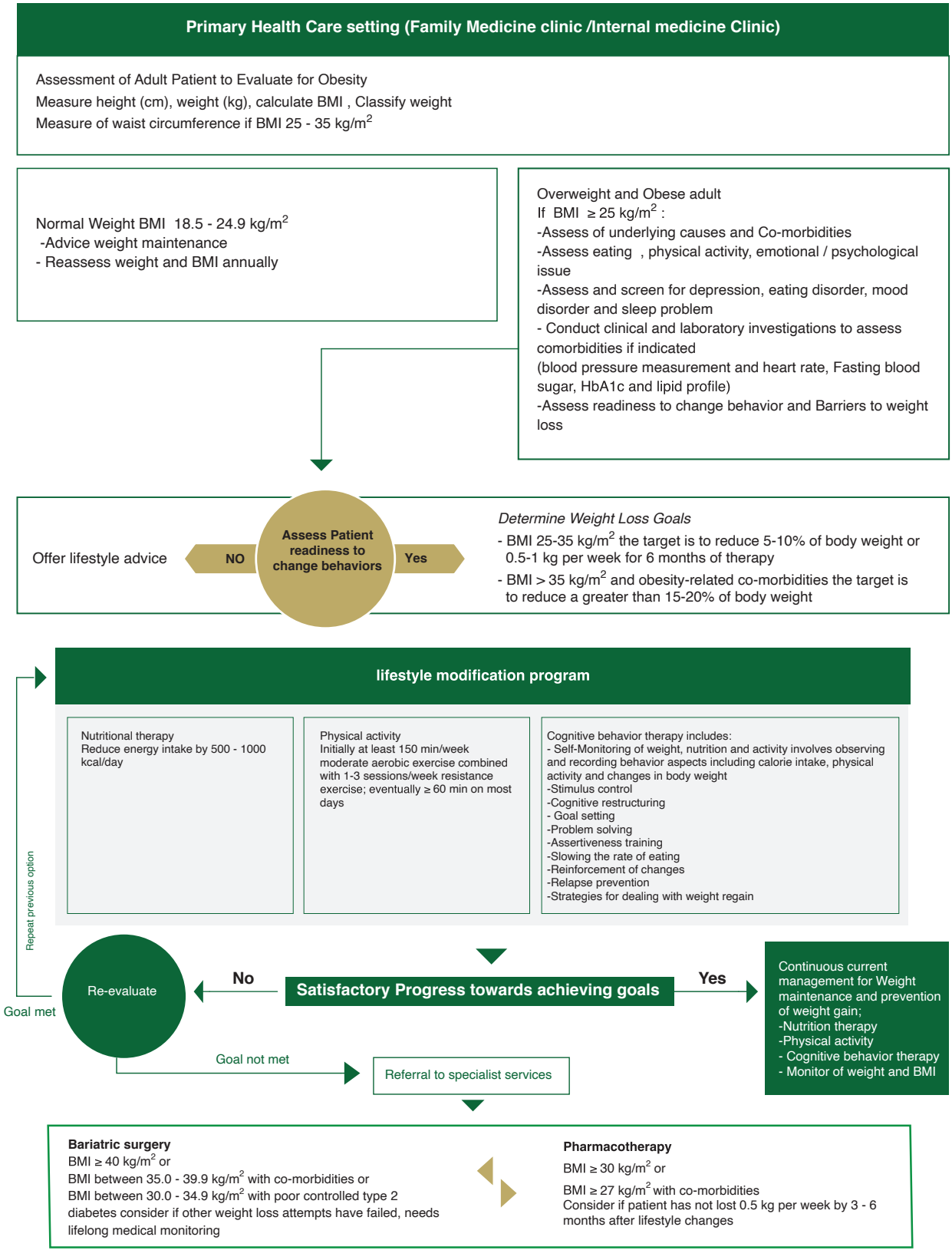
3 Treatment Stage 1: **Prevention Plus**
- Planned follow up themed visits(15-20 min) Focus on healthy lifestyle behaviors appropriate based on patient and family readiness to change
- Consider partnering with dietician , primary care provider ,physical therapist for added support and counselling by motivational interviewing
- Monthly follow up visits recommended to each patient at Primary Care Office, After 3-6 months, if the BMI/weight status has not improved, consider advancing to Stage 2

4 Treatment Stage 2 : **Structured Weight Management**
- Same intervention as stage 1 but with more intense support and structure by Focus on targeted behaviors eating and exercise plans outlined and presented to the child and family by dietician to achieve healthy behavior change
- Follow up visits every 2-4 weeks , After 3-6 months, if the BMI/weight status has not improved, consider advancing to Stage 3

5 Treatment Stage 3: **Comprehensive Multidisciplinary Intervention**
- Same intervention as stage 2 but Increased intervention intensity with maximal support for behavioral changes
- Multidisciplinary approach including health provider, behavioral counselor, registered dietician and exercise specialist
- Weekly follow up visits for a minimum of 8–12 weeks at a pediatric weight management center, after 3-6 months, if the BMI/weight status has not consider advancing to Stage 4

6 Treatment Stage 4: **Tertiary Care Intervention**
- Recommended for children with severe obesity who fail to improve following successful intervention of initial stages at Pediatric Weight Management Center
- Includes consideration of pharmacologic intervention, restriction diets and bariatric surgery

Figure 2: Algorithm for the Assessment and Management of Overweight and Obesity in Adults [23,25]



This Algorithm was adapted from 2006 Canadian clinical practice guideline and SIGN guideline

Health Benefits of Weight loss in adults

Weight loss targets should be based on the individual's comorbidities and risks, rather than their weight alone: [23]

• Patients with BMI 25-35 kg/m^2 and obesity-related comorbidities are less likely to be present and a 5-10 % weight loss is required for cardiovascular disease and metabolic risk reduction (SIGN, evidence grade D).[23]

• Patients with BMI > 35 kg/m^2 and obesity-related comorbidities are likely to be present therefore weight loss interventions should be targeted to improving these comorbidities; and a greater than 15-20 % weight loss will be required to obtain a sustained improvement in comorbidity (SIGN, evidence grade D). [23]

Recommended weight management plan for adults

• The objectives of preventing adulthood overweight or obesity are to reduce the risk of comorbidities and enhance healthy lifestyle behaviors.

• Health care providers can manage obesity in adults using the 5 As framework (see Appendix 6-1) [26] to initiate the discussion by asking for their permission and assessing their readiness to begin treatment (Canadian, Level 4, grade D). [16]

• Assess for readiness to change lifestyle behaviors

• Assess readiness for change in adults who are overweight or obese (NHMRC, evidence grade D).[24]

• Inform all obese or overweight adults that modest or even minor weight reduction could bring health benefits (NHMRC, evidence grade D)[24] including:

- Decreasing cardiovascular risk (reduced blood pressure and improved lipid profiles (NHMRC, evidence grade A). [24]
- Preventing, delaying progression of, or improving control of type 2 diabetes (NHMRC, evidence grade A)[24], kidney disease, sleep apnea, musculoskeletal problems (NHMRC, evidence grade B)[24], gastro-esophageal reflux or urinary incontinence (NHMRC, evidence grade C).[24]
- Improving quality of life, self-esteem and depression (NHMRC, evidence grade C).[24]

• Life style modification e.g. physical exercise and reduced energy intake is likely to produce some health benefits even without actual weight loss (NHMRC, evidence grade C)[24]

• On discussing weight management with the patient and family, health professionals are encouraged to create a nonjudgmental atmosphere and to address barriers to weight management (Canadian, evidence grade C, level 4).[16]

Referral for specialist support should be considered in the following circumstances

• Specialist services may be required for the following in children and adolescents (SIGN, Grade D [23] , and NHMRC, Evidence Grade D [24]) :

- Disordered eating, Poor body image, Depression and anxiety
- Presence of comorbidities (e.g., obstructive sleep apnea, orthopedic problems, risk factors for cardiovascular disease or type 2 diabetes, and psychological distress).
- Suspected underlying medical or endocrine cause
- Concerns about height and development.
- Pharmacological therapy or bariatric surgery may be considered in post-pubertal adolescents with severe obesity (BMI ≥ 40 kg/m^2 or 140 % of the 95th percentile Or BMI ≥ 35 kg/m^2 or120% of the 95th percentile with clinically significant co-morbid conditions), who failed to respond to lifestyle interventions for at least 6 months

• Pharmacologic treatment in adults may be considered as adjunct to lifestyle interventions in individuals with a BMI ≥ 30 kg/m^2 or BMI ≥ 27 kg/m^2 with an obesity-related comorbidity , who failed to respond to lifestyle interventions for at least 6 months (Canadian, evidence grade B, level 2a). [16]

• Refer for specialist services for comorbidities such as musculoskeletal disease, endocrine disease, sleep apnea, type 2 diabetes, or when a very-low-energy diet is recommended (NHMRC, Evidence Grade D).[24]

• Refer adults with the following characteristics for bariatric surgery:

- BMI ≥ 40 kg/m^2 without comorbidities.
- BMI 35-39.9 kg/m^2 with at least one serious comorbidity including type 2 diabetes, hypertension, obstructive sleep apnea, or limitations in the quality of life (NHMRC, Evidence Grade D). [24]
- BMI 30-34.99 kg/m^2 with metabolic syndrome or diabetes that is uncontrolled with medical therapy.

Plan for regular monitoring of weight management in children and adolescents:

Follow up the cases regularly every 3 months (NHMRC, Evidence Grade PP) [24]

Chapter 4

Lifestyle and Behavioral Interventions for obesity in Children, Adolescents, and Adults

Lifestyle and Behavioral Interventions in Obesity Management

The lifestyle modification approach is considered the cornerstone of treatment for overweight and obese individuals. It should focus on changing health behaviors, consumption of a healthy diet, and performing physical activity (see Appendix 8-1) [27]

• Psychological interventions should be part of any weight management program (SIGN, evidence grade A).[23] (see Appendix 8-2) [23,34]

• It should be adjusted to circumstances of the individuals or their families. The objectives are to decrease dietary energy intake, increasing physical activity, and decreasing sedentary behaviors (SIGN, evidence grade B).[23]

Effective psychological and behavioral interventions in obesity management

Multicomponent psychological interventions should be incorporated into care plans for weight loss and improved health status and quality of life (Canadian ,Level 1a, GradeA)[16] in a manner that promotes adherence, confidence and intrinsic motivation (Canadian ,Level 1b, Grade A).[16]

Children and adolescents

- Discourage sedentary behavior of more than two hours for children, particularly for screen time, like watching TV, computer use, and playing video games (ICSI, strongrecommendation, High-quality evidence).[15]
- Encourage leading an active daily life including activities such as walking, cycling, skipping, and using the stairs, and support them to practice regular physical activity appropriate for their age and ability such as football and swimming (ICSI, Strong Recommendation, moderate-Quality Evidence). [15]
- Encourage a family approach to physical exercise (e.g., walking and cycling to school and shops, going to the park, or swimming).
- Perform at least 60 minutes of moderate to vigorous exercise daily, continuous or accumulated in short bouts (ICSI, Moderate Recommendation, High-Quality Evidence). [15]
- Encourage children to have regular meals in a sociable atmosphere (ICSI, Strong Recommendation, High-Quality Evidence).[15]
- Encourage children to eat a nutrient-dense breakfast daily (ICSI, Strong Recommendation, High-Quality Evidence).[15]
- Discourage eating energy-dense foods, like fast food (ICSI, Strong Recommendation,High-Quality Evidence). [15]
- Advice on available healthy food choices. (ICSI, Strong Recommendation, moderate-Quality Evidence). [15]
- Encourage drinking water instead of sugary and energy drinks (ICSI, Strong Recommendation, and High-Quality Evidence). [15]
- Advise separating eating from other activities, e.g., watching television (ICSI, Strong Recommendation, moderate-Quality Evidence). [15]

Adults

- Lifestyle modification should target reducing energy intake, increasing energy expenditure, and assisting in behavioral change [27] (NHMRC, evidence grade A) [24]
- An optimal dietary plan for achieving healthy body weight should be developed with a team of qualified and experienced health professionals together with the individual and family.[16]
- Discuss weight management with the patient and family.(Communication Guidelines to Promote Health Behavior Change is presented in Appendix 6-2) [28]
- It is encouraged to create a nonjudgmental atmosphere and to address barriers to weight management (Canadian, evidence grade C, level 4)[16]
- Encourage overweight or obese individuals to be physically active and to avoid sedentary behavior (SIGN, evidence grade B).[23]
- Moderate-intensity activity for at least 150 minutes per week or 30 minutes per day for most days of the week is recommended.
- For weight maintenance, 200–300 minutes or more of physical activity per week is recommended and, again, depending on its

Lifestyle and Behavioral Interventions in Obesity Management

intensity, unless medically contraindicated.

