Clinical Practice GUIDELINE for the Management of Obesity in Adults in Ireland

Clinical Assessment of People Living with Obesity

Duggan D[i] and Kearney C[ii], Hynes M[iii], Manning S[iv], O'Malley E[v].
Chapter adapted from: Rueda-Clausen C, Poddar M, Lear S, Poirier P, Sharma A. Canadian Adult Obesity Clinical Practice Guidelines: Assessment of People Living with Obesity (version 1, 2020). Available from: https://obesitycanada.ca/guidelines/assessment

i) Dietitian Manager, Bariatric Service, The Bon Secours Hospital, Cork
ii) Clinical Nurse Manager II, Level 3 and 4 Obesity Service, St Columcille's Hospital, Dublin
iii) Senior Clinical Psychologist, Bariatric Service, Galway University Hospital
iv) Consultant Endocrinologist, Cork University Hospital, Cork
v) Senior Physiotherapist, Level 3 and 4 Obesity Service, St Columcille's Hospital, Dublin

Cite this Chapter

ASOI Adult Obesity Clinical Practice Guideline adaptation (ASOI version 1, 2022) by: Duggan D and Kearney C, Hynes M, Manning S, O'Malley E. Chapter adapted from: Rueda-Clausen C, Poddar M, Lear S, Poirier P, Sharma A. Available from: https://asoi.info/guidelines/assessment/ Accessed [date].

KEY MESSAGES FOR HEALTHCARE PROFESSIONALS

- **Obesity is a complex chronic disease, characterised by the excess or dysfunctional adiposity, that impairs health.**
- **Screening for obesity should be performed by measuring body mass index and, if indicated, waist circumference.**
- **The clinical assessment of obesity should establish the diagnosis and identify the causes and consequences of dysfunctional or excess adiposity on a patient's physical, mental and functional health.**
- **Healthcare professionals participating in the assessment of obesity should focus on establishing values and goals of treatment, identifying which resources and tools may be needed and fostering self-efficacy with the patient for long-term management.**
- **A non-judgemental, stigma-free environment is necessary when undertaking assessments with a patient living with obesity.**

RECOMMENDATIONS

1. We suggest that healthcare professionals (HCPs) involved in screening, assessing and managing people living with obesity use the 5As of Obesity Management framework to initiate the discussion by asking for their permission and assessing their readiness to initiate treatment (Level 4, Grade D, Consensus).

2. HCPs can measure height, weight and calculate BMI in all adults (Level 2a, Grade B)[1-9], and measure waist circumference in individuals with a BMI 25 kg/m^2 – 35 kg/m^2 (Level 2b, Grade B)[10-12].

3. We suggest a comprehensive history to identify root causes of weight gain, as well as including complications of obesity and potential barriers to treatment in the assessment (Level 4, Grade D)[13-15].

4. We recommend blood pressure measurement in both arms, fasting glucose or glycated hemoglobin (HbA1c) and lipid profile to determine cardiometabolic risk and, where appropriate, to screen for non-alcoholic fatty liver disease and sleep-disordered breathing in people living with obesity (Level 3, Grade D)[16-19].

5. We suggest HCPs consider using the Edmonton Obesity Staging System to determine the severity of obesity and to guide clinical decision making (Level 4, Grade D)[20,21].

KEY MESSAGES FOR PEOPLE LIVING WITH OBESITY

- **Obesity is a complex chronic disease, characterised by excess or dysfunctional body fat (adiposity), that impairs health.** Obesity has a negative impact on your physical and mental health, as well as your overall quality of life.

- **To guide you and your healthcare professional (HCP) on the best obesity-treatment options, a clinical assessment is needed to determine how your weight or body fat affects your health and wellbeing.** This may include a physical exam, blood tests, mental health assessment and interviews and questionnaires about health and habits.

- **Weight bias and obesity stigma exist for adults in healthcare settings and can be detrimental to helping you achieve your health goals.** HCPs should conduct an obesity assessment in a sensitive and non-judgemental way and use language that is respectful and inclusive[22-24].

Introduction

Obesity is a chronic disease that requires a systematic and comprehensive approach to assessment, diagnosis and treatment[25]. The objective of an obesity assessment is to gather information to confirm the diagnosis, determine the severity of the disease and related comorbidities, identify triggers and drivers and to guide appropriate management discussions in a non-biased and stigma-free clinical setting[22-24,26]. Healthcare professionals (HCPs) should initiate a discussion with the patient about their values and goals for treatment, and self-directed management to promote long-term improvements in health[15]. For the purpose of this document, the term HCP includes the broad range of professionals involved in delivering clinical services across all health and social care settings[27].

This chapter provides an evidence-based approach to assessing obesity through a structured history, physical examination and clinically appropriate laboratory testing. The authors also discuss clinical tools that allow for easy and efficient use in routine clinical practice.

In Ireland, the Health Service Executive (HSE) Model of Care for the Management of Overweight and Obesity, launched in 2021, describes healthcare services required for people living with obesity. It describes the structure of services and role of HCPs in the assessment and treatment of obesity. The assessment guidelines outlined in this chapter should be used as a guide and will need to be individualised to the setting and patient population. Assessment within, and/or referral to, the appropriate level of care (Table 1) should be undertaken as outlined in the Model of Care[27].

Table 1: **HSE Model of Care for the Management of Overweight and Obesity — Patient Profile and Suggested Services**

Level of care	Patient profile and suggested services that may influence assessment individualisation
Adult Level 0 Living well with overweight and obesity + **Adult Level 1** General practice and primary care team	• Body mass index (BMI) > 25 kg/m^2 with: o No or sub-clinical risk factors; and o Mild symptoms/impairment not requiring medical treatment. • Suggested services include early identification, brief advice, self-management supports, commercial programmes and primary care team interventions. • Assessment may include physical examination, laboratory assessment and other diagnostics to identify obesity complications and diagnose obesity. Assessment may also be required at this level for individuals that have undergone bariatric procedures outside of Ireland or are not under the care of a bariatric surgeon, with onward referral to specialist services. • The general practitioner (GP), general practice nurse (GPN) and the wider multi-disciplinary primary care team are the key HCPs within this setting.
Adult Level 2 Community specialist ambulatory care	• BMI > 30 kg/m^2 with: o Established but controlled obesity-related complications requiring medical intervention (hypertension, type 2 diabetes (T2DM), sleep apnoea, polycystic ovarian syndrome (PCOS), osteoarthritis); o Moderate but controlled obesity-related psychological symptoms (depression, eating disorder, anxiety disorder); and o Moderate functional limitations in daily activities. • Level 2 community specialist ambulatory care hubs will provide specialist support to GPs in assessing and treating people living with obesity and preventing disease progression. • Additional suggested enhanced support services at this level include behavioural weight-management programmes. • Assessment needs will likely be similar to those outlined at Level 1. Access may be required to phlebotomy, X-ray, echocardiography to support comprehensive clinical assessment of obesity.
Adult Level 3 Acute specialist ambulatory care + **Adult Level 4** Specialist hospital care	• BMI > 30 kg/m^2 with: o Significant/severe/uncontrolled obesity-related end organ disease; o Significant/severe obesity/uncontrolled related psychological symptoms; o Significant/severe/uncontrolled functional limitations; and o Significant/severe/uncontrolled impairment of wellbeing. • Physician or surgeon-led multi-disciplinary team (MDT) services, co-located in hospital sites, to provide care for adults with severe and complicated obesity. • Clinical assessment will involve screening for underlying causes and consequences of obesity, including assessment and review of existing complications and screening for additional complications. Detailed, evidence-based, individualised clinical assessments will be undertaken across the MDT. This also includes re-screening and treatment or onward referral for eating disorders, trauma and chronic mental health conditions. Assessments specific to bariatric surgery include pre-operative medical, nutritional, psychological and functional and those required for post-op management of obesity or bariatric complications.

Adapted from HSE Model of Care for the Management of Overweight and Obesity[27]

Definition of obesity

This adapted Irish guideline joins Obesity Canada, the World Health Organisation (WHO), the European Association for the Study of Obesity, the American Medical Association and the World Obesity Federation in defining obesity as a complex chronic disease, characterised by excess or dysfunctional adiposity, that impairs health[25,28-34]. Obesity has traditionally been viewed as a risk factor for a wide range of other health issues[35], but this new definition now considers obesity to be a chronic disease in its own right, similar to type 2 diabetes (T2DM), hypertension and dyslipidaemia. Obesity is a progressive, chronic and complex disease affecting all ages and genders. Obesity is associated with other chronic diseases, such as T2DM, cardiovascular disease, respiratory disease, several types of cancer, pain and musculoskeletal disorders. Certain groups in the population have a high risk of excess weight gain leading to obesity; these include older people, women in pregnancy and post-natal, individuals with eating disorders, mental illness, intellectual and physical disabilities as well as socially excluded and disadvantaged groups[27,36].

Initiating a discussion about obesity management

HCPs play an important role in the management of most chronic diseases. However, due to the multitude of demands and lack of expertise and training, the assessment and management of obesity is not easily undertaken. The initial approach, communication and attitude of the HCP during an obesity assessment is a significant determinant to the patient's outcome[37,38].

Many people living with obesity have experienced some form of weight bias[39,40]. Experiences of judgement and shame in the healthcare setting prevents people with obesity from seeking help[27]. Many people living with obesity feel discriminated against and, as a result, will often avoid seeking treatment and delay preventive care[41]. This can affect their health status, their relationship with HCPs and their response to interventions[42]. Stigmatisation of people living with obesity leads to worsened outcomes and promotes disordered eating, increased rates of depression and lower rates of physical activity[43]. This is reviewed in detail in Chapter 1 Reducing Weight Bias in Obesity Management, Practice and Policy.

Asking permission to weigh patients can help foster patient comfort and dignity. In addition, it is important to acknowledge the complexity of the disease and the difficulty in sustaining weight-management strategies as well as avoiding stereotypes and oversimplification of the disease[44]. A supportive environment with appropriate equipment should be available when conducting an assessment, for example, appropriately sized blood pressure cuffs, gowns and appropriate chairs (with/without arms) in waiting rooms and a private room for weigh-ins should be provided.

The use of structured consultation formats (such as Obesity Canada's 5As of Obesity Management) has been proposed to help facilitate discussions about obesity in primary care[45,46]. The main components of this framework include:

1. **ASKING** for permission to discuss weight;
2. **ASSESSING** obesity-related risks and root causes of obesity;
3. **ADVISING** on health risks and treatment options;
4. **AGREEING** on health outcomes and behavioural goals; and
5. **ASSISTING** in accessing appropriate resources and HCPs[47,48].

Personalising the approach to an assessment, recognising strengths and reframing misconceptions about obesity are important key processes that can have a positive impact on an individual's ability to create long-term changes[15,30]. These concepts are reviewed in detail in Chapter 10 Effective Psychological and Behavioural Interventions in Obesity Management chapter, and include use language that is:

- Neutral, non-judgemental and based on facts, actions or physiology/biology;
- Free from stigma;
- Strength-based, respectful, inclusive and imparts hope;
- Able to foster collaboration between patients and providers; and
- Person centred.