- Prescribe a volume of physical activity that produces energy deficit of approximately 1,800 - 2,500 kcal/week. This could be achieved through five sessions of 45–60 minutes per week of moderate-intensity physical activity, or lesser durations of vigorous physical activity (SIGN, evidence grade B)[23] ; however, the individuals can perform multiple, small sessions of at least 10 minutes duration during the day to accumulate the required physical activity volume.
- Clinically assess the individual's physical fitness to perform the required physical exercise.
- Build up the pace of physical activity gradually over time. The volume of physical exercise should be sustainable and tailored to the individual's condition (Canadian, evidence grade A, level 2): [16]
  - Sedentary individuals should start with 10–20 minutes of physical activity every other day during the first 2 weeks.
  - Vigorous-intensity activity should be introduced gradually after an initial 4 to 12 week period of moderate-intensity activity.
  - Encourage non-weight-bearing moderate-intensity physical activities (e.g., cycling, swimming, water aerobics) for obese patients suffering from joint problems (BMI over 35 kg/m^2).
  - Brisk walking can be classified as moderate-intensity physical activity in obese individuals. Walking one kilometer on a flat ground burns approximately 60 kcal for a 70 kg person and 90 kcal for a 100 kg person.
- For further information about examples of physical activity intensity (see Appendix 7-1) [29] , Physical activity recommendations for different age groups (see Appendix 7-2). [30] , Exercise Recommended for Obese Patients presented in (Appendix 7-4) [32-33]
- Prescribe a diet to achieve reduced calorie intake for obese or overweight individuals who would benefit from weight loss, as part of a comprehensive lifestyle intervention. Any one of the following methods can be used to reduce food and calorie intake:

  a) Prescribe 1,200–1,500 kcal/day for women and 1,500–1,800 kcal/day for men (kcal levels are usually adjusted for the individual's body weight).

  For more information about estimated caloric need per day by age, gender, and physical activity level, (see Appendix 7-3) [31]

  b) Prescribe a 500 kcal/day or 750 kcal/day energy deficit. Attention should be given to the individual's dietary preferences (NHMRC, evidence grade A). [24]

  c) Prescribe one of the evidence-based diets that restrict certain food types (such as highcarbohydrate foods, low-fiber foods, or high-fat foods) in order to create an energy deficit by reduced food intake.
- Provide advice on dietary modification appropriate to the patient's condition (type, quantity, and/or frequency) to achieve and maintain a hypo-caloric intake (a high-protein or low-fat diet with acceptable macronutrient-distribution range). Patients should be advised to:
  - Choose Low-energy-dense foods (e.g., whole grains, cereals, fruits, vegetables, and salads) and reduce intake of energy-dense foods (e.g., animal fats, sugary drinks) (SIGN, evidence grade B)[23]. For further information about dietary recommendations to promote weight loss presented in (Appendix 7-5). [12]
  - Reduce consumption of fast food; and
  - Weigh themselves regularly (SIGN, evidence grade B)[23]
- A dietary prescription targeting either the larger nutrient (i.e., energy and macronutrients) ordietary-pattern-based changes has been shown to be efficacious at producing clinically meaningful weight loss.
- Strictly supervise patients on very-low-calorie diets prescribed for rapid weight loss (SIGN, evidence grade D)[23]

Table 8: The Eat Well Plate Guide [23,34]

Food group	Recommendation
Bread, rice, potatoes, pasta, and other starchy foods	Eat plenty, choose whole-grain varieties when you can
Fruits and vegetables	Eat plenty, at least 5 portions of a variety of fruit and vegetables a day
Milk and dairy foods	Eat some, choose lower fat alternatives whenever possible or eat higher fat versions infrequently or in smaller amounts
Meat, fish, eggs, beans, and other non-dairy sources of protein	Eat some, choose lower fat alternatives whenever possible or eat higher fat versions infrequently or in smaller amounts. Aim for at least two portions of fish a week, including a portion of oily fish
Foods and drinks high in fat and/or sugar	Consume just a small amount

Source : SIGN Guideline

For further information on diet plans to lose weight, see “Calories Guideline to Lose Weight”[35] ,available at: https://www.moh.gov.sa/Ministry/About/Health20%Policies/022.pdf

Chapter 5

Pharmacotherapy for Obesity Management in Adolescents and Adults

Pharmacotherapy for Obesity Management

• Pharmacological treatment of overweight and obesity should be considered as part of a comprehensive management plan.[36] Orlistat and Liraglutide medications are approved by the Saudi Food and Drug Authority for obesity management (see Table 9). [37,38]

• Pharmacotherapy for weight loss can be used for individuals with BMI ≥ 30 kg/m^2 or BMI ≥ 27 kg/m^2 with adiposity-related complications, in conjunction with medical nutrition therapy, physical activity and psychological interventions[40] liraglutide 3.0 mg (Canadian, Level 2a, Grade B)[16], orlistat (Canadian ,Level 2a, Grade B)[16]

• In obese pre-pubertal children, pharmacological therapy is generally not recommended, and can be considered only treatment with orlistat under supervision of a specialized team if severe comorbidities are present (e.g., orthopedic problems, sleep apnea, severe psychological disease). (Canadian, level 4 , evidence grade C [16], and NICE, 2006, amended 2014).[39]

• Discuss with the patient the potential benefits, limitations, drug side effects, and the temporary nature of weight loss achieved with medications before initiating therapy (NICE, 2006, amended 2014).[39]

• The efficacy of pharmacotherapy should be evaluated after the first 3 months. If weight loss achieved is satisfactory, treatment should be continued. (Canadian, evidence grade A, Level 1) [16]

• Specific considerations for choosing weight loss medications in patients with certain comorbidities are listed in (Figure 3). [40]

• The use of obesity pharmacotherapy is not recommended in pregnant or breastfeeding women, or in women who are trying to conceive.[36]

• For people living with overweight or obesity who require pharmacotherapy for other health conditions, choosing drugs that are not associated with weight gain is recommended [36] (Table 10). [41,42] (Canadian, Level 4, Grade D, Consensus).[16]

Table 9: Characteristics of Medications Approved for the treatment of Overweight and Obesity [37,38]

Agent	Drug Class/ Mechanisms	Side effects	Contraindications / Drug interactions	Dose / frequency
Orlistat	**Reversible gastrointestinal lipase inhibitor;** decrease lipid absorption	**Common** Loose, oily stools, flatus **Rare** Liver failure, Nephrolithiasis, Acute kidney injury	**Contraindications** - Pregnancy and breastfeeding - Cholestasis, liver failure, nephrolithiasis, acute kidney injury - Chronic malabsorption syndrome **Drug interactions** - Fat-soluble vitamins - Oral anticoagulants - Levothyroxine - Cyclosporine - Anticonvulsants	120 mg capsule TDS with each main fatty meals
Liraglutide	**Glucagon-like peptide -1 receptor agonist** that in addition to stimulating insulin release and inhibiting glucagon secretion, slows gastric emptying and increases satiety after eating	**Common** (nausea, vomiting, diarrhea, constipation, abdominal pain, dyspepsia, abdominal distension, headache, dizziness, fatigue) - Hypoglycemia (usually in patients with DM on hypoglycemic medications) **Rare** Cholelithiasis , pancreatitis	**Contraindications** - Pregnancy and breastfeeding - Personal or family history of medullary thyroid cancer or MEN 2 - Past history of pancreatitis - Hypersensitivity to liraglutide **Drug interactions** May affect absorption of medications due to slowing of gastric emptying	Initiate dose titration with 0.6 mg daily, subcutaneously injection for 1 week; increase daily dose by 0.6 mg weekly until reaching a target dose of 3mg

Figure 3: Algorithm for Choice of Overweight and Obesity Pharmacotherapy [40]

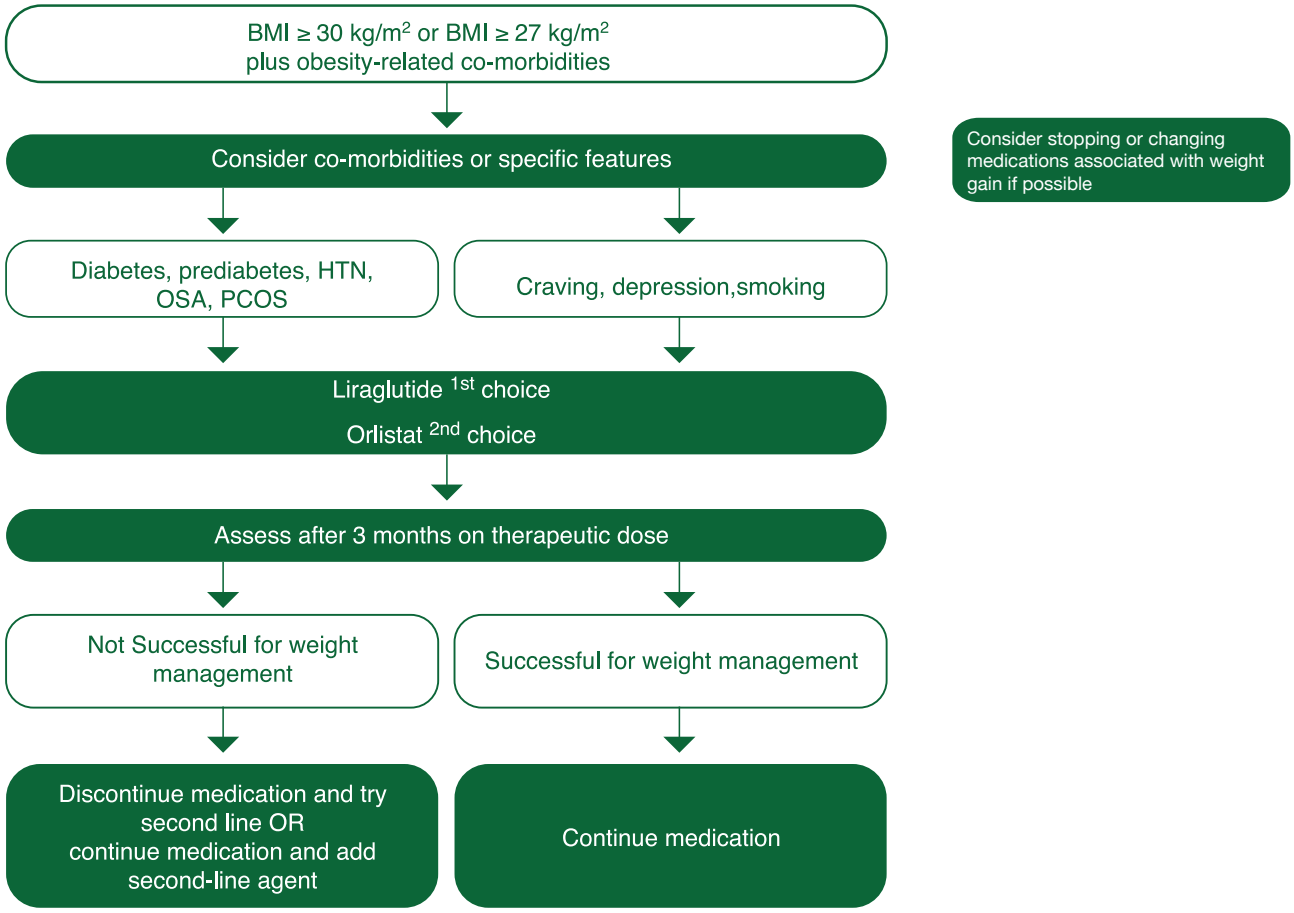


Table 10: Common medications associated with weight gain and alternative therapy [41.42]