Screening for obesity

Prior to initiating screening or assessment for obesity, it is important to ask permission to discuss the topic and/or to conduct anthropometric measurements. Evaluation of anthropometric parameters is recommended as a practical screening tool to identify increased adiposity where more intensive assessments may be indicated[49]. Moreover, performing regular anthropometric screening can identify those at risk of developing obesity in whom awareness of their risk and implementation of preventive measures can have a significant positive long-term effect on their health[50,51]. Many anthropometric parameters have been recommended in the screening and assessment of obesity; however, a calculated body mass index (BMI) and measured waist circumference (WC)[52] are the most widely used.

Traditionally, BMI (weight [kg]/height^2 [m]) has been used as a surrogate measure of body fat, and thus an objective parameter to define obesity, both in epidemiological and clinical studies[12,53-56]. The WHO classifications of BMI for adults are below (Table 2). The criteria are the same for all ages and genders. BMI has some limitations including overestimating body fat in athletic or muscular individuals, underestimating body fat in older or frail people, and less accuracy in certain ethnic groups. Individuals

from Black, Asian and other minority ethnic groups are at an equivalent risk to T2DM, other health conditions or mortality at a lower BMI than the white European population. It is therefore recommended that lower thresholds (BMI 23 kg/m^2 instead of 25 kg/m^2 for overweight and 27.5 kg/m^2 instead of 30 kg/m^2 for obesity) are used to trigger action to prevent T2DM among South Asian, Black African, Black Caribbean and Chinese populations[57].

For most populations, the presence of BMI ≥ 25 kg/m^2 represents an increased risk and requires further evaluation of other anthropometric, haemodynamic and biochemical parameters[4,58]. A BMI ≥ 30 kg/m^2 is associated with an increase in cardiovascular risk factors and all-cause mortality and should be used as a screening criterion to identify obesity in the general population[4,5]. In adults with South-, Southeast- or East Asian ethnicity, the recommended BMI cut-off for overweight should be ≥ 23 kg/m^2. In special populations, such as the elderly, very muscular patients and those with extreme tall or short stature, the BMI can be misleading and needs to be interpreted with caution[9].

Direct assessment of body composition, using reference methods such as dual-energy X-ray absorptiometry (DEXA), hydrostatic weighing or air displacement plethysmography are not readily available in most clinical settings. Consequently, BMI is often used as a proxy measure of adiposity in clinical practice. Bioelectrical impedance analysis (BIA) is available in some clinical settings — it is a non-invasive method that uses the electrophysical model of resistance to estimate muscle mass, total body water and percent body fat. Validation with DEXA in patients with different BMI classifications have shown conflicting results with both under- and overestimation of fat mass; perhaps related to the use of predictive equations that have not been specifically developed in populations with obesity[59,60]. Notwithstanding its limitations, BIA is more strongly associated with percentage fat mass than BMI[61]. Whole body BIA is preferable and the use of standardised procedures for body position, recent exercise, hydration and temperature improves consistency and accuracy of measurements[61].

Given its simplicity, objectivity and reproducibility, BMI continues to be an important measure in epidemiological and population-based surveillance studies. In a clinical setting, BMI at the recommended cut-offs should serve only as a simple screening measure. When used together with other clinical indicators, such as WC and clinical evaluation of cardiometabolic and other obesity-related complications, BMI can help identify individuals who may benefit from obesity management. WC has been independently associated to increase cardiovascular risk; however, it is not a good predictor of visceral adipose tissue on an individual basis[62]. Integration of both BMI and WC in clinical assessment may identify the higher-risk phenotype of obesity better than either BMI or WC alone, particularly in those individuals with lower BMI[63-65].

Regular assessment of BMI, WC and cardiometabolic risk factors can help identify people at greater risk of developing obesity. Regular assessment should also inform care and allow for increased vigilance avoiding medications that promote weight gain (see Table 9) and counselling on the avoidance of weight gain during high-risk time periods, such as pregnancy or forced sedentariness due to injury.

Box 1: Measuring Body Mass Index

All anthropometric measurements should be conducted barefoot and in light clothing where possible. At higher BMI classifications or where people living with obesity have difficulty with dressing, it may be appropriate to ask patients to wear the same/similar footwear for repeat weight measurement.

Weight and height should be measured by trained professionals using standardised techniques and equipment and recorded to the nearest 0.1 kg and 1 cm.

BMI should be calculated as weight (kg) divided by the square of the body height in metres (kg/m^2).

Table 2: Recommended Classification of BMI[53,66]

Category	BMI (kg/m^2)
Caucasian, Europid and North American ethnicity[53]	
Underweight	< 18.5
Ideal range*	18.5–24.9
Overweight	25–29.9
Obesity Class 1	30–34.9
Obesity Class 2	35–39.9
Obesity Class 3	40–49.9
Obesity Class 4	50–59.9
Obesity Class 5	≥ 60
South-, Southeast- or East Asian ethnicity [66]	
Underweight	< 18.5
Ideal range*	18.5–22.9
Overweight—At risk	23–24.9
Overweight—Moderate risk	25–29.9
Overweight—Severe risk	≥ 30

*The term "ideal" is included here as it is a term that is used for the adjustment of body weight in a number of predictive equations used in clinical practice. It is the weight range associated with a lower risk of obesity complications in population studies, but it is not intended to imply that it is "ideal" for every individual.

Although BMI is a simple, objective and reproducible measure, it

has certain limitations that need to be recognised by clinicians using these tools[45,46].

- BMI is not a direct measure of body fat, cardiovascular risk or health.
- BMI does not indicate body fat distribution.
- BMI is not a measure of physical fitness.
- BMI does not account for muscle mass (it overestimates body fat in muscular individuals).
- BMI can underestimate body fat in people who have lost muscle mass (sarcopenic obesity (SO)).
- BMI does not distinguish between men, women or ethnicity.
- BMI is less accurate in certain populations (e.g., the elderly, people with physical disability, people < 18 years of age, people with severe obesity, during pregnancy and in patients with ascites or severe oedema).
- BMI over- or underestimates body fat in certain ethnic groups, such as Indigenous Peoples, South Asians, Chinese and other populations.

Can you have a high BMI and be healthy?

As with most health indicators (e.g., blood pressure, blood glucose, cholesterol), there exists a curvilinear relationship between the amount of body fat and its impact on health. In epidemiological studies, the relationship between body fat (or BMI) and health impacts follows a U-shaped curve with health risks progressively increasing at both the lower and higher ends of the BMI spectrum[67]. While there is a statistically significant relationship between increasing BMI and health risks, a given individual can present with virtually no relevant health issues over a wide range of BMI levels[68,69]. Although individuals with an elevated BMI who are healthy may have a modestly elevated health risk, and an increased likelihood of developing complications in the long term[70], there is currently no evidence to support long-term benefits of intentional weight loss in these individuals. A prudent approach to individuals presenting with an elevated BMI without the presence of health complications, would be to reinforce health behaviours aimed at preventing weight gain and reducing the risk of developing relevant health complications.

Waist circumference

Considering the limitations of BMI in determining fat composition and distribution as well as the anatomical variations in fat deposition, the use of WC has been recommended as an alternate measure of abdominal or visceral fat[71]. There is epidemiological evidence to suggest that WC can help identify individuals at increased risk for cardiometabolic disease[62,72,73]. A standardised method for accurately measuring WC is outlined in Box 2. Current recommended WC cut-offs are included in Table 3. It is important to recognise that WC measurement requires undressing and palpation of bony landmarks. Please consider if it's measurement will add significantly to your assessment and sensitively discuss what is involved prior to completion as there is the potential for patients to feel uncomfortable.

In Ireland, a WC of > 102 cm for men and > 89 cm for women indicates a substantially increased risk of cardiovascular disease (CVD), 63% of adults in Ireland have an increased risk of CVD based on WC[74]. For adults with a predominant South Asian, Southeast Asian or East Asian ethnicity, a lower cut-off for WC (≥ 85 cm in men and ≥ 75 cm in women) is recommended.

Despite its low-tech appeal and significant statistical association with cardiometabolic risk, there are important limitations to the routine use of WC measurement in the clinical setting:

- WC is not a direct measure of visceral fat.
- Considerable training and standardisation are required.
- WC is sensitive to abdominal distention due to food or fluid intake, bloating, ascites, pregnancy, etc.
- It has varying cut-offs for ethnic populations.
- It is a less-sensitive measure of visceral fat with increasing BMI.
- WC requires further body exposure and can be an intrusive measurement for some individuals.
- Measuring WC in patients with a BMI > 35 kg/m^2 may not change management, but it can provide patients with valuable information regarding the efficacy of their treatment during their long-term follow-up. Some patients can see changes in adipose distribution before a significant change in body weight or BMI.

As with BMI, WC can be used as a simple and practical screening tool to identify individuals at higher risk of cardiometabolic disease. This may be particularly true for individuals who fall below the accepted BMI cut-offs for obesity. A variety of optimal cut-off values have been proposed, depending on ethnicity, measuring technique and outcomes of interest. Most cut-offs range from 65.5 cm to 101.2 cm for women and 72.5 to 103 cm for men[73,75-77]. Patients with an increased BMI (< 35 kg/m^2) and an elevated WC are associated with an increased risk of developing cardiometabolic complications, such as T2DM and hypertension[78]. Those with a BMI > 35 kg/m^2 are likely to be at an increased risk of cardiometabolic risk factors irrespective of their WC.

Box 2: Measuring Waist Circumference

Remove clothing from the waistline only.

Stand with feet shoulder width apart (25 cm to 30 cm or 10 inches 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 in 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. This is the part of the hip bone at the side of the waist, not at the front of the body.

WC 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.

To increase comfort, it may be beneficial to ask the patient to initially hold one end of the tape measure instead of reaching around the patients' waist.

Integration of anthropometric measurements

Both BMI and WC provide valuable and complementary information in the assessment of obesity and the estimation of cardiometabolic risk. Among individuals with an elevated BMI (< 35 kg/m^2), having an increased WC may imply a greater risk of developing significant cardiometabolic outcomes. Furthermore, among patients with a BMI < 25 kg/m^2, an increase in WC may imply intra-abdominal fat deposition and an increased risk of cardiometabolic disease[83]. These patients may benefit from early intervention to treat and prevent obesity-related complications.

Assessing the impact of excess or dysfunctional adiposity on health

The association between the diagnosis of obesity and the development of obesity-related complications is strong but not always linear; therefore, comparable levels of excess adiposity can have different impacts on health and quality of life for different patients. Similarly, multiple reports have documented a sub-group of "metabolically healthy" patients with obesity, characterised by the absence of any objective evidence of increased cardiometabolic risk despite having an elevated BMI and waist circumference[84,85]. Metabolically healthy patients with higher levels of adiposity may still be at increased mortality risk[85], and may have other non-metabolic complications, such as sleep apnoea, depression and musculoskeletal pain, among others. Information gathered in the obesity assessment and analysed using the Edmonton Obesity Staging System (EOSS)[20,21] can help to understand the severity of the disease and guide the intensity of treatment required.