Drug Category	Drug Class associated with Weight Gain	Alternative therapy
Antipsychotics	- Quetiapine - Clozapine - Olanzapine - Risperidone - Thioridazine	- Aripiprazole - Haloperidol - Ziprasidone
Antidepressants	- Mirtazapine - SSRIs (paroxetine ,sertraline, citalopramb, escitalopramb, fluoxetineb) - MAOIs (phenelzine) - Tricyclic antidepressants (amitriptyline, clomipramine, doxepin, imipramine, nortriptyline, protriptyline)	- Bupropion - Desvenlafaxine - Venlafaxine
Anticonvulsants Or Mood stabilizers	Gabapentin ,Pregabalin, Carbamazepine , Divalproex , Lithium ,Valproic acid , Vigabatrin	Topiramate , Lamotrigine Zonisamide
Hormone replacement therapy	Progestins (medroxyprogesterone, megestrol acetate)	Copper Intrauterine Device
Corticosteroids	- Prednisone - Methylprednisolone - Hydrocortisone	- NSAIDs -Biologic/disease modifying antirheumatic drugs
Antihyperglycemics	- Insulin - Sulfonylureas (chlorpropamide ,glimepiride, glipizide, glyburide) - Meglitinides (nateglinide,repaglinide) -Thiazolidinedione (pioglitazone, rosiglitazone)	-Metformin, GLP-1 receptor agonists (semaglutide,liraglutide, exenatide, dulaglutide, lixisenatide) -SGLT-2 inhibitors(empagliflozin,canagliflozin,dapagliflozin, ertugliflozin) - Pramlintide -Alpha-glucosidase inhibitors (acarbose , miglitol) -Dipeptidyl-peptidase-4 inhibitors(alogliptin, linagliptin, saxagliptin,sitagliptin)
Antihypertensives	- Alpha-blockers (Terazosin) - Beta-blockers (Metoprolol , Atenolol ,Propranolol)	Doxazosin, Alfuzosin, Tamsulosin Carvedilol ,Nebivolol , ACEIs, ARBs, Diuretics, CCBs
Antihistamines	- Cetirizine - Cyproheptadine	Ipratropium nasal spray, decongestants, inhalers, nasal irrigation

Chapter 6

Bariatric Surgery Interventions for Obesity in Adolescents and Adults

Bariatric surgery interventions

- Bariatric surgery should be considered as part of a comprehensive treatment for adults delivered by a multidisciplinary team including GP, bariatric physician, surgeon, dietitian, nurse, social worker and psychologist (SAGES, level III, Grade C [43], and Canadian, Level4, Grade D, Consensus [45])
- The components include determining the patient's indications for surgery, identifying issues which may interfere with the success of the surgery, and assessing and treating comorbid diseases (Canadian, Level 4, Grade D, Consensus).[45]
- Assessment for medical, nutritional evaluation, and assessment for psychological stability should be undertaken for patients undergoing bariatric surgery (SAGES, level III, Grade C).[43] Receiving psychological treatment does not prevent patients from undergoing bariatric surgery (SAGES evidence level II, Grade B).[43]

- **Indications for weight loss surgery are as follows:** [43,45]
  - Adults with BMI ≥ 40 kg/m^2 without comorbidities (SAGES, level I, Grade A [43], and Canadian, Level 4, Grade D ,Consensus) [45].
  - Adults with BMI 35–39.99 kg/m^2 with at least one of the serious comorbidities including type 2 diabetes, hypertension, obstructive sleep apnea, or limitations in the quality of life (SIGN, Grade C[23], and Canadian, Level 2, Grade B [45]), who are unsuccessful in meeting their initial weight loss goals in 6 months (UMHS,Level II, Grade B) [12] .
  - Adults with BMI 30–34.99 kg/m^2 with metabolic syndrome or diabetes that is uncontrolled with medical therapy (NHMRC, Grade PP [24], and Canadian, Level 1a, Grade A)[45] .
- Consider bariatric surgery in adolescents with BMI ≥ 35 kg/m^2 or 120 % of the 95th percentile with clinically significant comorbid conditions such as obstructive sleep apnea (apnea-hypopnea index > 5), type 2 diabetes, idiopathic intracranial hypertension, nonalcoholic steatohepatitis, Blount's disease, gastroesophageal reflux disease, or hypertension; or BMI ≥ 40 kg/m^2 or 140 % of the 95th percentile. (SAGES, Level II, Grade B [43], Canadian, Level 4,Grade C[45]).
- Preoperative evaluation and collaborative support from clinical dietitian are recommended for all patients considering bariatric surgery (Canadian, Level I, Grade A)[45] .

- **Intragastric balloon** is [44] a safe and effective procedure for weight reduction, but, unfortunately, the results are temporary and almost all patients return to their initial weight after balloon removal if no lifestyle modifications are made.[44]

Table 11: Summary of common Bariatric Surgery Procedures [41,43,46]

Sleeve gastrectomy	
Method of weight loss	Restrictive
Expected weight loss	60 % - 70 % after 1-2 years of surgery
General	• Hospital stay: 1-2 days • Recovery: 1-2 weeks
Contraindications	Poor surgical candidates - Sever psychiatric disorder - Intolerance to general anesthesia -Pregnancy -Drug or alcohol addiction - Untreated or sever esophagitis - Barrett's esophagus - Sever gastroparesis -Achalasia - Previous gastrectomy
Acute complications	Bleeding - Anastomotic leak - Deep vein thrombosis - Pulmonary embolism - Dehydration
Chronic complications	Weight regain - Stenosis - Gallstone formation - Fistula formation - Rare nutritional deficiencies -Raremacrocytic anemia (due to B12 deficiency) - Depression - GERD - Neuropathies (resulting fromnutritional deficiencies) - Potential need to reoperate
Laparoscopic adjustable gastric banding	
Method of weight loss	Restrictive
Expected weight loss	40 %- 50 %
General	• Hospital stay :One-day • Recovery: one week
Contraindications	Poor surgical candidates - Sever psychiatric disorder - Intolerance of general anesthesia - Pregnancy -Drug or alcohol addiction - Untreated or sever esophagitis - Achalasia
Acute complications	Band too tight with upper GI obstructive symptoms (e.g., dysphagia) - Gastric perforation - Hemorrhage - Deep vein thrombosis
Chronic complications	Weight regain - Band slippage, erosion ulceration, infection, disconnection and displacement - Esophageal dilation - Rare nutrient deficiencies if persistent vomiting or marked and sustained decrease in nutritional intake - Pouch enlargement - Potential need to reoperate – GERD
Mini gastric bypass (MGB)	
Method of weight loss	Restrictive and malabsorptive
Expected weight loss	70 % - 80 % after 1 year of surgery
General	• Hospital stay: 2-3 days • Recovery: 2-4 weeks
Contraindications	Poor surgical candidates - Sever psychiatric disorder - Intolerance of general anesthesia - Pregnancy - Drug or alcohol addiction - Sever gastroparesis - Achalasia
Acute complications	Gastrointestinal obstruction - Bleeding - Anastomotic leaks - Deep vein thrombosis - Pulmonary embolism - Dehydration
Chronic complications	Weight regain - Bile reflux - Marginal ulcer / perforation - Gallstone formation - Small bowel obstruction - Anastomotic stricture - Anastomotic leak - Upper GI bleeding - Calcium deficiency - Iron deficiency - Protein malnutrition - Other nutritional and mineral deficiencies - (e.g., deficiency of vitamins A, C, D, E, B, and K, folate, zinc, magnesium, thiamine, etc.) - Anemia (often related to mineral and nutritional deficiencies) - Kidney stones - Neuropathies (resulting from nutritional deficiencies)
Gastric bypass	
Method of weight loss	Restrictive and malabsorptive
Expected weight loss	70 % - 80 % after 2 years of surgery
General	• Hospital stay: 2-4 days • Recovery: 2-4 weeks
Contraindications	Poor surgical candidates - Sever psychiatric disorder - Intolerance of general anesthesia - Pregnancy - Crohn's disease - Drug or alcohol addiction - Unwillingness or an inability to commit to appropriate long-term follow-up
Acute complications	Gastrointestinal obstruction – Bleeding - Anastomotic leaks - Deep vein thrombosis - Pulmonary embolism – Dehydration
Chronic complications	Weight regain - Marginal ulcer - Upper GI bleeding - Gastric remnant syndrome - Dumping syndrome with reactive hypoglycemia - Internal hernia - Small bowel obstruction - Fistula - Anastomotic stricture - Calcium deficiency - Secondary hyperparathyroidism - Iron deficiency - Protein malnutrition - Other nutritional and mineral deficiencies - (e.g., deficiency of vitamins A, C, D, E, B, and K, folate, zinc, magnesium, thiamine, etc.) - Anemia (often related to mineral and nutritional deficiencies) - Metabolic acidosis - Kidney stones - Neuropathies (resulting from nutritional deficiencies) - Depression - Potential need to reoperate

Follow up care after bariatric surgery [47,48]

-Complications may occur following bariatric surgery, and may differ depending on the type of procedure used. Appropriate assessment is therefore necessary on a regular basis. If complications occur, they will need to be followed up by the appropriate specialist team or surgeon.

-The role of primary care health professionals is to monitor the individual based on the specialist team or surgeon's advice, check on compliance where appropriate and refer as appropriate.

-Primary healthcare professionals have a continuing role in the care of people who have had bariatric surgery for a minimum of 2 years after their operation within bariatric service and this should include:

- Monitoring and treating comorbidities, including psychological distress and risk of suicide
- Continuing to promote the benefits of physical activity and healthy eating
- Assessing nutritional status, including for micronutrient and vitamin deficiencies that might develop over time
- Providing support for behavioral change (e.g. brief intervention, referral for psychological therapy)
- Providing support for healthy nutrition (e.g. developing an eating plan or providing referral to a dietitian) and sustained levels of physical activity (e.g. referral to an exercise program)
- Arranging re-assessment and re-intervention as required (e.g. regular review of laparoscopic adjustable gastric bands by a bariatric clinician is necessary for reassessment of the stability and integrity of the prosthesis).