Table 3: Proposed Waist Circumference Cut-Off Points (cm) to Define Increased Abdominal Adiposity by Predominant Ethnicity

Predominant ethnicity	Increased abdominal adiposity/ cardiovascular risk		Significant abdominal adiposity/ greater cardiovascular risk	
	Women	Men	Women	Men
Caucasian Europid/United States/Mid-East Mediterranean[79]	80	94	88	102
Latino Central/South American[80]	83	88	90	94
Sub-Saharan African[79]	80	94		
African American	90	80	99	95
African	71.5	76.5	81.5	80.5
Asian	80	85		
Chinese[81]	81	83		
Korean[82]	75	80	85	90

Edmonton Obesity Staging System

Elements of the EOSS have been proposed to guide clinical decisions from the obesity assessment and at each BMI category[21]. Table 4 reviews the proposed clinical staging and its impact on management. EOSS is a measure of the mental, metabolic and functional impact that obesity has had on the patients' health and uses these factors to determine their stage of obesity (from stage 0–4). In population studies, EOSS has been shown to be a better predictor of all-cause mortality when compared to BMI or waist circumference measurements alone[86-88]. Recently, EOSS has been shown to better predict Covid-19 outcomes than BMI alone[89], and it is feasible to estimate from primary care electronic medical records[90].

Once the diagnosis has been established, the primary goal for the clinical assessment for obesity should be to identify the possible causes leading to weight gain, determine the extent to which weight has affected the patients' health and to systematically look for barriers in their management[91]. Given that obesity is a complex and heterogeneous disease, this can be a daunting task for HCPs. Using a clinical tool such as the 4Ms framework (mental health, mechanical, metabolic, monetary health/milieu) can provide a practical approach for HCPs to explore major drivers, barriers and complications of obesity (see Table 5)[92]. It can be used to provide a structure to perform an efficient and complete obesity assessment, including the history, physical exam and clinically indicated investigations. Furthermore, it can provide a baseline assessment if referral to a more specialist service is required as per the Model of Care for the Management of Overweight and Obesity[27].

Table 4: **Edmonton Obesity Staging System**

Stage	Description	Management
0	No apparent obesity-related risk factors (e.g., blood pressure, serum lipids, fasting glucose, etc. within normal range), no physical symptoms, no psychopathology, no functional limitations and/ or impairment of wellbeing.	Identification of factors contributing to increased body weight. Counselling to prevent further weight gain through behavioural measures, including healthy eating and increased physical activity.
1	Presence of obesity-related sub-clinical risk factors (e.g., borderline hypertension, impaired fasting glucose, elevated liver enzymes, etc.), mild physical symptoms (e.g., dyspnea on moderate exertion, occasional aches and pains, fatigue, etc.), mild psychopathology, mild functional limitations and/or mild impairment of wellbeing.	Investigation for other (non-weight-related) risk factors. More intense behavioural interventions, including nutrition therapy, exercise and psychological treatments to prevent further weight gain. Monitoring of risk factors and health status.
2	Presence of established obesity-related chronic disease (e.g., hypertension, type 2 diabetes, sleep apnoea, osteoarthritis, reflux disease, polycystic ovary syndrome, anxiety disorder, etc.), moderate limitations in activities of daily living and/or wellbeing.	Initiation of obesity treatment, including considerations of all psychological interventions, pharmacological and surgical treatment options. Close monitoring and management of complications as indicated.
3	Established end-organ damage, such as myocardial infarction, heart failure, diabetic complications, incapacitating osteoarthritis, significant psychopathology, significant functional limitations and/or impairment of wellbeing.	More intensive obesity treatment, including consideration of all psychological interventions, pharmacological and surgical treatment options. Aggressive management of complications as indicated.
4	Severe (potentially end-stage) disabilities from obesity-related chronic diseases, severe disabling psychopathology, severe functional limitations and/or severe impairment of wellbeing.	Aggressive obesity management as deemed feasible. Palliative measures including pain management, occupational therapy and psychosocial support.

Adapted from: Sharma AM, Kushner RF. A proposed clinical staging system for obesity. Int J Obes. 2009;33(3):289–295[21].

Table 5: **Components of the 4Ms Framework for Assessment of Obesity**[92]

Category	Complications	Investigations	Treatment Notes
Mental health	Knowledge/cognition	This can be identified through sensitive questioning about individual understanding of obesity as a chronic relapsing disease (e.g., would it be ok to talk about what you understand or have been told are the causes of obesity?).	It is important to establish understanding of obesity as a chronic disease and as applicable to begin to reduce shame and stigma that may be present.
	Expectations	Investigating expectations of different treatment options at the beginning can support patient satisfaction with treat-ment outcomes (e.g., would it be ok to discuss different treatment options and potential outcomes?).	Having realistic expectations about weight management/loss can affect how outcomes are viewed. Having collaborative discussions about what is perceived as success can be helpful in framing expectations.
	Self-image		
	Internalised weight bias	This can be accomplished through sensitive questioning/dialogue/motivational inter- viewing (e.g., "Can you share with me if or how your weight affects your perception of yourself?") or by questionnaire (WBIS). See the Chapter 1 Reducing Weight Bias in Obesity Management, Practice and Policy for details.	Unresolved perception of weight bias can have an influence on obesity management. Coping strategies to address internalised weight bias should be incorporated into behavioural interventions, consistent with the principles of cognitive behavioural therapy and acceptance and commitment therapy.
	Mood/anxiety	PHQ-9, GAD, HADS, The Beck Depression Inventory II, The Beck Hopelessness Scale and The Beck Anxiety Scales (see Chapter 10 Effective Psychological and Behavioural Interventions in Obesity Management).	If starting pharmacotherapy, consider options that do not increase weight (see Table 9). Consider referral to AMH service or more specialist service as clinically indicated[27].
	Addiction	Yale Food Addiction Scale (see Chapter 10 Effective Psychological and Behavioural Interventions in Obesity Management).	
	Sleep	Sleep questionnaires can be utilised to identify potential anatomical contribution to sleep disturbance (see below). Discussing sleep pattern and routine can also be helpful, e.g., duration, pattern, quality, barriers (to initiation/ maintenance).	Discussing the impact of sleep disturbance on hormonal balance, appetite, physical activity and weight management can help guide discussion in relation to treatment options.
	Attention		
	Personality		
Mechanical	Osteoarthritis, pain	History, X-ray, musculoskeletal assessment.	Consider referral to a physiotherapist to help manage pain and guide physical activity engagement as appropriate, e.g., exercise therapy, pacing, activity modification.
	Gout	Uric acid level.	Avoid steroids if possible.
	Sleep apnoea	STOP BANG sleep apnoea questionnaire, Berlin Questionnaire, Epworth Sleepiness Scale, overnight sleep study.	A home sleep study may be performed with consultant diagnostic support. CPAP therapy if indicated. CPAP adherence can be challenging, and support is required.
	Plantar fasciitis	Musculoskeletal assessment +/- orthotic assessment.	Consider referral to a physiotherapist to manage pain and guide physical activity engagement as appropriate, e.g., exercise therapy, pacing, modification, footwear. It may be appropriate to refer for orthotic assessment.
	Gastroesophageal reflux		
	Urinary/faecal incontinence	This can be investigated through careful questioning around urinary/faecal frequency and control, e.g., nocturia, urge/stress incontinence. Consider causes and barriers to management.	Consider referral to a physiotherapist or other HCP who specialises in pelvic health. Also note, a referral to an occupational therapist may be appropriate in relation to related ADL needs. A referral to dietitian may also be helpful to give guidance on hydration or nutritional factors which may be a contributing factor, e.g., constipation. Consider referral to a Level 3 service[27].
	Intertrigo		
	Idiopathic intracranial hypertension (pseudotumor cerebri)		
	Thrombosis		

Table 5: **Components of the 4Ms Framework for Assessment of Obesity** - continued

Category	Complications	Investigations	Treatment Notes
Metabolic	Type 2 diabetes	HbA1C, fasting glucose.	Consider medication options that are weight neutral, promote weight loss. Refer to a local diabetes self-management programme for support. Diabetic retina screen (Model of Integrated Care for Patients with Type 2 Diabetes)[93]. Consider referral to endocrinology/diabetes team. Enrolment in diabetes support course (Discover Diabetes)[93].
	Hyperlipidaemia	Total cholesterol, triglycerides, HDL-C.	
	Nutritional deficiency	25 hydroxy-vitamin D, iron studies, serum B12 level.	Supplement as needed to achieve therapeutic levels (see Chapter 8 Medical Nutrition Therapy in Obesity Management).
	Gout	Uric acid.	Avoid prednisone if possible.
	Hypertension	Ensure appropriate cuff size (bladder width 40% of arm circumference, length 80%–100% of arm circumference)[54].	DASH diet, consider secondary causes (e.g., sleep apnoea, pain) (See Chapter 8 Medical Nutrition Therapy in Obesity Management). Consider referral to a Level 2 service. Prioritise medications that affect the renin-angiotensin system, avoid beta blockers as first line.
	Endocrine PCOS/hypogonadism Infertility	Total testosterone, estradiol, prolactin, 17 hydroxyprogesterone, LH/FSH, DHEAS. TSH if clinical suspicion of hypothyroidism.	Consider metformin if insulin resistant.
	Cardiovascular disease Left ventricular hypertrophy, atrial fibrillation Chronic venous stasis/ ulcers/thrombophlebitis Stroke, DVT/PE Neurological Pseudotumor cerebri	ECG if indicated. Consider sub-maximal fitness assessment or functional testing to identify impact of CVD, e.g., Timed Up and Go, 6 minute walk test. Hx: Headache, pulsatile tinnitus, papilledema.	Referral to a cardiac rehabilitation programme may be appropriate. A Chester Step test may be utilised for assessment of cardiovascular health but it's suitability should be considered in the context of balance and joint pain.
	Gastrointestinal disease Fatty liver Gallstones	Liver enzyme elevation, increased liver stiffness (elastography) abdominal ultrasound, FIB-4 score.	
	Oncology Colorectal, gallbladder, pancreatic, breast, renal, uterine, cervical, prostate	Routine cancer screening.	Patients with obesity are at high risk for certain cancers and are less likely to be screened due to technical issues with diagnostic testing and delays in seeking medical attention.
	Skin Acanthosis, skin tags Candida Intertrigo Tinea Folliculitis Obesity-related lymphoedema-like swelling Cellulitis		Where lower limb swelling is identified, please consider referral for compression therapy. Consider PHN referral or referral to CIT.