Follow-up visits

Patients who had bariatric surgery are scheduled for routine office visits at 2 and 4 weeks following discharge, then at 3 ,6 ,9 ,12 ,18, and 24 months, then annually with a primarycare physician, and then as per the patient's condition (Canadian, Level 4, grade D, Consensus).[47]

Management Complications after Bariatric Surgery

Patients undergoing bariatric surgery should be prepared to recognize complications (Table 12) [41,43,46] and to follow instructions regarding dietary progression, nutritional supplementation, and exercise (Canadian, Level 4, grade D, Consensus).[47]

Table 12: Management of Complications After Bariatric Surgery*

Complications	Presentation	Management plan
Wound infection	Redness around the incisions, abscess, foul smell from the incisions, increased tenderness and swelling of the wound	Antibiotics Referral for surgical debridement
Anastomotic leak	Tachycardia ,worsening abdominal pain, fever, leukocytosis and oliguria	Presence of these symptoms should prompt urgent referral to the surgical team
DVT	Severe pain, swelling, tenderness and skin redness in leg, arm, or other areas of the body	Presence of these symptoms should prompt emergency referral
Dumping syndrome There are two types of dumping (early dumping happens 10-30 minutes after a meal, late damping happens 1-3 hours after a meal)	Abdominal pain, bloating, facial flushing, palpitations, sweating, nausea, vomiting, diarrhea, agitation, tachycardia, and hypotension and dizziness or fainting These symptoms often occur after meals rich in simple carbohydrates	Dietary modification, with small, regular meals containing protein and complex carbohydrates Acarbose may be helpful in some refractory cases If no improvement, refer to registered dietitian
Marginal ulcers	Epigastric pain and nausea If severe, marginal ulcers may be complicated by gastrointestinal bleeding or perforation	-Discontinue use of tobacco, aspirin, and NSAIDs to avoid ulcers - Prescribe PPIs
Cholelithiasis	Upper abdominal pain after bariatric surgery, because rapid weight loss promotes gallstone formation	-Prescribed ursodeoxycholic acid 300 mg orally BID for six months to prevent gallstone formation -Cholecystectomy may be recommended for select patients
Nephrolithiasis	RYGB patients are prone to an increase in oxaluria that can promote kidney stones and can progress to oxalate nephropathy and renal failure. Therefore, patients should be counseled to avoid dietary oxalate	Treat with hydration using normal saline or Ringer's lactate for few days
Depression	Decrease dose of serotonin reuptake inhibitor antidepressant after RYGB Patients with mental illness may be at risk for exacerbation of depressive symptoms and should be monitored closely after RYGB	Referral to psychologist
Stenosis	Dysphagia or vomiting	- Referral to hospital for upper GI barium studies - manage with endoscopic dilation - surgery indicated in refractory cases
Internal hernia after gastric bypass	Unexplained intermittent abdominal pain Patient will often describe as burning, tearing, and sharp, dull pain, nausea, vomiting, and nonspecific gastrointestinal symptoms. Diagnosis can be difficult. Abdominal x-ray (three views) may not show the classic air-fluid levels because the obstruction is proximal, CT can reveal the subtle rotation of mesenteric vessels (whirl sign) that suggests an internal hernia	Referral to bariatric surgeon for urgent CT abdomen and management to avoid small bowel gangrene

*In case of acute / chronic complications after bariatric surgery ,patient referral to secondary care is highly recommended

Post-surgery adjustments

In addition to recognizing and addressing any postoperative complications, patients must be prepared to make other adjustments.

Nutritional Supplementation

• Metabolic deficiencies can be created by Bariatric surgery and , therefore, routine office visits are scheduled for screening and assessment of nutritional deficiencies and monitoring by laboratory evaluations that include serum calcium, iron, vitamin B12, vitamin D, folate, and thiamine (Table 14). (Canadian, Level 4 , Grade D, Consensus). [47]

• The usual follow-up laboratory tests are requested and refill medications are adjusted according to the results.

• Bariatric surgery patients should receive periodic counseling by a dietician about long-term dietary modifications (Canadian, Level 4 , Grade D, Consensus).[47]

Table 13: Laboratory Monitoring After Bariatric Surgery

Bariatric surgery procedures	Laparoscopic adjustable gastric banding (LAGB) or laparoscopic sleeve(LS)	Roux-en-Y gastric bypass (RYGB)	Comment
Lab values to monitor	CBC, FBS, electrolytes, LFT, albumin, iron profile, ferritin, vitamin B12, folate, urea, creatinine, calcium, vitamin D, parathyroid hormone	Same as for LAGB / LS + vitamin A, zinc, copper	Screen for thiamine for at-risk patients who have clinical features related to thiamine deficiency
Frequency of tests	At 3 ,6, and 9 months after surgery for 2 years, then annually		

Recommended Supplementations [48]

All post-bariatric-surgery patients should take vitamin/mineral supplements to prevent vitamin and mineral deficiency complications (Canadian, Level 4, Grade D, Consensus) [47]

Table 14: Recommended Supplementation for the Prevention and Treatment of Nutritional Deficiencies [48]

Nutrient	Measurement(threshold for deficiency)	Symptoms of Deficincy	Recommended freqyency of screening	Recommended supplement for prevention	Recommended supplement for treatment of deficiency
Protein	Serum albumin (<3.5 mg/dL)	Oedema, weakness, decreased muscle mass	Every 6 months for 2 years, then annually	60-120 g/d protein or 1.1 g/kg ideal body weight	1st Line: oral lactose-free supplementation rich in branched chain amino acids; 2nd line: enteral or parenteral nutrition
Calcium	Ionized calcium (<4.48 mg/dL)	Low bone density, osteoporosis, paresthesia, muscle spasms, tetany	Calcium and PTH every 6 months for 2 years, then annually	1200-2000 mg/d calcium citrate or dietary	1st Line: intensify calcium and vitamin D supplementation; 2nd line: IV bisphosphonates for osteoporosis
Vitamin B1 (thiamine)	Serum thiamine (<10 mcg/L)	Dry beriberi, wet beriberi, Wernicke's encephalopathy	Optional screening starting at 3 months; check every 6 months for 2 years, annually thereafter	6 mg/d oral	Subclinical: 100 mg/d oral Clinical symptoms: 100-200 mg IV/IM With psychoses and Wernicke's encephalopathy: -300 200 mg/d IV for 3 days, followed by 250 mg/d IV until clinical improvement
Vitamin B12 (cobalamin)	Serum vitamin B12 (<200 pg/ mL) Serum homocysteine increases sensitivity when symptomatic (<10 mcmol/L)	Macrocytic anemia, fatigue, glossitis, paresthesia, sensory deficits, ataxia, dementia	Every 6 months for 2 years, then annually	50-600 mcg/d Oral, or 1000 mcg/month IM, or 3000 mcg IM every 6 months	Symptomatic: 1000-2000 mcg/d oral, or 1000 mcg/wk IM Clinical symptoms: 1000 mcg/d IM/SC for 5-7 days, then 1000 mcg/ wk IM/SC for 4-5 weeks, then monthly indefinitely
Vitamin A	Serum vitamin A (<38 mcg/dL) or serum RBP/TTR ratio (<0.37)	Symptoms are rare, but include dry hair, decreased immunity, xerophthalmia	Optional annually	5,000-10,000 IU/d Oral	50,000 IU/d oral If corneal lesions: 50,000 - 100,000 IU/d IM for 2 weeks (should not exceed 10,000 IU if pregnant)
Folic acid	Serum folate (<4 nmol/L)	Macrocytic anemia, fatigue, neural tube defects	Every 6 months for 2 years, then annually	400 - 1000 mcg/d oral	1000 mcg/d oral
Vitamin D	25-OH vitamin D (<20 ng/mL)	Osteomalacia, fractures, depression, myalgia, bone pain	Every 6 months for 2 years, then annually	- 2000 IU/d for malabsorptive procedures - 1000 IU/d for LSG - 3000 IU/d for pediatric patients	1500-9100 IU/d, adjust based on individual response
Iron	Serum iron saturation <15%, total iron <40 mcg/dL	Microcytic anemia, fatigue, dyspnea on exertion, angular stomatitis, glossitis		- 45-65 mg/d elemental iron - 50-100 mg/d elemental iron for pregnant patients	Calculate iron deficit; IV iron 1000 mg, then weekly 500 mg IV infusion to calculated dose
Zinc	Plasma zinc <11 mcmol/ L	Poor wound healing, skin lesions, dermatitis, diminished taste, hair loss, altered immune function, glossitis	Optional: every 6 months for 2 years, then annually	No standardized recommendation	220 mg/d zinc sulphate (50 mg elemental zinc) or 50 mg/d zinc gluconate or 30 mg/d zinc histidine (zinc may interfere with absorption of iron and copper)
Copper	Serum copper (<11 mcmol/L) may have high false-negative rates in inflammatory states	Anemia, pancytopenia, fatigue, dyspnea on exertion, spastic gait, sensory ataxia, peripheral neuropathy, paresthesias	No routine screening recommended Monitor closely if on zinc supplementation	2 mg /day oral	2-4.4 mg oral copper or 2 mg IV/day copper for 5-6 days

Medical management of patients after bariatric surgery [48]

• Many chronic medical conditions improve postoperatively with weight loss. Thus, monitoring is necessary, and changes may be required in the medications prescribed for those conditions:[48]

• Dyslipidemia:

- Medications for dyslipidemia should be continued, unless there is an indication to discontinue, and reassessed periodically for cardiovascular risk status (Canadian, Level 4, Grade D)[47]

• Hypertension:

- Continue surveillance of blood pressure by blood pressure measurement and follow hypertension management guidelines for adults (Canadian, Level 4, Grade D) [47]

• Diabetes:

- Patients with diabetes should have frequent monitoring of blood glucose in the early postoperative period and should be managed by sliding scale insulin.
- Many diabetic patients have a decreased need for insulin after bariatric surgery.
- Periodic laboratory tests (FBS, HbA1c).
- **Assess diabetes remission:**
  - Partial remission: Hyperglycemia below diagnostic threshold for diabetes (HbA1c > 6% but < 6.5%, FBS 100–125 mg/dl), at least -1year duration, no active pharmacological therapy or ongoing procedures.
  - Complete remission: Normal glycemic measures (HbA1c normal range, < 6%; FBS < 100 mg/dl), at least 1 year duration, no active pharmacological therapy or ongoing procedures.
  - Prolonged remission: Complete remission of at least a 5 year duration.

• Hypothyroidism

- All hypothyroid patients need serial TSH monitoring and dose adjustment after bariatric surgery, because levothyroxine requirement in obese hypothyroid patients decreases after bariatric surgery.

Adjustment of chronic medications [48]

• Prior to bariatric surgery, patients need to receive general precautions surrounding their medications, because changes in the absorption of some medications may occur with certain bariatric surgical procedures. Patients may be asked to change either the type or preparation of the medication they are currently taking. [48]

• Aspirin and anti-inflammatory agents must be discontinued prior to surgery. The utilization of these agents postoperatively will depend on their indication, risk tolerance, and the surgical procedure. Chronic use of NSAIDs is contraindicated for Roux-en-Y gastric bypass, due to the risk of anastomotic ulcers [48] (Canadian, Level 4, Grade D)[47]

• Antiplatelet and anticoagulant medication will also require cessation prior to surgery. In some cases, bridging anticoagulation may be necessary. The use of a direct oral anticoagulant whose absorption is not dependent on low pH conditions may be considered for anticoagulation post-sleeve gastrectomy. The efficacy of direct oral anticoagulants post Roux-en-Y gastric bypass is uncertain and, hence, vitamin K antagonists like warfarin remain the preferred oral agent for anticoagulation. Patients should be made aware of the need to switch to vitamin K antagonists after bypass procedures.[48]

• Immune-modulating medications used in the treatment of connective tissue and inflammatory disorders, skin disorders, and immune-mediated gastrointestinal diseases may need to be held prior to surgery as well as postoperatively for a period of time, at the discretion of the prescribing specialist. [48]

• Long-acting slow-release medications may need to be converted after bariatric surgery to short-acting preparations. Medications dependent on absorption or an acidic environment within the stomach and upper gastrointestinal tract may need to be re-evaluated, as well. Certain medications may need to be crushed, while encapsulated formulations may need to be opened in the early postoperative period. A comprehensive pharmacological consultation prior to surgery should be considered.[48]

Chapter 7

Obesity Management in Women of Reproductive Age

Obesity Management in Women of Reproductive Age

• The reproductive years including before, during, and after pregnancy, bring many additional challenges for women with obesity in maintaining a healthy weight beyond eating well and being physically active.

• It is important for women with obesity to seek advice and support from their health care providers on strategies to optimize their own health outcomes, as well as those of their children, over both the short and long term.[49]

• The strategies described in this chapter include: [49]

  • Entering pregnancy at a lower BMI

  • Setting a weight-gain target during the entire pregnancy at 5–9 kg

  • Returning to at least pre-pregnancy BMI in the year after delivery

• The following are recommendations for the management of weight over the reproductive years for women with obesity (BMI ≥30 kg/m^2), with a singleton pregnancy, who are ≥ 18 years of age, and do not have pre-existing diabetes or gestational diabetes.

• **General advice:** The primary care providers should discuss weight management targets specific to the reproductive years with women with obesity in relation to the following topics:

  • Preconception weight loss [49] (Canadian, Level 3, Grade C) [16]

  • Gestational weight gain of 5–9 kg over the entire pregnancy [49] (Canadian, Level 4, Grade D) [16] . (Table 16)

  • Postpartum weight loss of, at a minimum, gestational weight gain (Canadian, Level 3 , Grade C) [49], to reduce the risk of adverse outcomes in the current pregnancy or in future pregnancies.

• **Combined behavioral-change interventions:** The primary care providers should offer behavioral-change interventions, including both nutrition and physical activity, to women with obesity who are considering pregnancy [49] (Canadian, Level 3, Grade C) [16], who are pregnant (Canadian, Level 2a, Grade B) [49] , and who are postpartum (Canadian, Level 1a , Grade A) [49] in order to achieve weight targets.

• **Nutrition counseling alone:** The primary care providers encourage and support pregnant women with obesity to consume foods consistent with a healthy dietary pattern in order to meet their target gestational weight gain [49] (Canadian, Level 3, Grade C) [16]

• **Physical activity counseling alone:** The primary care providers encourage and support pregnant women with obesity who do not have contraindications to exercise.

• **Pharmacotherapy:** The primary care providers should not prescribe metformin for management of gestational weight gain in women with obesity (Canadian, Level Ib, Grade A)[49], Suggest no weight management medications during pregnancy or breast-feeding [49] (Canadian, Level 4, Grade C) [16]

• **Breastfeeding:** The primary care providers promote and support breastfeeding initiation and continuation among women with high BMIs [49] (Canadian, Level 3, Grade C) [16]

• Women taking oral contraception therapy should discontinue their medication four weeks prior to surgery, while postmenopausal women may discontinue hormone-replacement therapy three weeks prior to surgery [49] (Canadian, Level 3, Grade C) [16]

• Women should be advised to delay pregnancy for 12 to 18 months to avoid pregnancy during the period of rapid weight loss [49] (Canadian, Level 3, Grade C) [16]

Table 15: Associations between Obesity and Adverse Clinical Outcomes over the Reproductive Periods in Women [49]

Reproductive period	Weight management issue	Adverse clinical outcome
Preconception	Pre-pregnancy obesity	↑ Infertility ↑ Gestational diabetes ↑ Hypertensive disorders of pregnancy ↑ Maternal venous thromboembolism ↑ Postpartum depression ↑ Miscarriage ↑ Caesarean delivery ↑ Congenital malformations ↑ Newborn asphyxia ↑ Macrosomia/large for gestational age
Antenatal	Excess gestational weight gain	↑ Gestational diabetes ↑ Hypertensive disorders of pregnancy ↑ Caesarean delivery ↑ Preterm birth (medically indicated) ↑ Macrosomia ↑ Neonatal hyperinsulinemia ↑ High neonatal hypoglycemia, hypomagnesemia, & hypocalcemia ↑ High postpartum weight retention
	Low gestational weight gain	↓ Hypertensive disorders of pregnancy ↓ Caesarean delivery ↓ Large for gestational age infant ↑ Macrosomia
	Weight loss	↑ Low birth weight infant
Postpartum	Pre-pregnancy obesity	↑ Postpartum weight retention
	Obesity during pregnancy	↑ Obesity by 9 months postpartum
	Excess postpartum weight retention	↑ Gestational diabetes in future pregnancy Hypertensive disorders in a future pregnancy
	Reduction in BMI by 2 kg/m^2	↓ Gestational diabetes in future pregnancy

Table 16: Recommendations for Gestational Weight Gain [49]

Pre-pregnancy BMI (kg/m^2)	Total weight gain (kg)	Rates of weight gain in 2nd and 3rd trimesters of pregnancy (kg/week)
Underweight (BMI below 18.5)	12.5 -18	0.51 (0.44–0.58)
Normal weight (BMI 18.5-24.9)	11.5 -16	0.42 (0.35–0.50)
Overweight (BMI 25.0-29.9)	7-11.5	0.28 (0.23–0.33)
Obese (BMI ≥ 30.0)	5-9	0.22 (0.17–0.27)

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Appendices

Appendix 1: Key to Evidence Statements and Grades of Recommendations

1- Level of evidence and grade of recommendations used by the Scottish Intercollegiate Guidelines Network (SIGN).

Levels of evidence	Criteria
1 ++	High-quality meta-analyses, systematic reviews of Randomized controlled trials or RCTs with a very low risk of bias
1 +	Well-conducted meta-analyses, systematic reviews or Randomized controlled trials with a low risk of bias
1 -	Meta-analyses, systematic reviews, or Randomized controlled trials with a high risk of bias
2 ++	High-quality systematic reviews of case-control or cohort studies/high-quality case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2 +	Well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2 -	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g., case reports, case series
4	Expert opinion
Grades of recommendation	**Description**
A	At least one meta-analysis, systematic review, or Randomized controlled trials rated as 1++, and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4; or extrapolated evidence from studies rated as rated as 2+

2- Grades of recommendations used by the National Health and Medical Research Council (NHMRC) Austrlia

Grade	Description
A	Body of evidence can be trusted to guide the practice
B	Body of evidence can be trusted to guide the practice in most situations
C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Body of evidence is weak and recommendation must be applied with caution
CBR	Consensus-based recommendation formulated in the absence of quality evidence
PP	Developed by the Obesity Guidelines Development Committee for areas beyond the scope of the systematic review

3- Classification of evidence used in the 2020 Canadian Adults Obesity Clinical Practice Guidelines (CPGs)

Level of evidence	Criteria
1a	Evidence from meta-analysis of randomized controlled trials (RCTs)
1b	Evidence from at least 1 RCT
2a	Evidence from at least 1 controlled study without randomization
3	Evidence from non-experimental descriptive studies, such as comparative studies, correlation studies and case–control studies
4	Evidence from expert committee reports or opinions or clinical experience of respected authorities, or both

Criteria for assigning a grade to recommendations	
Level of evidence	**Criteria**
A	Strong recommendation (action can apply to most individuals in most circumstances) • benefits clearly outweigh risks (or vice versa) • evidence is level 1
B	Intermediate recommendation (action may vary depending on the person's characteristics or other circumstances) • unclear whether benefits outweigh risks • evidence is level 2 or 1
C	Weak recommendation (alternative actions may be equally reasonable) • unclear whether benefits outweigh risks • evidence is level 3 or 1, 2
D	Consensus recommendation • evidence is level 4 or 1,2,3

Adapted with permission from BMJ Publishing Group Limited. Shekelle PG, Woolf SH, Eccles M, et al. Developing clinical guidelines. West J Med 1999;170:348-51.

4- Definition of grades of recommendations used by the Institute for Clinical Systems Improvement (ICSI), Minnesota , US

Category	Quality definitions	Strong recommendation	Weak recommendation
High Quality Evidence	Further research is very unlikely to change our confidence in the estimate of effect	The work group is confident that the desirable effects of adhering to this recommendation outweigh the undesirable effects. This is a strong recommendation for or against. This applies to most patients	The work group recognizes that the evidence, though of high quality, shows a balance between estimates of harms and benefits. The best action will depend on local circumstances, patient values or preferences.
Moderate Quality Evidence	Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.	The work group is confident that the benefits outweigh the risks but recognizes that the evidence has limitations. Further evidence may impact this recommendation. This is a recommendation that likely applies to most patients.	The work group recognizes that there is a balance between harms and benefits, based on moderate-quality evidence, or that there is uncertainty about the estimates of the harms and benefits of the proposed intervention that may be affected by new evidence. Alternative approaches will likely be better for some patients under some circumstances.
Low Quality Evidence	Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change. The estimate or any estimateof effect is very uncertain.	The work group feels that the evidence consistently indicates the benefit of this action outweighs the harms. This recommendation might change when higher-quality evidence becomes available.	The work group recognizes that there is significant uncertainty about the best estimates of benefits and harms.

5- Definition of grades of recommendations used by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)

Level of evidence	Criteria
Level I	Evidence from properly conducted randomized controlled trials
Level II	Evidence from controlled trials without randomization Or Cohort or case-control studies Or Multiple time series, dramatic uncontrolled experiments
Level III	Descriptive case series, opinions of expert panels

Scale used for recommendation grading

Grade	Description
Grade A	Based on high-level (level I or II), well-performed studies with uniform interpretation and conclusions by expert panel
Grade B	Based on high-level, well-performed studies with varying interpretation and conclusion by the expert panel
Grade C	Based on lower-level evidence (level II or less) with inconsistent findings and/or varying interpretations or conclusions by the expert panel

6- Classification of evidence used by the University of Michigan Health Services (UMHS) on obesity prevention and management, 2020

Level of evidence	Criteria
Level I	randomized controlled trials
Level II	controlled trials, no randomization
Level III	observational trials

Scale used for recommendation category

Evidence Categories	Description
Category A	generally should be performed
Category B	may be reasonable to perform
Category C	generally should not be performed
Category D	opinion of expert panel

Appendix 2: Second Edition Main Sources

The second edition was updated using the same sources as mentioned in the first edition of the Saudi Guideline on the Prevention and Management of Obesity:

- Scottish Intercollegiate Guidelines Network (SIGN) for management of obesity.
- Clinical practice guidelines for the management of overweight and obesity in adults, adolescents and children in Australia.
- NICE (National Institute for health and Care Excellence) - Obesity: identification, assessment and management of overweight and obesity in children, young people and adults (2014).
- Institute for Clinical Systems Improvement (ICSI) guideline for Prevention and Management of Obesity for Children and Adolescents.
- SAGES. Society of American Gastrointestinal and Endoscopic Surgeons. Guidelines for Clinical Application of Laparoscopic Bariatric Surgery (2008).

In addition to other sources:

- Canadian Adult Obesity Clinical Practice Guidelines (2020)
- University Michigan Health Services (UMHS) Clinical Guideline on obesity prevention and management (2020)

Appendix 3: Team Members of the second edition of the Saudi Guideline on Prevention and Management of overweight and obesity

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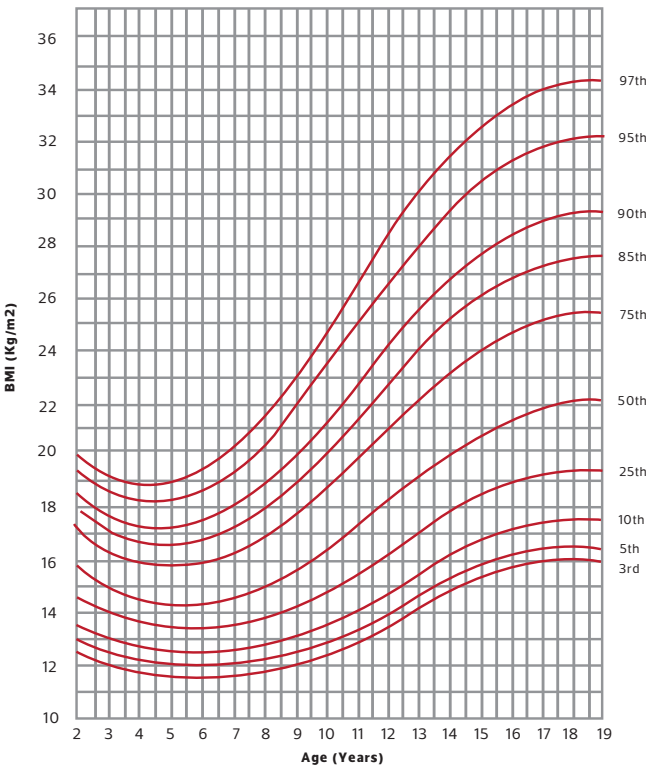
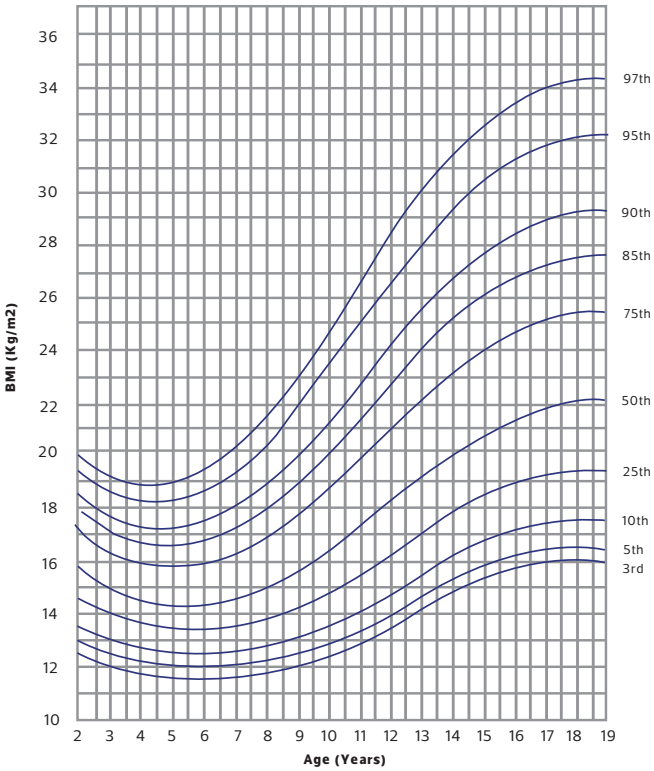
Appendix 4: Chart for BMI to age percentile among Saudi Children and Adolescents, Chlidren From 2 to 19 years old [13]

BMI for age-percentiles: Girls, 2 to 19 years.