Table 5: **Components of the 4Ms Framework for Assessment of Obesity** - continued

Category	Complications	Investigations	Treatment Notes
Monetary health/ milieu	Socioeconomic status Education Access to food Occupation Disability Clothing Weight-loss programmes Access to pharmacotherapy Surgery Vitamins		Consider referral to a community medical social worker or occupational therapist. Consider applying for LTI scheme, medical card, Drug Payment Scheme, PHEW Healthy eating programme. Consider using a PROMS evaluation tool[94-97].

CIT: Community Intervention Team; CPAP: Continuous Positive Airway Pressure; CVD: Cardiovascular Disease; DAS: Dietary Approaches to Stop Hypertension; DHEAS: dehydroepiandrosterone; DVT/PE: Deep Venous Thrombosis/Pulmonary Embolism; ECG: Electrocardiogram; ECHO: Echocardiogram; F: Female; FIB-4 : Fibrosis-4; GAD: Generalised Anxiety Disorder; HADS: Hospital Anxiety and Depression Scale ; HCP: Healthcare Professional; M: Male; PCOS: Polycystic Ovarian Syndrome; PHN: Public Health Nurse; PHQ-9: Patient Health Questionnaire-9; LH/FSH: luteinizing hormone/follicle stimulating hormone; LTI: Long-Term Illness; PHEW: Programme for Healthy Eating and Weight Management; PROMS: Patient Reported Outcome Measures; TSH: thyroid stimulating hormone.

Patient-reported outcome measures

Patient-reported outcome measures (PROMS) are tools that capture the patient's perspective about the effectiveness of interventions, and can include symptoms, function, physical, mental and social health[94,95]. Historically there has been a lack of standardisation in the use of these measures in obesity assessment and treatment. Recently the Standardise Quality of life Measurement in Obesity Treatment (S.Q.O.T) initiative identified eight domains considered important to measure: self-esteem, physical health/functioning, mental/psychological health, social health, eating, stigma, body image and excess skin[97]. The authors also suggested using PROMS and to consider including Impact of Weight on Quality Of Life-Lite (IWQOL-Lite)-, BODY-Q, 36-item Short Form Health Survey(SF-36), Obesity-related Problems scale (OP) and the Quality Of Life for Obesity Surgery (QOLOS)[97].

Components of an obesity-centred history

An obesity-centred history should include all parts of a routine clinical interview, such as past medical and surgical history, medications, allergies and social and family history. However, an emphasis should be placed on screening for underlying root causes and consequences of obesity (reviewed in Table 5). Key elements of the history include screening for sleep disorders; physical, sexual and psychological abuse; description of eating patterns; physical activity and screen time; internalised weight bias; mood and anxiety disorders; as well as substance abuse and addiction[13,14]. The British Obesity and Metabolic Surgery Society have guidance on psychological assessment relating to bariatric surgery, but some of the themes covered may be relevant to Level 2 and 3 obesity services[98]. A thorough history of medications should screen for weight-promoting medications. Consider alternative options where possible. The most common weight-promoting medications are outlined in Table 9. The clinician conducting the assessment should also identify and document the patient's values and goals around treatment and foster insight to help with long-term coping and self-management skills[15,30]. Table 6 reviews some key components which are specific to an obesity-focused interview. Key processes of a personalised obesity assessment in primary care are highlighted in Table 6; these have been shown to have a positive impact on the patient's' ability to foster everyday change and facilitate improvements in their physical, mental and social health[15,30]. Screening for monogenic causes of obesity should be considered in the context of evolving personalised approaches to clinical care of patients living with obesity (refer to Chapter 3 Science of Obesity for more information on genetics and obesity).

Components of an obesity-centred physical exam

An obesity-centred physical exam should be focused on determining the obesity phenotype, drivers of weight gain and treatment barriers for all patients. The key components of an obesity-centred physical exam are outlined in Table 7. Routine anthropometric measurements should include height, weight, BMI and WC. Blood pressure should be measured with an appropriately sized cuff according to the patient's arm circumference. If a large upper arm

size is prohibitive, systolic blood pressure can be measured in the forearm selecting the cuff size (small cuff [20.0 cm – 26.0 cm], standard cuff [between 25.4 cm – 40.6 cm and 25.0 cm – 34.0 cm] and large cuff [> 32.0 cm]) according to participant's forearm circumference. For cuff installation in the forearm, position the distal edge of the cuff about 6 cm proximal to the styloid process of the ulna[99,100]. Neck circumference and airway patency are also helpful to estimate the risk of sleep apnoea. Irish studies have shown an obstructive sleep apnoea (OSA) prevalence of over 90% in populations with severe obesity and recommend referral for sleep assessment in the presence of a BMI ≥ 50 kg/m^2 alone[19,101]. In addition to a routine cardiorespiratory assessment, a head, neck and gastrointestinal exam should be performed along with a general skin examination to rule out common skin findings (see Table 7). A musculoskeletal, gait and physical function examination is also recommended to assess for barriers in mobility. Identification of barriers to engagement in activities of daily living is further described in Chapter 5 Enabling Participation in Activities of Daily Living for People Living with Obesity and should be considered in relation to a focus on improving quality of life. A cursory endocrine exam includes palpating for an enlarged thyroid gland and screening for signs of Cushing syndrome and PCOS. These signs, if present, should prompt further biochemical screening and referral to endocrinology may be appropriate.

Metabolic investigations to assess obesity

Diagnostic testing is commonly ordered during the initial assessment of obesity to identify metabolic problems and to tailor therapy. There is no single blood test or diagnostic evaluation that is indicated for all people living with obesity. The specific evaluations performed should be based on the presenting symptoms, risk factors and index of suspicion. Table 8 reviews some blood and diagnostic testing for clinicians to consider when assessing a person living with obesity. Screening for metabolic syndrome with a HbA1c or fasting blood sugar, total cholesterol, serum triglycerides and high density lipoprotein (HDL) level is recommended for the majority[102]. Those at high risk of fatty liver disease, including those with type 2 diabetes or metabolic syndrome, should be screened with for their alanine transaminase level and an abdominal ultrasound. A referral to gastroenterology/ hepatology may be appropriate in patients with persistently elevated liver enzymes (greater than two times the upper limit of normal over six months and/or high Fibrosis-4 (FIB-4) scores). The gold standard to diagnose non-alcoholic fatty liver disease is a liver biopsy[103].

Evaluation of coronary artery disease

Large prospective studies have documented obesity as being an independent predictor of coronary artery disease[104]. This relationship was stronger in younger individuals. Susceptibility to obesity-related cardiovascular complications is not only mediated by overall body fat mass but is largely dependent upon individual differences in regional body fat distribution[83,105]. Large cohort studies using imaging techniques have identified excess abdominal visceral adipose tissue as a strong predictor in the development of cardiovascular disease over time, independently of total body fat mass[106]. Numerous non-invasive tests can diagnose atherosclerosis or myocardial ischemia, or both. The correct choice depends on local expertise, the relative strengths and weaknesses of each modality and individual patient characteristics, as well as pre-test likelihood of coronary artery disease. Consideration before referral should also be given to the structural dimensions and composition of the equipment utilised and safe working load.

Electrocardiogram

Obesity has the potential to impact the electrocardiogram (ECG) in several ways, including displacement of the heart by elevating the diaphragm in the supine position, increasing the cardiac workload and increasing the distance between the heart and the recording electrodes. Besides low QRS voltage and left-ward trend in the axis, other alterations frequently seen are non-specific flattening of the T-waves in the infero-lateral leads (attributed to the horizontal displacement of the heart) and voltage criteria for left atrial abnormality. An increased incidence of false positive criteria for inferior myocardial infarction in individuals living with obesity, due to the elevation of the diaphragm has been reported.[107] Left ventricular hypertrophy is probably underdiagnosed based on the usual ECG criteria in individuals with greater than Class II obesity. Since baseline ECG may be influenced by obesity (false positive for inferior myocardial infarction, microvoltage, non-specific ST-T changes) and people living with obesity may have impaired maximal exercise testing capacity (dyspnoea, mechanical limitations, left ventricular diastolic dysfunction), other modalities may be of interest in the evaluation of coronary artery disease in this population. Indeed, due to impaired exercise tolerance because of mechanical and physiological limitations related to stress testing in patients with very high BMIs, a perfusion scan may be used instead of exercise testing for evaluating the presence of ischemic heart disease.

Table 6: **Recommended Key Components of an Obesity-Centred Medical History**

Note: Where complications are identified referral to the appropriate medical, nursing or health and social care professionals should be made accordance with the Model of Care for the Management of Overweight and Obesity.

Interview component	Details	Implication/significance /recommended actions
Medical	Medical history Surgical history Medications	
Weight history	Document age of onset of obesity and major weight trajectories over time. Previous weight-loss attempts and response to interventions (including behavioural interventions, medications, endoscopic and surgical interventions). Highest and lowest weight. Major life event(s) associated with weight change. Current phase of weight (e.g., gaining, losing, stable).	Can help to understand patients weight journey, success/failures of past attempts and causes of weight gain/loss in the past, childhood vs. adult obesity. Can help to establish realistic expectations. Can help to prevent future weight gain and target behavioural and psychological treatment. Can help to make appropriate goals (e.g., weight stabilisation if currently gaining weight). Key processes[15,30] • Show compassion; • Real listening (paraphrase and summarise to ensure you understand and validate the patient's thoughts); and • Help patients make sense of their story (find root causes, foster insight, find patterns/triggers, identify values/goals, reflect on timeline to acknowledge impact on life in context to weight).
Nutrition	Current eating patterns, nutrient intake, medical conditions that may require a specialist diet. Food environment (access, preparation facilities and skills, budget/ food security, social eating) . Nutritional requirements (protein, energy, micronutrients). Appetite e.g., TFEQ. Relationship with food. Assess nutrition literacy.	Is there concern of physiological hunger, emotional eating, mindless eating, knowledge deficit[108]? Consider referral to registered dietitian. See Chapter 8 Medical Nutrition Therapy in Obesity Management for more details on use of nutrition care process for detailed nutrition assessment.
Physical activity	Current physical activity, including time spent in sedentary activities. Limitations/barriers to activity (e.g., pain, time, motivation, past experience, cardiorespiratory or neurological impairment, obesity-related lymphoedema-like swelling). Mobility aid requirement. Identify social limiting factor restricting access to increasing physical activity. Falls history assessment. Number of days a week outside of the home. Activity of daily living assessment. BODY-Q.	Help patient to make self-directed activity goals if helpful to the individual. Address limitations independently (e.g., pain management and appropriate referral for joint pain, etc.). See the Chapter 9 Physical Activity in Obesity Management. Key processes[15,30] • Recognise strengths; • Shift beliefs; • Reframe misconceptions; and • Help establish whole-person value goals and functional outcomes, instead of weight-based goals.
Depression and anxiety screening	Screen for depression and anxiety. Determine overall quality of life, e.g., IWQOL, SF-36, Dartmouth COOP Questionnaire/European Quality of Life Questionnaire Visual Anaolgue Scale (EQVAS).	Consider referral to psychiatry/psychology.
Other mental health issues/ drivers	Screen for attention deficit hyperactivity disorder, post-traumatic stress disorder, chronic grief. Screen for eating disorders, e.g., using BES, ESS and EDI, QEWP-5, EDE-Q or clinical interviews EDE, NESHI, SCID-1, SIAB, BODY-Q. Psychological impact of previous weight journey.	Consider referral to psychiatry/psychology. Review challenges with body image, self-esteem. See Chapter 10 Effective Psychological and Behavioural Interventions in Obesity Management.