BMI for age-percentiles: Boy, 2 to 19 years.



Source: Al Herbish AS, El Mouzan MI, Al Salloum AA, Al Qureshi MM, Al Omar AA, Foster PJ, Kecojevic T. Body mass index in Saudi Arabian children and adolescents: a national reference and comparison with international standards.

Available online at : https://www.annsaudimed.net/doi/full/10.4103/0256-4947.55162

Appendix 5-1: Measuring Waist Circumference [16]

• Remove clothing from the waistline.
• Stand with feet shoulder-width apart (25 to 30 cm or 10 to 12 inches) and a straight back.
• Palpate the abdomen to locate inferior margin of the last rib at the level of the mid-axillary line.
• Palpate and identify the crest of the ileum on both sides. Use the area between the thumb and index finger to feel for the hip bone at the level of the mid-axillary line.
• Waist circumference should be measured at the end of a normal expiration,
• midway between the inferior margin of the last rib and the crest of the ileum in a horizontal plane using a stretch-resistant tape that provides a constant 100 g tension and should be recorded to the nearest 1 cm.
• Have the patient take two normal breaths, and on the exhale of the second breath tighten the tape measure so it is snug but not digging into the skin.

Appendix 5-2: Ethnic-Specific Values for Waist Circumference [16]

Waist circumference (cm)				
Country / ethnic group	Increased abdominal adiposity cardiovascular risk		Significant abdominal adiposity greater cardiovascular risk	
	Women	Men	Women	Men
Caucasian Europid /United States /Mid-East Mediterranean	80	94	88	102
Latino Central / South American	83	88	90	94
Sub-Saharan African	80	94	-	-
African American	90	80	99	95
African	71.5	76.5	81.5	80.5
Asian	80	85	-	-
Chinese	81	83	-	-
Korean	75	80	85	90
Canadian Aboriginal	80	94	-	-

Appendix 5-3: Components of the Medical History Evaluation for Obese Patients [16,19]

Interview component	Details	Significance / recommended actions
Past medical history Including Birth history and past illness	Birth history Antenatal ,natal, neonatal Maternal smoking during pregnancy, maternal gestational diabetes or other complications of pregnancy, maternal obesity, gestational weight gain, reduced breastfeeding duration (months), rapid weight gain during the first few months of life, and infant short sleep duration.	Help to identify the causes and risk factors of overweight and obesity in childhood
Weight history	Assess Age of onset of overweight or obesity, Family history of obesity, Any history of eating disorders, symptoms of eating disorders or unhealthy weight loss methods (e.g. misuse of laxatives, self-induced vomiting), Is weight stable and for how long has the person been this present weight, What have been the maximum and minimum weights, What attempts at weight loss have been made in the past, Have any worked, If not, why does the person think they were unsuccessful? If so, what attempts were made to maintain the new lower weight?, Did these work and for how long? , What is the person's understanding of the reasons or triggers for weight gain/regain?, Has weight loss medication been tried?, Has the person had weight loss surgery?, Has the person seen other professionals or organizations for weight loss?	Helps to understand patient's weight journey
Nutritional history	Assess nutritional literacy, energy intake, and identify current nutritional restrictions (celiac disease, allergies).	Is there concern of physiological hunger ,emotional eating ,mindless eating
Physical activity history	Current physical activity including Time spent in sedentary activities, limitations to activity (pain, time, motivation), identifying limiting social factors restricting access to increasing physical activity.	Help patient to make selfdirected activity goals and address limitations independently (pain management for joint pain)
Psychological assessment	Assess patient expectations and motivation for weight loss , and Screen for the presence or history eating disorders and mood disorders	Consider referral to psychiatry/ psychology
Addiction / dependency assessment	Smoking status, alcohol intake ,Use of psychoactive substances Excessive use of caffeine-containing beverages (sugar-sweetened beverages)	Consider referral to psychiatry/ psychology
Abuse assessment	Screen for previous and current forms of abuse: physical, psychological, and sexual	Consider referral to psychiatry/ psychology
Sleep history	Number of hours of sleep per night , Use of pharmacological sleeping aids	Poor sleep quality and quantity can be a barrier to obesity management. Consider referral to rule out sleep apnea
Drug History	Review medications that can have a significant impact on weight (Table 10)	Help to identify root causes of weight gain

Interview component	Details		Significance / recommended actions
Review of systems	Symptoms	Related Comorbidity	**Help to establish Possible Causes of pediatric obesity**
	Nervousness, school avoidance, social inhibitions, sleepiness, wakefulness	Depression, anxiety, bullying	
	Headaches, visual disturbances, facial numbness	Idiopathic intracranial hypertension	
	Shortness of breath, exercise intolerance	Asthma, lack of physical conditioning	
	Snoring, daytime somnolence, witnessed apnea, nocturnal enuresis	Obstructive sleep apnea	
	Postprandial abdominal pain (right upper quadrant or epigastric)	Biliary colic/gallstone disease	
	Indigestion, abdominal pain	Gastroesophageal reflux disease	
	Polydipsia, polyuria, fatigue, nocturia, unexpected weight loss	Type 2 diabetes	
	Hirsutism, acne, irregular menses	Polycystic ovarian syndrome	
	Primary amenorrhea	PCOS, Prader-Willi Syndrome	
	Dull pain in the hip, thigh, or knee	Slipped capital femoral epiphysis , early osteoarthritis, musculoskeletal stress from weight	
	Fatigue, muscle aches	Vitamin D deficiency	
Family history	Family History (first- and second-degree relatives) with obesity , type 2 diabetes, hypertension, lipid level abnormalities, heart disease		**Determine patient's risk of obesity or related complications**
Social history	Age, gender, ethnicity, marital status, occupation/work schedule: number of hours per week, night shift work , income support, medical coverage, access to exercise facilities ,Level of functional independence		
Interpersonal assessment	Motivation, confidence, and readiness to change, expectations		

Appendix 5-4: Components of the General Physical Examination for Children and Adults with Obesity. [16,19]

Systems or conditions to be assessed for child and adolescent obesity	
Systems / Conditions	**Assessment**
Anthropometric features	Calculation of BMI (weight in kilograms and height in centimeters) Short stature
Vital signs	Pulse and blood pressure
General	Body fat distribution and affect
Eyes	Papilledema, cranial nerve vi paralysis
Skin	Acanthosis nigricans, keratosis pilaris, skin tags, intertrigo, excessive acne, hirsutism, or violaceous striae
Throat	Tonsillar size
Neck	Goiter
Chest	Auscultation for rhythm and sounds (heart) and abnormal breathing (lungs) , rhonchi, rales, and wheezes
Abdomen	Palpation for liver size, right upper quadrant tenderness, and epigastric tenderness
Reproductive system	Premature/abnormal appearance of pubic hair, breast development, testicular enlargement, acne or comedones, axillary odor, Apparent micropenis , gynecomastia
Extremities	Abnormal gait, hip or knee tenderness, limited range of motion in hip , small hands and feet, polydactyly, lower back pain or limited motion, Bowing of tibia
Common Genetic Causes associated with adolescent and Common Presenting Features	
Genetic Causes	Common Features
Prader-Willi syndrome	Short stature, acromicria, characteristic facies, hypotonia, and development delay
POMC mutation	Red hair, pale skin, low blood pressure or rapid pulse, and corticotropin deficiency/adrenal insufficiency
Albright's hereditary osteodystrophy	Developmental delay, skeletal defects
Bardet- Biedl syndrome	Retinitis pigmentosa, polydacyly, developmental delay, hypogonadism, renal abnormalities
MC4R mutation	Tall stature and rapid growth, early onset obesity
Down syndrome	Typical phenotypic features
Fragile X syndrome	Macro- orchidism , prominent jaw, large ears, developmental delay

Systems or Conditions to be assessed for adult obesity	
Systems / Conditions	Assessment
Vital signs	Blood pressure, heart rate
Anthropometric measurements	Weight, height, WC, and BMI
Head and neck	Neck circumference, jugular venous pulse, thyroid examination
Cardiorespiratory	Heart rate and rhythm (added heart sounds, pedal edema, pulmonary rales)
Gastrointestinal	Hepatomegaly, umbilical/incisional hernias, encephalopathy, ascites, jaundice, palmar erythema.
Musculoskeletal	Heberden's/Bouchard's nodes, weight-bearing joints , gout, gait exam
Skin	Candida, intertrigo, tinea, skin tags, psoriasis, acanthosis nigricans, pallor of conjunctiva, palmar crease, atrophic glossitis, neuropathy, abdominal striae
Lower limbs	Pitting edema, typically in arms/legs; painful fat deposition, typically in arms and legs with sparing of the hands and feet, venous insufficiency, ulcers, stasis, thrombophlebitis

Appendix 5-5: Disease Risk by BMI and Waist Circumference [16]

Disease risk* relative to normal weight and waist circumference				
Classification / population (Caucasian, Europid, Middle-Eastern, Sub-Saharan African populations)	BMI(kg/m^2) category	Comorbidity risk	Waist circumference (cm) category	
			Men 94–102 Women 80–88	Men >102 women >88
Underweight	<18.5	Low but other problems	-	-
Normal weight**	18.5–24.9	Average	-	Increased
Overweight	25.0–29.9	Increased	Increased	High
Obesity Class I	30.0-34.9	Moderate	High	Very high
Obesity Class II	35.0-39.9	Severe	Very high	Very high
Obesity Class III	≥ 40	Very severe	Extremely high	Extremely high
Classification / Population (East Asian, South Asian and Southeast Asian populations)	BMI(kg/m^2) category	Comorbidity risk	Waist circumference (cm) category	
			Men < 85 Women < 74	Men ≥ 85 Women ≥ 74
Normal weight	18.5-22.9	-	-	-
Overweight	23.0 – 27.4	Increased	Increased	High
Obesity class I	27.5-32.4	High	High	Very high
Obesity Class II	32.5-37.4	Very high	Very high	Very high
Obesity Class III	≥ 37.5	Extremely high	Extremely high	Extremely high

*Disease risk for type 2 diabetes, hypertension, and cardiovascular disease. ** Increased waist circumference can also be a marker for increased risk even in persons of normal weight.