Table 6: **Recommended Key Components of an Obesity-Centred Medical History** - continued

Interview component	Details	Implication/significance /recommended actions
Addiction/ dependency	Smoking status. Alcohol intake. Use of cannabinoids and other psychoactive substances, current or previous abuse of substance. Excessive use of caffeine-containing beverages (e.g., sugar-sweetened beverages).	Consider referral to psychiatry/psychology or other appropriate HCP/HSE pathway, e.g., Quit.ie. See Chapter 10 Effective Psychological and Behavioural Interventions in Obesity Management.
Abuse	Screen for previous and current forms of physical, psychological and sexual abuse.	Unresolved history of abuse and current abuse can be a barrier to obesity management and can have an impact on food behaviours and relationship with food. Interdisciplinary approach may be required.
Sleep history	Number of hours of sleep per night, sleeping pattern (bed time/ rise time, sleep quality) and barriers to initiation/maintenance. Use of pharmacologic sleeping aids. Sleep apnoea-hypopnoea screening (such as STOP BANG Sleep Apnoea Questionnaire, Epworth Sleepiness Scale). If night eating is identified, consider using questionnaire NEQ.	Poor sleep quality and quantity can be a barrier to obesity management[109]. If positive screening (STOP BANG > 4), consider referral for a sleep study.
Medication history	Review medications that can have a significant impact on weight[110].	See Table 9. Key processes[15,30] • Make sense of the story, and • Help establish root causes.
Social history Family history	Age, sex, ethnicity, marital status, occupation/work schedule: number of hours per week, night shift work, commute time/mode.	Eating behaviours in shift workers may require additional consideration when deciding therapeutic options.
	Income support, medical coverage, access to exercise facilities.	Evaluate patients' access to food options, nutritional education, cooking skills. Consider involving a social worker/counsellor in cases where income, medication coverage and resource access may be limited
	Level of functional independence.	In patients with decreased independence, consider involving caregivers and decision makers. Consider referral to an occupational therapist +/- medical social worker.
	History of first-degree relative with overweight/obesity or related complications. Overweight and obesity in other household members.	Can help determine patients' risk of obesity or related complications. Group interventions are more challenging but more likely to be feasible and sustainable in patients exposed to environments where obesity is highly prevalent.
Other mental health issues/ drivers	Past experience. Motivation. Confidence. Expectations.	See Chapter 10 Effective Psychological and Behavioural Interventions in Obesity Management. Key processes[15,30] • Recognise strengths; • Shift beliefs (help manage expectations, focus on the whole health of the patient); • Co-construct a new story (context integration, prioritising goals); • Orient values and plan actions (help establish direction); • Foster reflection (insight, motivation, accountability); and • Help internalise core messages (help establish coping skills).

BES: Binge Eating Scale; EDE-Q: Eating Disorder Examination Questionnaire; EDI:Eating Disorder Inventory; ESS: Emotional Eating Scale; IWQOL: Impact of Weight on Quality of Life; NEQ: Night Eating Questionnaire; NESHI: Night Eating Syndrome History Inventory; QEWP-5: Questionnaire on Eating and Weight Patterns-5; SCID-1: Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV Axis I Disorders; SF-36: 36-Item Short Form Health Survey; SIAB: Structured Interview for Anorexia and Bulimia; TFEQ: Three Factor Eating Questionnaire.

Table 7: **Key Components of an Obesity-Centred Physical Exam**

Vital signs: Blood pressure (appropriately sized cuff), heart rate, oxygen saturation.

Anthropometric measurement: Weight, height, waist circumference, BMI.

Head and neck
- Neck circumference, Mallampati score.
- Thyroid exam.
- Cushing's syndrome (moon faces, prominent supraclavicular and dorsocervical fat pad).
- Polycystic ovary syndrome (acanthosis nigricans, hirsutism, acne).
- Relevant nutrition-focused physical findings: dentition and oral health.

Cardiorespiratory
- Heart rate and rhythm.
- Signs of heart failure (added heart sounds, pedal edema, pulmonary rales).
- Respiratory rate and oxygen saturation.
- Sub-maximal fitness assessment and recovery, e.g., 6-minute walk test and cardiorespiratory response – heart rate, oxygen saturation and perceived exertion.

Gastrointestinal
- Liver span.
- Umbilical, incisional hernias.
- Screening for stigmata of chronic liver disease (encephalopathy, ascites, jaundice, palmar erythema, etc.).
- Relevant nutrition-focused physical findings: reflux, appetite.

Musculoskeletal & balance assessment
- Assessment of pain, particularly low back pain, knee pain, plantar fasciitis, as appropriate.
- Osteoarthritis (Heberden's/Bouchard's nodes, weight-bearing joints).
- Gout.
- Falls history.
- Functional assessment & gait exam, e.g., timed up and go, 6-minute walk test, functional reach/balance assessment, grip strength.
- Relevant nutrition-focused physical findings: muscle wasting, sarcopenia.

Skin
- Candida, intertrigo, tinea, skin tags, psoriasis, acanthosis nigricans.
- Nutritional deficiencies (pallor of conjunctiva, palmar crease rubor, atrophic glossitis, neuropathy)[111].
- Abdominal striae (violaceous striae wider than 1 cm).
- Colour and temperature (evidence of cellulitis).

Lower limbs
- Lymphoedema (non-painful, pitting edema, typically arms/legs).
- Lipoedema (often painful fat deposition, non-pitting edema, typically in arms and legs with sparing of the hands and feet).
- Venous insufficiency, ulcers, stasis, thrombophlebitis.
- Circumferential measurements.

Sarcopenic obesity

SO is a clinical and functional condition characterised by excess fat mass and low skeletal l[112]. In 2022, the European Association for the Study of Obesity (EASO) and the European Society for Clinical Nutrition and Metabolism (ESPEN) released a joint consensus statement on the definition and diagnostic criteria for SO for use in clinical settings[113]. They recommend three steps:

- **Screening:** Based on the concomitant presence of an elevated BMI/WC (using WHO cut-points) and surrogate indicators of sarcopenia (e.g., clinical symptoms, risk factors (including age > 70 years, chronic/acute disease diagnosis and history of falls, fatigue or weakness)) and/or validated questionnaires (e.g., SARC-F in older subjects).

- **Diagnosis:** Based on altered skeletal muscle function (using handgrip strength or chair stand tests) and altered body composition of increased fat mass plus reduced muscle mass (assessed using appendicular lean mass adjusted to body weight by DEXA or skeletal muscle mass adjusted by weight by BIA).

- **Staging:** To establish the severity of SO, consider the absence (Stage 1) or presence (Stage 2) of at least one complication attributable to altered body composition and skeletal muscle functional parameters (e.g., metabolic diseases, disability, cardiovascular and respiratory diseases).

Evaluation of other conditions associated with obesity

Women with obesity and symptoms of PCOS should be screened for LH, FSH, total testosterone, dehydroepiandrosterone (DHEAS), prolactin, TSH and 17 hydroxyprogesterone levels. Other endocrinopathies, including thyroid dysfunction, Cushing's syndrome or acromegaly are not routinely recommended unless clinically warranted. We encourage age-appropriate cancer screening for patients with obesity as they are at an increased risk and often have poor outcomes due to lower rates of routine screening and delays in seeking treatment.

Table 8: **Laboratory and Diagnostic Tests to Consider in the Assessment of Patients with Obesity**

Consider for most patients
- HbA1c
- Electrolytes renal function tests (creatinine, eGFR)
- Total cholesterol, HDL- and LDL-cholesterol, triglycerides
- Alanine aminotransferase Age-appropriate cancer screening

Consider if clinically indicated
- Complete (full) blood count
- Thyroid stimulating hormone/thyroid function tests
- Uric acid
- Assessment of iron (TIBC, % saturation, serum ferritin, serum iron)
- Vitamins B12 and D levels
- Urinalysis for micro-proteinuria
- OSA screen 101

Women with obesity and symptoms of polycystic ovary syndrome
- LH, FSH, total testosterone, DHEAS, prolactin and 17 hydroxyprogesterone levels

DHEAS: dehydroepiandrosterone; eGFR: estimated Glomerular Filtration Rate; FSH: follicle stimulating hormone;
HDL; High Density Lipoprotein; LDL; Low Density Lipoprotein; LH: luteinizing hormone; OSA: Obstructive Sleep Apnea; TIBC: total iron binding capacity.

Table 9: **Summary of Weight-Promoting Medications and Alternative Therapies**

Note: *The information below lists medications associated with high or low risk for weight gain. However, as with all medication side effects, there is significant individual variability with weight responses to medications, and some people may experience unexpected weight gain or weight loss that is atypical for a medication.

Category	Class	Name	Weight gain	Possible alternative therapy*
Hypoglycaemic agents† [110,114-120]	Insulins	Insulin	↑↑	Biguanide (metformin) GLP1 analogues (e.g., liraglutide, semaglutide)# SGLT-2i (e.g., dapagliflozin, empagliflozin)# DPP4i (e.g., linagliptin, sitagliptin)#
	Thiazolidinedione	Pioglitazone	↑	
	Sulphonylurea	Gliclazide	↑	
Anti-depressants / mood stabilisers[110,121-127]	Tricyclics	Amitriptyline	↑↑	Serotonin and noradrenaline reuptake inhibitor (SNRI) (venlafaxine, duloxetine) Alternative MAOI (moclobemide, tranylcypromine) Other anti-depressants (trazodone, bupropion, vortioxetine)
		Clomipramine	↑↑	
		Lofepramine	↑↑	
		Nortriptyline	↑↑	
	Atypical	Mirtazapine	↑↑↑	
	MAOIs	Phenelzine	↑	
	Selective serotonin reuptake inhibitors (SSRIs)	Paroxetine	↑	Fluvoxamine Sertraline Citalopram Escitalopram Fluoxetine
	Lithium	Lithium	↑↑	
Anti-psychotics [110,126,128,129]		Clozapine	↑↑↑	Ziprasidone Lurasidone (not reimbursed in Ireland) Aripiprazole Amisulpride Cariprazine
		Olanzapine	↑↑↑	
		Chlorpromazine	↑↑	
		Risperidone	↑↑	
		Paliperidone	↑↑	
		Quetiapine	↑↑	
		Zuclopenthixol	↑↑	
Anti-convulsants [124-126,130-133]		Valproate	↑	Topiramate Zonisamide Lamotrigine
		Carbamazepine	↑	
		Gabapentin	↑↑	
		Pregabalin	↑↑	
Corticosteroids[134,135]	Oral steroids	Prednisolone	↑↑↑	Budesonide Alternative pain relief (NSAIDs, paracetamol, opioids)
		Cortisone	↑↑↑	
	Inhaled steroids	Ciclesonide	↑	
		Fluticasone	↑	
Contraceptives^ [136,137,138]		Depo medoxyprogesterone acetate (Depo-Provera)	↑↑	Etonogestral implant (Implanon) Progesterone only pill Combined hormonal contraception Intrauterine contraceptive device
Anti-histamines[139]		Diphenhydramine	↑	Loratadine Fexofenadine
		Promethazine	↑	