Appendix 5-6 : Laboratory Investigations and Diagnostic Tests for children and adolescents with Obesity [20]

Comorbidity	Tests and Interpretation
Non-Alcoholic Fatty Liver Disease	-Alanine aminotransferase; ≥26 U/L (boys) and ≥22 U/L (girls) -Ultrasonography, if indicated
Prediabetes	-Haemoglobin A1c; 5.7 to 6.5% (39 to 48 mmol/L) -Fasting plasma glucose; 100–125 mg/dL (5.5–6.9 mmol/L) -Two-hour plasma glucose; 140–199 mg/dL (7.8–11.0 mmol/L)
Diabetes Mellitus Type 2	-Haemoglobin A1c; ≥ 6.5% (≥48 mmol/L) -Fasting plasma glucose; ≥126 mg/dL (≥7.0 mmol/L) -Two-hour plasma glucose; ≥200 mg/dL (≥11.1 mmol/L) during an oral glucose tolerance test In a patient with classic symptoms of hyperglycemia, random plasma glucose; ≥200 mg/dL
Dyslipidaemia	Fasting Lipids -Triglycerides (mg/dL) : 0–9 yr; <75 (acceptable), 75–99 (borderline high), ≥100 (high) 10–19 yr; <90 (acceptable), 90–129 (borderline high), ≥130 (high) -Low-density lipoprotein cholesterol (mg/dL) : <110 (acceptable), 110–129 (borderline high), ≥130 (high) -Total cholesterol (mg/dL) : <170 (acceptable), 170–199 (borderline high), ≥200 (high) -High-density lipoprotein cholesterol (mg/dL) : <40 (low), 40–45 (borderline low), >45 (acceptable) -Non- high-density lipoprotein cholesterol (mg/dL) (can be nonfasting): <120 (acceptable), 120–144 (borderline high), ≥145 (high)
Prehypertension and hypertension	3–11 yr: (standardized according to sex, age, and height percentile) blood pressure > 90th percentile to <95th percentile = prehypertension blood pressure ≥ 95th percentile to <99th percentile + 5 mmHg = stage 1 hypertension blood pressure ≥ 99th percentile + 5 mmHg = stage 2 hypertension 12–17 yr: (standardized according to sex, age, and height percentile) blood pressure >90th percentile to <95th percentile or > 120/80 mmHg = prehypertension blood pressure ≥ 95th percentile to <99th percentile + 5 mmHg = stage 1 hypertension blood pressure ≥ 99th percentile + 5 mmHg = stage 2 hypertension 18 to 21 yr: blood pressure ≥ 120/80 to 139/89 mm Hg = prehypertension blood pressure ≥ 140/90 to 159/99 mm Hg = stage 1 hypertension blood pressure ≥ 160/100 to 179/109 mm Hg = stage 2 hypertension blood pressure > 180/110 mm Hg = stage 3 hypertension
Polycystic Ovary Syndrome (PCOS)	-Free and total testosterone and sex hormone binding protein. -Ultrasonography, if indicated.
Obstructive sleep apnea	-If positive history, refer to a pulmonologist for nocturnal polysomnography or overnight oximetry
Psychiatric problem	-If positive history, refer to a mental health specialist

Appendix 5-7: Laboratory and Diagnostic Evaluations for Adult with Obesity and Preoperative Assessment for Bariatric Surgery [16 ,21]

Comorbidity	Tests and Interpretation
Consider for all obese patients	• BP measurement and heart rate • Fasting blood sugar, HbA1c and lipid profile
Consider only if obstructive sleep apnea clinically suspected (daytime sleepiness, loud snoring, gasping or chocking episodes during sleep, and awakening headaches)	• Measurement of neck circumference (> 43 cm in men, > 41cm in women) • Polysomnography • ENT examination
Consider only if alveolar hyperventilation (Pickwickian) syndrome clinically suspected (hypersomnolence, right sided heart failure including elevated JVP, hepatomegaly, and lower limb edema	• Polysomnography • CBC • Blood gases • Chest x-ray • ECG • Pulmonary function test
Consider only if hypothyroidism clinically suspected	TSH
Consider only if Cushing's syndrome clinically suspected (moon face, thin skin that bruises easily, severe fatigue, striae)	• Measurement of salivary cortisol secretion level
Consider only for obese women with symptoms of PCOS (oligo menorrhea, hirsutism, enlarged ovaries may be palpable, hypercholesterolemia, impaired glucose tolerance, persistent acne, and androgenic alopecia	• Total testosterone, LH, FSH, DHEAS, prolactin, TSH and 17-hydroxyprogesteron levels • Pelvic ultrasound

Preoperative assessment for bariatric surgery

- Complete history (weight history, presence of obesity-related comorbidities, causes of obesity, weight loss history, family history, medical history) and physical examination (weight or BMI, neck circumference, WC, blood pressure, signs of specific causes of obesity)
- Routine laboratory screening including fasting blood glucose, HbA1c, urea and electrolytes, liver function tests, lipid profile, , coagulation profile, hepatitis screening, blood type, full blood count. Urine analysis/Urine HCG(females)
- Nutrient screening with iron studies, vitamin B12, folate, 25-OH vitamin D ± parathyroid hormone, calcium profile Consider more extensive testing in patients undergoing malabsorptive procedures based on symptoms and risks

Additional evaluation to consider (preoperative screening)

- Cardiopulmonary evaluation with sleep apnea screening (ECG, CXR, ECHO if cardiac disease or pulmonary hypertension suspected, DVT evaluation if clinically indicated)
- Gastroenterology evaluation (H pylori screening in high-prevalence areas, gallbladder evaluation and upper endoscopy if clinically indicated)
- Endocrine evaluation (HbA1c with suspected or diagnosed prediabetes or diabetes, TSH with symptoms or increased risk of thyroid disease, androgens with PCOS suspicion (total/bioavailable testosterone, DHEAS, D-4androstenedione), screening for Cushing's syndrome if clinically suspected (24-hour urinary free cortisol, overnight dexamethasone suppression test, late-night salivary cortisol)
- Clinical nutrition evaluation by registered dietitian
- Psychosocial evaluation to assess commitment, motivation, understanding, and expectations of surgery; and psychiatric referral if known or suspected psychiatric illness or substance abuse
- Informed consent
- Pregnancy counseling
- Smoking-cessation counseling (cigarette smokers should stop smoking, preferably at least six weeks prior to surgery)
- Age- and risk-appropriate cancer screening by primary-care physician

Appendix 6-1: Five As Framework for Obesity Management in Adults [26]

1. Ask

Weight is a sensitive issue. Do not assume every patient with a larger body has obesity. Ask for permission to discuss body weight. Does the person feel their weight is impairing their medical, functional, or psychosocial health?

"Would it be alright if we discussed your weight?"

If the person is not ready to discuss their weight, offer resources about obesity as a chronic disease and an open opportunity to reassess.

2. Assess

BMI, waist circumference and obesity stage, and explore drivers and complications of excess weight. This can be helpful for assessing comorbidities, and for interacting with and motivating patients towards achieving a down-staging of the severity of their obesity through weight loss intervention.

3. Advise

Health risks of obesity, the benefits of modest weight loss, the need for a long-term strategy, and the available treatment options.

Medical Nutrition Therapy

is used in managing chronic diseases and focuses on nutrition assessment, diagnostics, therapy, and counseling. MNT should:

a) be personalized and meet individual values, preferences, and treatment goals to promote long-term adherence

b) be administered by a registered dietitian to improve weight-related and health outcomes

Physical Activity

30 – 60 minutes of aerobic activity on most days of the week, at moderate to vigorous intensity, can result in:

a) small amounts of weight and fat loss

b) improvements in cardio-metabolic parameters and weight maintenance after weight loss

The Three Pillars of Obesity Management that Support Nutrition and Activity

Psychological Intervention:

a) Implement multicomponent behavior modification; manage sleep ,time and stress

b) cognitive behavioral therapy and/or acceptance and commitment therapy should be provided for patients if appropriate

Indications for Pharmacological Therapy:

- BMI ≥30 kg/m^2 without comorbidities or
- BMI ≥27 kg/m^2 with obesityrelated complications

Indications for weight loss Surgery:

- BMI ≥40 kg/m^2 without comorbidities or
- BMI 35 – 39.9 kg/m^2 with at least one serious comorbidity or
- BMI 30 – 34.9 kg/m^2 with poorly controlled type 2 diabetes or metabolic syndrome

4. Agree

Realistic weight loss expectations and targets, behavioral changes, and specific details of the treatment options that are practical and sustainable, and addresses the drivers of weight gain

5.Assist

Assist in identifying and addressing drivers and barriers, provide resources and assist in identifying and consulting with appropriate providers, and arrange for regular follow-up

Appendix 6-2: Communication to Promote Health Behavioral Changes [28]

Determining your patient's readiness for change is essential for success. Discussing change when a patient is not ready often leads to resistance, denial of problems, and frustration which may hamper future efforts. The following tool provides a basis for starting discussions with patients.

Ask Permission Would you be willing to spend a few minutes discussing your weight? / Are you interested in discussing ways to stay healthy and energized?

Ask an Open-Ended Question – Listen – Summarize
What do you think/ how do you feel about your weight? / What have you tried so far to work toward a healthier weight?

Share BMI
Your BMI falls within the _____category.
The target BMI for someone your height is _____ .
Ask for the patient's interpretation: "What does this_____ mean to you?"
Add your own interpretation or advice as needed after eliciting the patient's response.

Negotiate the Agenda
Here are some examples of ways to achieve a healthy weight:
- Eat at least 5 servings of fruits and vegetables a day.
- Cut back on TV and computer time.
- Participate in at least one hour or more of physical activity every day.
- Avoid soda and sweetened drinks; limit fruit juice to one cup or less per day.

Instead, encourage water and 3-4 servings/day of fat-free milk.
Is there any health topic you would like to discuss further today?

Assess readiness on a scale of 0 to 10
How ready are you to consider _____ [option chosen above]
Ready 10 9 8 7 6 5 4 3 2 1 0 Not Ready
Straight question: Why a 5?
Backward question: Why a 5 and not a 3?
Forward question: What would it take to move you from a 5 to a 7?

Explore ambivalence

Step 1: Ask a pair of questions to help the patient explore the pros and cons of the issue.
- What are the things you like about ? AND what are the things you don't like about ? OR
- What are the advantages of keeping things the same? AND what are the advantages of making a change?

Step 2: Summarize ambivalence.
- Let me see if I understand what you've told me so far…. (Begin with reasons for maintaining the status quo, end with reasons for making a change)
- Ask: Did I get it all? / Did I get it right?

Stages of Readiness to Lose Weight

Stage of Readiness	Key Questions
Not Ready 0 – 3 • Raise awareness • Elicit change talk • Advise and encourage	• Would you be interested in knowing more about reaching a healthy weight? • How can I help? • What might need to be different for you to consider a change in the future?
Unsure 4 – 6 • Evaluate ambivalence • Elicit change talk • Build readiness	• Where does that leave you now? • What do you see as your next steps? • What are you thinking / feeling at this point? • Where does fit into your future? How does being overweight affect you?
Ready 7 – 10 • Strengthen commitment • Elicit change talk • Facilitate action planning	• Why is this important to you now? • What are your ideas for making this work? What is hard about managing your weight? What might get in the way? • How might you work around the barriers? • How might you reward yourself along the way?

Cognitive behavioral Skills for Patients Ready to Makes Changes

• Develop awareness of eating habits, activity, and lifestyle behaviors
• Identify problem behaviors
• Problem-solving and modifying behaviors
• Set weekly weight, dietary, and physical activity goals
• Use a goal achievement reward system
• Track diet, weight loss, and physical activities using a journal or worksheet
• Routinely check weight

Close

• Summarize: Our time is almost up. Let's take a look at what you've worked through today…
• Show appreciation / acknowledge willingness to discuss change: Thank you for being willing to discuss your weight.
• Offer advice; emphasize choice, and express confidence: I strongly encourage you to be more physically active. The choice to increase your activity, or course, is entirely yours. I am confident that if you decide to be more active you can be successful.
• Confirm next steps and arrange for follow-up: Are you able to come back in 1 month so we can continue to work together?