Table 9: **Summary of Weight-Promoting Medications and Alternative Therapies** - continued

Category	Class	Name	Weight gain	Possible alternative therapy*
Beta blockers/ Anti-hypertensives [140,141]		Propranolol	↑	CCBs (may cause fluid retention) Vasodilating beta blockers (bisoprolol, nebivolol, carvedilol)
		Metoprolol	↑	
		Atenolol	↑	
		Clonidine	↑	Prazosin ACEi/ARBs Diuretics

DPP4i: Inhibitors of dipeptidyl peptidase 4; GLP-1: Glucagon-like peptide-1 receptor agonists; NSAIDs: Nonsteroidal anti-inflammatory drugs: SGLT-2: Sodium glucose co-transporter 2; ACEi: Angiotensin converting enzyme inhibitors; ARBs: Angiotensin II receptor blockers; CCBs: Calcium channel blockers; MAOIs: Monoamine oxidase inhibitors; SSRIs: Selective serotonin reuptake inhibitors; SNRIs: Serotonin and noradrenaline reuptake inhibitors; ↑ up to 5 kg weight gain; ↑↑ 5 to 10 kg weight gain; ↑↑↑ more than 10 kg weight gain; † See the American Diabetes Association / European Association for the Study of Diabetes recommendations and treatment algorithms to guide pharmacologic therapy in type 2 diabetes[120]; #the SGLT-2 inhibitors, GLP-1 agents and DPP4 inhibitors in the alternative therapy section is not intended to be a definitive list, other options are available within each class and newer agents may be available with time; ^See Faculty of Sexual and Reproductive Healthcare guidance on contraception and weight gain[136].

The Clinical Assessment of People Living with Obesity chapter is adapted from the Canadian Adult Obesity Clinical Practice Guidelines (the "Guidelines"), which Obesity Canada owns and from whom we have a license. ASOI adapted the Guidelines having regard for any relevant context affecting the Island of Ireland using the ADAPTE Tool.

ASOI acknowledges that Obesity Canada and the authors of the Guidelines have not reviewed the Clinical Assessment of People Living with Obesity chapter and bear no responsibility for changes made to such chapter, or how the adapted chapter is presented or disseminated. As Obesity Canada and the authors of the original Guidelines have not reviewed the Clinical Assessment of People Living with Obesity chapter, such parties, according to their policy, disclaim any association with such adapted Materials. The original Guidelines may be viewed in English at: www.obesitycanada.ca/guidelines.

Correspondence:
info@asoi.info

References

1. Wormser D, Kaptoge S, Di Angelantonio E. Separate and combined associations of body-mass index and abdominal adiposity with cardiovascular disease: collaborative analysis of 58 prospective studies. The Lancet 2011; 377(9771): 1085-95.
2. Whitlock G, Lewington S, Sherliker P, Clarke R, Emberson J, Halsey J. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. The Lancet 2009; 373(9669): 1083-96.
3. Cornier MA, Despres JP, Davis N, et al. Assessing adiposity: a scientific statement from the American Heart Association. Circulation 2011; 124(18): 1996-2019.
4. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. BMC Public Health 2009; 9: 88.
5. Berrington de Gonzalez A, Hartge P, Cerhan JR. Body-Mass Index and Mortality among 1.46 Million White Adults. New England Journal Medicine 2011; 363(23): 2211-9.
6. Cerhan JR, Moore SC, Jacobs EJ, et al. A pooled analysis of waist circumference and mortality in 650,000 adults. Mayo Clin Proc 2014; 89(3): 335-45.
7. Lassale C, Tzoulaki I, Moons KGM, et al. Separate and combined associations of obesity and metabolic health with coronary heart disease: a pan-European case-cohort analysis. Eur Heart J 2018; 39(5): 397-406.
8. World Health Organization (WHO) Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004; 363(9403): 157-63.
9. Gavriilidou NN, Pihlsgard M, Elmstahl S. Anthropometric reference data for elderly Swedes and its disease-related pattern. Eur J Clin Nutr 2015; 69(9): 1066-75.
10. Balkau B, Deanfield JE, Despres JP, et al. International Day for the Evaluation of Abdominal Obesity (IDEA): a study of waist circumference, cardiovascular disease, and diabetes mellitus in 168,000 primary care patients in 63 countries. Circulation 2007; 116(17): 1942-51.
11. de Koning L, Merchant AT, Pogue J, Anand SS. Waist circumference and waist-to-hip ratio as predictors of cardiovascular events: meta-regression analysis of prospective studies. Eur Heart J 2007; 28(7): 850-6.
12. Vazquez G, Duval S, Jacobs DR, Jr., Silventoinen K. Comparison of body mass index, waist circumference, and waist/hip ratio in predicting incident diabetes: a meta-analysis. Epidemiol Rev 2007; 29: 115-28.
13. Luppino FS, de Wit LM, Bouvy PF. Overweight, obesity, and depression. a systematic review and meta-analysis of longitudinal studies. Arch GFen Psychiatry 2010; 67(3): 220-9.

14. Foster GD, Borradaile KE, Sanders MH. A randomized study on the effect of weight loss on obstructive sleep apnea among obese patients with type 2 diabetes. The Sleep AHEAD stud. Arch Intern Med 2009; 169: 1619-26.

15. Luig T, Anderson R, Sharma AM, Campbell-Scherer DL. Personalizing obesity assessment and care planning in primary care: patient experience and outcomes in everyday life and health. Clin Obes 2018; 8(6): 411-23.

16. Wildman RP, Muntner P, Reynolds K, et al. The obese without cardiometabolic risk factor clustering and the normal weight with cardiometabolic risk factor clustering: prevalence and correlates of 2 phenotypes among the US population (NHANES 1999-2004). Arch Intern Med 2008; 168(15): 1617-24.

17. Campbell-Scherer D, Rogers J, Manca D, et al. Guideline harmonization and implementation plan for the BETTER trial: Building on Existing Tools to Improve Chronic Disease Prevention and Screening in Family Practice. CMAJ Open 2014; 2(1): E1-E10.

18. European Association for the Study of the Liver (EASL), European Association for the Study of Diabetes (EASD), European Association for the Study of Obesity (EASO). EASL-EASD-EASO Clinical Practice Guidelines for the management of non-alcoholic fatty liver disease. Diabetologia 2016; 59(6): 1121-40.

19. National Institute of Health and Care Excellence. Obstructive sleep apnoea/hypopnoea syndrome and obesity hypoventilation syndrome in over 16s. NG 202, 2021.

20. Grammatikopoulou MG, Chourdakis M, Gkiouras K, et al. Edmonton obesity staging system among pediatric patients: a validation and obesogenic risk factor analysis. J Endocrinol Invest 2018; 41(8): 947-57.

21. Kirk SF, Penney TL, McHugh TL, Sharma AM. Effective weight management practice: a review of the lifestyle intervention evidence. Int J Obes (Lond) 2012; 36(2): 178-85.

22. Albury C, Strain WD, Brocq SL, Logue J, Lloyd C, Tahrani A. The importance of language in engagement between health-care professionals and people living with obesity: a joint consensus statement. Lancet Diabetes Endocrinol 2020; 8(5): 447-55.

23. Obesity UK. Language Matters Guide. UK: Obesity UK, 2020.

24. National Health Service (NHS). Language Matters - Language and diabetes. England: NHS, 2018.

25. Wisniewski AE. The weight of communication: The Canadian Medical Association Journal's discourse on obesity. Public Underst Sci 2013; 22(3): 351-64.

26. Phelan SM, Burgess DJ, Yeazel MW, Hellerstedt WL, Griffin JM, van Ryn M. Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. Obes Rev 2015; 16(4): 319-26.

27. Health Service Executive (HSE). Model of Care for the Management of Overweight and Obesity. Dublin: Royal College of Physicians in Ireland, 2021.

28. Mechanick JI, Hurley DL, Garvey WT. Adiposity-Based Chronic Disease as a New Diagnostic Term: The American Association of Clinical Endocrinologists and American College of Endocrinology Position Statement. Endocr Pract 2017; 23(3): 372-8.

29. Garvey WT, Mechanick JI. Proposal for a Scientifically Correct and Medically Actionable Disease Classification System (ICD) for Obesity. Obesity (Silver Spring) 2020; 28(3): 484-92.

30. World Health Organization (WHO). Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser 2000; 894: i-xii, 1-253.

31. Kyle TK, Dhurandhar EJ, Allison DB. Regarding Obesity as a Disease: Evolving Policies and Their Implications. Endocrinol Metab Clin North Am 2016; 45(3): 511-20.

32. Vallgarda S, Nielsen MEJ, Hansen AKK, et al. Should Europe follow the US and declare obesity a disease?: a discussion of the so-called utilitarian argument. Eur J Clin Nutr 2017; 71(11): 1263-7.

33. Ortiz SE, Kawachi I, Boyce AM. The medicalization of obesity, bariatric surgery, and population health. Health (London) 2017; 21(5): 498-518.

34. Frühbeck G, Busetto L, Dicker D, et al. The ABCD of Obesity: An EASO Position Statement on a Diagnostic Term with Clinical and Scientific Implications. Obesity Facts 2019; 12(2): 131-6.

35. The European Commission. World Obesity Day: 23% of adults in the EU live with obesity, another 36% with pre-obesity - a silent health crisis. 2021. https://ec.europa.eu/jrc/en/news/world-obesity-day-23-adults-eu-live-obesity-another-36-pre-obesity-silent-health-crisis (accessed 1 February 2022).

36. World Health Organization (WHO). Guideline: assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition. Switzerland: WHO; 2017.

37. Welzel FD, Stein J, Pabst A, et al. Five A's counseling in weight management of obese patients in primary care: a cluster-randomized controlled trial (INTERACT). BMC Fam Pract 2018; 19(1): 97.

38. Retat L, Pimpin L, Webber L, et al. Screening and brief intervention for obesity in primary care: cost-effectiveness analysis in the BWeL trial. Int J Obes (Lond) 2019; 43(10): 2066-75.

39. Puhl RM, Luedicke J, Grilo CM. Obesity bias in training: attitudes, beliefs, and observations among advanced trainees in professional health disciplines. Obesity (Silver Spring) 2014; 22(4): 1008-15.