Source: Adapted from the Adolescent Provider Tool Kit, Adolescent Health Working Group, 2004

Appendix 7-1: Example of Physical Activity Intensity [29]

Intensity	Description	Example
Sedentary	Activities that involve sitting or lying down, with little energy expenditure	Occupational (e.g., sitting at work) Leisure (watching TV, reading, sewing, computer use for games, social networking) Transport (e.g., sitting in a car, train or bus)
Light	Activities are common daily activities that don›t require much effort	Housework (hanging out washing, ironing, dusting) Working at a standing workstation
Moderate	Activities are at an intensity that requires some effort, but allow a conversation to be held	Brisk walking, gentle swimming, social tennis
Vigorous	Activities that lead to harder breathing, or puffing and panting (depending on fitness)	Aerobics, jogging, and some competitive sports

Appendix 7-2: Physical Activity Recommendations for Different Age Groups [30]

PRESCHOOL-AGED CHILDREN (3-5 YEARS)

Physical activity every day throughout the day
Active play through a variety of enjoyable physical activities

CHILDREN AND ADOLESCENTS (6-17 YEARS OLD)

60mins (1hour) or more of moderate -to-vigorous intensity physical activity daily
a variety of enjoyable physical activities as part of the 60 minutes , on at least 3 days a week, children and adolescent need:

* vigorous activity such as ruinning of soccer
*activity that strengthens muscles such as climbing or push ups
*activity that strengthens bones such as gymnastics or jumping rope

ADULTS (18-64 YEARS OLD)

at least 150 minutes a week of moderate intensity activity such as brisk walking
at least 2 days a week of activities that strengthen muscles

OLDER ADULTS (65 YEARS AND OLDER)

at least 150 minutes a week of moderate intensity activity such as brisk walking
at least 2 days a week of activities that strengthen muscles
activities to improve balance such as standing on one foot

Appendix 7-3: Estimated Calorie Needs Per Day, by Age, Gender, and Physical Activity Level [31]

Male				Female			
Age	Sedentary	Moderately active	Active	Age	Sedentary	Moderately active	Active
2	1000	1000	1000	2	1000	1000	1000
3	1000	1400	1400	3	1000	1200	1400
4	1200	1400	1600	4	1200	1400	1400
5	1200	1400	1600	5	1200	1400	1600
6	1400	1600	1800	6	1200	1400	1600
7	1400	1600	1800	7	1200	1600	1800
8	1400	1600	2000	8	1400	1600	1800
9	1600	1800	2000	9	1400	1600	1800
10	1600	1800	2200	10	1400	1800	2000
11	1800	2000	2200	11	1600	1800	2000
12	1800	2200	2400	12	1600	2000	2200
13	2000	2200	2600	13	1600	2000	2200
14	2000	2400	2800	14	1800	2000	2400
15	2200	2600	3000	15	1800	2000	2400
16	2400	2800	3200	16	1800	2000	2400
17	2400	2800	3200	17	1800	2000	2400
18	2400	2800	3200	18	1800	2000	2400
19-20	2600	2800	3000	19-20	2000	2200	2400
21-25	2400	2800	3000	21-25	2000	2200	2400
26-30	2400	2600	3000	26-30	1800	2000	2400
31-35	2400	2600	3000	31-35	1800	2000	2200
36-40	2400	2600	2800	36-40	1800	2000	2200
41-45	2200	2600	2800	41-45	1800	2000	2200
46-50	2200	2400	2800	46-50	1800	2000	2200
51-55	2200	2400	2800	51-55	1600	1800	2200
56-60	2200	2400	2600	56-60	1600	1800	2200
61-65	2000	2400	2600	61-65	1600	1800	2000

Male				Female			
Age	Sedentary	Moderately active	Active	Age	Sedentary	Moderately active	Active
66-70	2000	2200	2600	66-70	1600	1800	2000
71-75	2000	2200	2600	71-75	1600	1800	2000
76 & Up	2000	2200	2400	76 & Up	1600	1800	2000

• Sedentary means a lifestyle that includes only the physical activity of independent living.
• Moderately active means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.
• Active means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.
• Estimates for females do not include women who are pregnant or breastfeeding.

SOURCE: Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington (DC): The National Academies Press; 2002.

Appendix 7-4: Exercise Recommended for Obese Patients[32,33]

Frequency	≥ 5 days of aerobic exercises to maximize caloric expenditure
Intensity	• Moderate- to vigorous-intensity aerobic exercises should be encouraged. • Some individuals may prefer doing vigorous exercise as it is less time consuming, but vigorous exercise is probably not appropriate for the very obese (BMI > approximately 35 kg/m^2). • Individuals choosing to incorporate vigorous-intensity activity into their program should do this gradually and after an initial 4 to 12 week period of moderate-intensity activity.
Time	• To prevent obesity, people may need 45 to 60 minutes of moderateintensity aerobic activity each day unless they also reduce their energy intake. • Patients who are overweight or obese should be prescribed a volume of 45 to 60 minutes of moderate-intensity activity per day (corresponding to approximately 225 to 300 minutes per week of moderate-intensity physical activity or lesser amounts of vigorous physical activity). • People who have been obese and have lost weight should be advised they may need to do 60 to 90 minutes of activity a day to avoid regaining of weight. • Sedentary individuals should build up to their physical activity targets over several weeks, starting with 10 to 20 minutes of physical activity every other day during the first week or two, to minimize potential muscle soreness and fatigue.
Type	• Walking is an excellent form of physical activity for overweight and obese people (for obese, sedentary individuals, brisk walking often constitutes moderate-intensity physical activity). • Weight-bearing physical activity may be difficult for some individuals with BMI over approximately 35 kg/m^2, particularly for those with joint problems. For these individuals, gradually increasing non-weightbearing moderate-intensity physical activities (e.g., cycling, swimming, water aerobics, etc.) should be encouraged.

Tips:

- Set reasonable exercise goals.
- Start slow building up your level and duration of activity gradually.
- Warm up by stretching before any physical activities.
- Wear comfortable shoes and dress appropriately and comfortably.
- Breathe in and out, taking deep breathes while exercising.
- Drink plenty of water before and after physical activities.
- Try substituting the stairs instead of taking the elevator.
- Try parking further away and walking.
- Take your pulse to set and monitor intensity of activity.

Appendix 7-5: Dietary Interventions to Promote Weight Loss [12]

Diet and eating:
Avoid high calorie, low nutrient foods

Eat a variety of nutritious foods:
Fruits and vegetables – at least 5 servings per day. Whole grains – look for 100 % whole grains and at least 3 grams of dietary fiber per serving. Fat-free or low-fat milk and milk products – If lactose-intolerant, choose fat-free lactose-free milk, or fat-free plain soy, almond, or rice milk. Lean meats, skinless poultry, fish, beans, soy products, eggs, and nuts – Bake, broil, steam, or grill. Avoid frying foods. Low saturated fats – Consider using plant-based oils such as olive oil for cooking instead of margarine or butter. Stay within your daily caloric needs or use the plate method to control caloric intake.

Eliminate or reduce:
Foods high in saturated fat – including fatty meats (e.g., sausages, deli meats and hot dogs), fried foods, full-fat dairy products, donuts, cookies, ice cream).
High calorie beverages – sugar-sweetened beverages (regular soft drinks, fruit drinks, fruit punch, sweet tea, sweetened coffee drinks).
High calorie and low nutrient foods – sweets and junk food such as chips.
Avoid fast food and limit eating out. When eating out, choose grilled or baked fish or chicken, steamed vegetables without butter, salads with low-fat dressing on the side. Avoid fried foods.

Address environmental and family factors associated with eating:
Reduce portions. Use smaller plates.
Schedule food consumption. Schedule regular meals and snacks throughout the day, starting with breakfast. Avoid excessive snacking.
Encourage children's healthy eating. Promote family meals. Limit eating out and avoid fast food.
Limit young children's screen time and exposure to food and beverage marketing.
Read food labels and select low-fat, high fiber, and low sodium foods. Choose foods with less than 5 grams of fat per serving. Choose foods with 5 grams or more of fiber per serving. Limit sodium to 300 mg per serving.
Be aware that advertising can be deceptive. Low-carbohydrate and low-fat messaging does not necessarily translate into reduced calories.

Appendix 8-1 : Components of Comprehensive Lifestyle Modification Program to maintain weight loss [27]

Components	Weight loss	Weight loss maintenance
Frequency and duration of treatment contact	Weekly contact for 20–26 week	Every-other-week contact for 52 weeks
	Group or individual contact	Group or individual contact
Dietary prescription	Low-calorie diet (1200–1500 kcal for individuals <250 lb , 1500–1800 kcal for those ≥250 lb)	Consumption of a hypo-caloric diet to maintain reduced body weight
	Typical macronutrient composition: ≤30 % fat (≤7 % saturated fat); 15 % – 25 % protein; remainder from carbohydrates.	Typical macronutrient composition similar to that for weight loss
Physical activity prescription	180 minutes /week of moderately vigorous aerobic activity (e.g., brisk walking); strength training also desirable	200 to 300 minutes/week of moderately vigorous aerobic activity (e.g., brisk walking); strength training also desirabl
Behavioral therapy prescription	Daily monitoring of food intake and physical activity by use of paper or electronic diaries	Occasional to daily monitoring of food intake and physical activity by use of similar diaries
	Weekly monitoring of weight	Twice weekly to daily monitoring of weight
	Structured curriculum of behavioral change	Curriculum of behavioral change, including relapse prevention and individualized problem-solving
	Regular feedback from an interventionist	Periodic feedback from an interventionist

Appendix 8-2: Psychological / Behavioral Interventions and Strategies [23,34]

The range of appropriate psychological interventions and strategies includes:

- Self-monitoring of behavior and progress.
- Stimulus control (where the patient is taught how to recognize and avoid triggers that prompt unplanned eating).
- Cognitive restructuring (modifying unhelpful thoughts/thinking patterns).
- Goal setting.
- Problem solving.
- Assertiveness training.
- Slowing the rate of eating.
- Reinforcement of changes.
- Relapse prevention.
- Strategies for dealing with weight regain.

Source: (SIGN, 2010)

Appendix 8-3: Framework for Implementing an Adult Weight Loss Program (Indicated for BMI levels of 25.0 kg/m² and over)[28]

Initial Visit

- Determine BMI.
- Measure waist circumference.
- Determine risk status (blood pressure, triglycerides and cholesterol levels, blood sugar level).
- Assess nutrition and physical activity habits and readiness to change health behaviors.
- Determine if patient should be treated. If yes:
- Identify patient's contributing factors (e.g., depression, environmental influences on food choices and physical activity, such as access to healthy foods and a safe place to engage in physical activity, family dynamics and support systems).
- Assist patient in setting goals for making health behavioral changes related to eating and/or physical activity utilizing patient-centered counseling techniques.
- Prescribe weight loss medication. If indicated, referral to psychologist and /or registered dietitian may also be helpful to assist with behavioral changes before medication is considered.

First Four Months

- Weekly communication for the following purposes:
  - Weight monitoring
  - Problem resolution, if indicated (medicine, diet or physical activity)
  - Group meetings on exercise, nutrition, and behavioral change

Second Four Months

- Biweekly meetings for the following purposes:
  - Weight monitoring
  - Group meetings on exercise, nutrition, and behavioral change
  - Problem resolution, if indicated (medicine, diet or physical activity)
  - **If after six months**, patient has not made or been able to maintain any behavioral changes related to eating, consider pharmacotherapy. A referral to a licensed psychologist and/or licensed registered dietitian may also be helpful to assist with behavioral changes before medication is considered.

Follow-up Visits

Six months after initial visit:

- Weight monitoring
- Problem resolution, if indicated (medicine, dietary or physical activity)
- Monthly group meetings for next six months on exercise, nutrition, and behavioral-change topics.

One year after initial visit:

- Weight monitoring
- Problem resolution, if indicated (medicine, dietary, or physical activity)
- Corrective actions, as needed (medication, re-education, etc.)
- If no or limited weight loss has occurred by the end of one year, consider surgery.
- Referral to local support groups for continued weight maintenance

Continued follow-up at annual visits:

- The amount of follow-up provided will depend on your patient's needs (recommendation should be based on what the patient has done previously—were they not ready for change, but now they are? Did they participate in a program, but regained weight? Did they agree to make behavioral changes but did not follow through?)
- Weight monitoring
- Problem resolution, if indicated (medicine, dietary, or physical activity)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