40. Smigelski-Theiss R, Gampong M, Kurasaki J. Weight Bias and Psychosocial Implications for Acute Care of Patients With Obesity. AACN Adv Crit Care 2017; 28(3): 254-62.

41. Hunte HE, Williams DR. The association between perceived discrimination and obesity in a population-based multiracial and multiethnic adult sample. Am J Public Health 2009; 99(7): 1285-92.

42. Pearl RL, Hopkins CH, Berkowitz RI, Wadden TA. Group cognitive-behavioral treatment for internalized weight stigma: a pilot study. Eat Weight Disord 2018; 23(3): 357-62.

43. Puhl RM, Heuer CA. The stigma of obesity: a review and update. Obesity (Silver Spring) 2009; 17(5): 941-64.

44. Fruh SM, Nadglowski J, Hall HR, Davis SL, Crook ED, Zlomke K. Obesity Stigma and Bias. J Nurse Pract 2016; 12(7): 425-32.

45. Akpinar E, Bashan I, Bozdemir N, Saatci E. Which is the best anthropometric technique to identify obesity. Body mass index, waist circumference or waist-hip ratio? Coll Antropol 2007; 31(2): 387-93.

46. Feldstein CA, Akopian M, Olivieri AO, Kramer AP, Nasi M, Garrido D. A comparison of body mass index and waist-to-hip ratio as indicators of hypertension risk in an urban Argentine population: a hospital-based study. Nutr Metab Cardiovasc Dis 2005; 15(4): 310-5.

47. Rueda-Clausen CF, Benterud E, Bond T, Olszowka R, Vallis MT, Sharma AM. Effect of implementing the 5As of obesity management framework on provider-patient interactions in primary care. Clin Obes 2014; 4(1): 39-44.

48. Jay M, Gillespie C, Schlair S, Sherman S, Kalet A. Physicians' use of the 5As in counseling obese patients: is the quality of counseling associated with patients' motivation and intention to lose weight? BMC Health Serv Res 2010; 10: 159.

49. Douketis JD, Macie C, Thabane L, Williamson DF. Systematic review of long-term weight loss studies in obese adults: clinical significance and applicability to clinical practice. Int J Obes (Lond) 2005; 29(10): 1153-67.

50. Littman AJ, Damschroder LJ, Verchinina L, et al. National evaluation of obesity screening and treatment among veterans with and without mental health disorders. Gen Hosp Psychiatry 2015; 37(1): 7-13.

51. Lau DC, Douketis JD, Morrison KM, et al. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [summary]. CMAJ 2007; 176(8): S1-13.

52. Ortega FB, Sui X, Lavie CJ, Blair SN. Body Mass Index, the Most Widely Used But Also Widely Criticized Index: Would a Criterion Standard Measure of Total Body Fat Be a Better Predictor of Cardiovascular Disease Mortality? Mayo Clin Proc 2016; 91(4): 443-55.

53. World Health Organization (WHO). Physical status: The Use and Interpretation of Anthropometry. Switzerland: WHO, 1995.

54. Seidell JC, Kahn HS, Williamson DF, Lissner L, Valdez R. Report from a Centers for Disease Control and Prevention Workshop on use of adult anthropometry for public health and primary health care. Am J Clin Nutr 2001; 73(1): 123-6.

55. Pi-Sunyer FX. Obesity: criteria and classification. Proc Nutr Soc 2000; 59(4): 505-9.

56. Javed A, Jumean M, Murad MH, et al. Diagnostic performance of body mass index to identify obesity as defined by body adiposity in children and adolescents: a systematic review and meta-analysis. Pediatr Obes 2015; 10(3): 234-44.

57. National Institute for Health and Care Excellence (NICE). BMI: preventing ill health and premature death in black, Asian and other minority ethnic groups. UK: NICE; 2013.

58. Hartemink N, Boshuizen HC, Nagelkerke NJ, Jacobs MA, van Houwelingen HC. Combining risk estimates from observational studies with different exposure cutpoints: a meta-analysis on body mass index and diabetes type 2. Am J Epidemiol 2006; 163(11): 1042-52.

59. Beato GC, Ravelli MN, Crisp AH, de Oliveira MRM. Agreement Between Body Composition Assessed by Bioelectrical Impedance Analysis and Doubly Labeled Water in Obese Women Submitted to Bariatric Surgery : Body Composition, BIA, and DLW. Obes Surg 2019; 29(1): 183-9.

60. Schiavo L, Pilone V, Tramontano S, Rossetti G, Iannelli A. May Bioelectrical Impedance Analysis Method Be Used in Alternative to the Dual-Energy X-Ray Absorptiometry in the Assessment of Fat Mass and Fat-Free Mass in Patients with Obesity? Pros, Cons, and Perspectives. Obes Surg. United States; 2020: 3212-5.

61. Coppini LZ, Waitzberg DL, Campos AC. Limitations and validation of bioelectrical impedance analysis in morbidly obese patients. Curr Opin Clin Nutr Metab Care 2005; 8(3): 329-32.

62. Yusuf S, Hawken S, Ôunpuu S, et al. Obesity and the risk of myocardial infarction in 27 000 participants from 52 countries: a case-control study. The Lancet 2005; 366(9497): 1640-9.

63. Tran NTT, Blizzard CL, Luong KN, et al. The importance of waist circumference and body mass index in cross-sectional relationships with risk of cardiovascular disease in Vietnam. PLoS One 2018; 13(5): e0198202.

64. Du SM, Ma GS, Li YP, et al. Relationship of body mass index, waist circumference and cardiovascular risk factors in Chinese adult. Biomed Environ Sci 2010; 23(2): 92-101.

65. Janssen I, Heymsfield SB, Allison DB, Kotler DP, Ross R. Body mass index and waist circumference independently contribute to the prediction of nonabdominal, abdominal subcutaneous, and visceral fat. Am J Clin Nutr 2002; 75(4): 683-8.

66. Pan W-H, Yeh W-T. How to define obesity Evidence-based multiple action points for public awareness, screening, and treatment. an extension of Asian-Pacific recommendations. Asia Pac J Clin Nutr 2008; 17(3): 370-4.

67. Bhaskaran K, dos-Santos-Silva I, Leon DA, Douglas IJ, Smeeth L. Association of BMI with overall and cause-specific mortality: a population-based cohort study of 3·6 million adults in the UK. The Lancet Diabetes & Endocrinology 2018; 6(12): 944-53.

68. Xu Y, Li H, Wang A, et al. Association between the metabolically healthy obese phenotype and the risk of myocardial infarction: results from the Kailuan study. Eur J Endocrinol 2018; 179(6): 343-52.

69. Lee S, Arslanian S. Body Composition and Cardiorespiratory Fitness Between Metabolically Healthy Versus Metabolically Unhealthy Obese Black and White Adolescents. J Adolesc Health 2019; 64(3): 327-32.

70. Lin H, Zhang L, Zheng R, Zheng Y. The prevalence, metabolic risk and effects of lifestyle intervention for metabolically healthy obesity: a systematic review and meta-analysis: A PRISMA-compliant article. Medicine (Baltimore) 2017; 96(47): e8838.

71. Pinho CPS, Diniz ADS, Arruda IKG, Leite A, Petribu MMV, Rodrigues IG. Waist circumference measurement sites and their association with visceral and subcutaneous fat and cardiometabolic abnormalities. Arch Endocrinol Metab 2018; 62(4): 416-23.

72. Csongova M, Volkovova K, Gajdos M, et al. Gender-associated differences in the prevalence of central obesity using waist circumference and waist-to-height ratio, and that of general obesity, in Slovak adults. Cent Eur J Public Health 2018; 26(3): 228-33.

73. Wang Z, Ma J, Si D. Optimal cut-off values and population means of waist circumference in different populations. Nutr Res Rev 2010; 23(2): 191-9.

74. Healthy Ireland (HI). Healthy Ireland Survey 2015 - Summary of Findings. Dublin: HI, 2015.

75. Lear SA, James PT, Ko GT, Kumanyika S. Appropriateness of waist circumference and waist-to-hip ratio cutoffs for different ethnic groups. Eur J Clin Nutr 2010; 64(1): 42-61.

76. Cardinal TR, Vigo A, Duncan BB, et al. Optimal cut-off points for waist circumference in the definition of metabolic syndrome in Brazilian adults: baseline analyses of the Longitudinal Study of Adult Health (ELSA-Brasil). Diabetol Metab Syndr 2018; 10: 49.

77. Zaher Z, Zambari R, Pheng C, Muruga V, Ng B, Appannah G. Optimal cut-off levels to define obesity. Body mass index and waist circumference, and their relationship to cardiovascular. Asia Pac J Clin Nutr 2009; 18(2): 209-16.

78. Douketis JD, Paradis G, Keller H, Martineau C. Canadian guidelines for body weight classification in adults: application in clinical practice to screen for overweight and obesity and to assess disease risk. CMAJ 2005; 172(8): 995-8.

79. Alberti KG, Eckel RH, Grundy SM, et al. Harmonizing the metabolic syndrome: a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. Circulation 2009; 120(16): 1640-5.

80. Herrera VM, Casas JP, Miranda JJ, et al. Interethnic differences in the accuracy of anthropometric indicators of obesity in screening for high risk of coronary heart disease. Int J Obes (Lond) 2009; 33(5): 568-76.

81. Pan J, Wang M, Ye Z, et al. Optimal cut-off levels of obesity indices by different definitions of metabolic syndrome in a southeast rural Chinese population. J Diabetes Investig 2016; 7(4): 594-600.

82. Cho GJ, Yoo HJ, Hwang SY, et al. Differential relationship between waist circumference and mortality according to age, sex, and body mass index in Korean with age of 30-90 years; a nationwide health insurance database study. BMC Med 2018; 16(1): 131.

83. Yusuf S, Hawken S, Ôunpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. The Lancet 2004; 364(9438): 937-52.

84. Li H, He D, Zheng D, et al. Metabolically healthy obese phenotype and risk of cardiovascular disease: Results from the China Health and Retirement Longitudinal Study. Arch Gerontol Geriatr 2019; 82: 1-7.

85. Neeland IJ, Poirier P, Despres JP. Cardiovascular and Metabolic Heterogeneity of Obesity: Clinical Challenges and Implications for Management. Circulation 2018; 137(13): 1391-406.

86. Sharma AM, Campbell-Scherer DL. Redefining obesity: Beyond the numbers. Obesity (Silver Spring) 2017; 25(4): 660-1.

87. Sharma AM, Kushner RF. A proposed clinical staging system for obesity. Int J Obes (Lond) 2009; 33(3): 289-95.

88. Atlantis E, Sahebolamri M, Cheema BS, Williams K. Usefulness of the Edmonton Obesity Staging System for stratifying the presence and severity of weight-related health problems in clinical and community settings: A rapid review of observational studies. Obes Rev 2020; 21(11): e13120.

89. Rodríguez-Flores M, Goicochea-Turcott EW, Mancillas-Adame L, et al. The utility of the Edmonton Obesity Staging System for the prediction of COVID-19 outcomes: a multi-centre study. Int J Obes (Lond) 2022; 46(3): 661-8.

90. Swaleh R, McGuckin T, Myroniuk TW, et al. Using the Edmonton Obesity Staging System in the real world: a feasibility study based on cross-sectional data. CMAJ Open 2021; 9(4): E1141-e8.

91. Aronne LJ. Classification of obesity and assessment of obesity-related health risks. Obes Res 2002; 10 Suppl 2: 105S-15S.

92. Sharma AM. M, M, M & M: a mnemonic for assessing obesity. Obes Rev 2010; 11(11): 808-9.

93. Health Service Executive (HSE). Model of Integrated Care for Patients with Type 2 Diabetes. Dublin: HSE; 2018.

94. Canadian Institute for Health Information (CIHI). Patient-reported outcome measures (PROMs). 2022. https://www.cihi.ca/en/patient-reported-outcome-measures-proms (accessed 2 February 2022).

95. Promis Health Organization (PHO). What is Promis? 2022. https://www.promishealth.org/57461-2/ (accessed 2 February 2022).

96. Aasprang A, Våge V, Flølo TN, et al. Patient-reported quality of life with obesity - development of a new measurement scale. Tidsskr Nor Laegeforen 2019; 139(11).

97. de Vries CEE, Terwee CB, Al Nawas M, et al. Outcomes of the first global multidisciplinary consensus meeting including persons living with obesity to standardize patient-reported outcome measurement in obesity treatment research. Obesity Reviews 2022; n/a(n/a): e13452.

98. Ogden J, Ratcliffe D, Snowdon-Carr V. British Obesity Metabolic Surgery Society endorsed guidelines for psychological support pre- and post-bariatric surgery. Clin Obes 2019; 9(6): e12339.

99. Leblanc ME, Auclair A, Leclerc J, et al. Blood Pressure Measurement in Severely Obese Patients: Validation of the Forearm Approach in Different Arm Positions. Am J Hypertens 2019; 32(2): 175-85.

100. Leblanc ME, Croteau S, Ferland A, et al. Blood pressure assessment in severe obesity: validation of a forearm approach. Obesity (Silver Spring) 2013; 21(12): E533-41.

101. Meurling IJ, Russell A, O'Malley E, Dunlevy C, O'Shea D, Garvey JF. Prevalence of Sleep Disordered Breathing in an Ambulatory Bariatric Population. Irish Medical Journal 2021; 114(6): 2-5.

102. Canadian Cardiovascular Society. The Canadian Cardiovascular Society's Dyslipidemia Guidelines. 2016. https://ccs.ca/app/uploads/2020/11/Lipids_Gui_2016_EN.pdf (accessed 2 February 2022).

103. Chalasani N, Younossi Z, Lavine JE, et al. The diagnosis and management of nonalcoholic fatty liver disease: Practice guidance from the American Association for the Study of Liver Diseases. Hepatology 2018; 67(1): 328-57.

104. Poirier P, Giles TD, Bray GA, et al. Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. Circulation 2006; 113(6): 898-918.

105. Kragelund C, Hassager C, Hildebrandt P, Torp-Pedersen C, Kober L, group Ts. Impact of obesity on long-term prognosis following acute myocardial infarction. Int J Cardiol 2005; 98(1): 123-31.

106. Abraham TM, Pedley A, Massaro JM, Hoffmann U, Fox CS. Association between visceral and subcutaneous adipose depots and incident cardiovascular disease risk factors. Circulation 2015; 132(17): 1639-47.

107. Fuster V, Alexander R, O'Rourke R. Hurst's The Heart. 10th ed; 2000.

108. Sharma AM, Padwal R. Obesity is a sign - over-eating is a symptom: an aetiological framework for the assessment and management of obesity. Obes Rev 2010; 11(5): 362-70.

109. Van Cauter E, Knutson KL. Sleep and the epidemic of obesity in children and adults. Eur J Endocrinol 2008; 159 Suppl 1: S59-66.

110. Domecq JP, Prutsky G, Leppin A, et al. Clinical review: Drugs commonly associated with weight change: a systematic review and meta-analysis. J Clin Endocrinol Metab 2015; 100(2): 363-70.

111. Aasheim ET, Aylwin SJ, Radhakrishnan ST, et al. Assessment of obesity beyond body mass index to determine benefit of treatment. Clin Obes 2011; 1(2-3): 77-84.

112. Barazzoni R, Bischoff S, Boirie Y, et al. Sarcopenic Obesity: Time to Meet the Challenge. Obesity facts 2018; 11(4): 294-305.

113. Donini LM, Busetto L, Bischoff SC, et al. Definition and Diagnostic Criteria for Sarcopenic Obesity: ESPEN and EASO Consensus Statement. Obesity Facts 2022.

114. Apovian CM, Okemah J, O'Neil PM. Body Weight Considerations in the Management of Type 2 Diabetes. Adv Ther 2019; 36(1): 44-58.

115. McIntosh B, Cameron C, Singh SR, et al. Second-line therapy in patients with type 2 diabetes inadequately controlled with metformin monotherapy: a systematic review and mixed-treatment comparison meta-analysis. Open Med 2011; 5(1): e35-48.

116. Phung OJ, Scholle JM, Talwar M, Coleman CI. Effect of noninsulin antidiabetic drugs added to metformin therapy on glycemic control, weight gain, and hypoglycemia in type 2 diabetes. Jama 2010; 303(14): 1410-8.

117. Hirst JA, Farmer AJ, Dyar A, Lung TW, Stevens RJ. Estimating the effect of sulfonylurea on HbA1c in diabetes: a systematic review and meta-analysis. Diabetologia 2013; 56(5): 973-84.

118. DCCT Research Group. Effect of intensive diabetes management on macrovascular events and risk factors in the Diabetes Control and Complications Trial. Am J Cardiol 1995; 75(14): 894-903.

119. Rys P, Wojciechowski P, Rogoz-Sitek A, et al. Systematic review and meta-analysis of randomized clinical trials comparing efficacy and safety outcomes of insulin glargine with NPH insulin, premixed insulin preparations or with insulin detemir in type 2 diabetes mellitus. Acta Diabetol 2015; 52(4): 649-62.

120. American Diabetes Association. Pharmacologic Approaches to Glycemic Treatment: Standards of Medical Care in Diabetes-2021. Diabetes Care 2021; 44(Suppl 1): S111-s24.

121. Deshmukh R, Franco K. Managing weight gain as a side effect of antidepressant therapy. Cleve Clin J Med 2003; 70(7): 614, 6, 8, passim.

122. Vanina Y, Podolskaya A, Sedky K, et al. Body weight changes associated with psychopharmacology. Psychiatr Serv 2002; 53(7): 842-7.

123. Cipriani A, Furukawa TA, Salanti G, et al. Comparative efficacy and acceptability of 21 antidepressant drugs for the acute treatment of adults with major depressive disorder: a systematic review and network meta-analysis. Lancet 2018; 391(10128): 1357-66.

124. Bowden CL, Calabrese JR, Ketter TA, Sachs GS, White RL, Thompson TR. Impact of lamotrigine and lithium on weight in obese and nonobese patients with bipolar I disorder. Am J Psychiatry 2006; 163(7): 1199-201.

125. Missio G, Moreno DH, Demetrio FN, et al. A randomized controlled trial comparing lithium plus valproic acid versus lithium plus carbamazepine in young patients with type 1 bipolar disorder: the LICAVAL study. Trials 2019; 20(1): 608.

126. Torrent C, Amann B, Sánchez-Moreno J, et al. Weight gain in bipolar disorder: pharmacological treatment as a contributing factor. Acta Psychiatr Scand 2008; 118(1): 4-18.

127. Kearns B, Cooper K, Orr M, Essat M, Hamilton J, Cantrell A. The Incidence and Costs of Adverse Events Associated with Antidepressants: Results from a Systematic Review, Network Meta-Analysis and Multi-Country Economic Model. Neuropsychiatr Dis Treat 2022; 18: 1133-43.

128. Taylor DM, Barnes TR, Young AH. The Maudsley prescribing guidelines in psychiatry: John Wiley & Sons; 2021.

129. Huhn M, Nikolakopoulou A, Schneider-Thoma J, et al. Comparative Efficacy and Tolerability of 32 Oral Antipsychotics for the Acute Treatment of Adults With Multi-Episode Schizophrenia: A Systematic Review and Network Meta-Analysis. Focus (Am Psychiatr Publ) 2020; 18(4): 443-55.

130. Dinesen H, Gram L, Andersen T, Dam M. Weight gain during treatment with valproate. Acta Neurol Scand 1984; 70(2): 65-9.

131. El-Khatib F, Rauchenzauner M, Lechleitner M, et al. Valproate, weight gain and carbohydrate craving: a gender study. Seizure 2007; 16(3): 226-32.

132. Cabrera J, Emir B, Dills D, Murphy TK, Whalen E, Clair A. Characterizing and understanding body weight patterns in patients treated with pregabalin. Curr Med Res Opin 2012; 28(6): 1027-37.

133. Shurman J, Laham R, Aronoff G, et al. Weight change in adults with postherpetic neuralgia receiving gabapentin enacarbil in a randomized, placebo-controlled trial. The Journal of Pain 2015; 16(4): S74.

134. Berthon BS, MacDonald-Wicks LK, Wood LG. A systematic review of the effect of oral glucocorticoids on energy intake, appetite, and body weight in humans. Nutr Res 2014; 34(3): 179-90.

135. Rice JB, White AG, Scarpati LM, Wan G, Nelson WW. Long-term Systemic Corticosteroid Exposure: A Systematic Literature Review. Clin Ther 2017; 39(11): 2216-29.

136. The Faculty of Sexual & Reproductive Healthcare (FSRH) of the Royal College of Obstetricians & Gynaecologists. FSRH CEU Statement: Contraception and Weight Gain 12 August 2019. Edinburgh: FSRH Clinical Effectiveness Unit, 2019.

137. Lopez LM, Ramesh S, Chen M, et al. Progestin-only contraceptives: effects on weight. Cochrane Database Syst Rev 2016; 2016(8): Cd008815.

138. Le YL, Rahman M, Berenson AB. Early weight gain predicting later weight gain among depot medroxyprogesterone acetate users. Obstet Gynecol 2009; 114(2 Pt 1): 279-84.

139. Ratliff JC, Barber JA, Palmese LB, Reutenauer EL, Tek C. Association of prescription H1 antihistamine use with obesity: results from the National Health and Nutrition Examination Survey. Obesity (Silver Spring) 2010; 18(12): 2398-400.

140. Sarafidis PA, Bakris GL. Do the metabolic effects of beta blockers make them leading or supporting antihypertensive agents in the treatment of hypertension? J Clin Hypertens (Greenwich) 2006; 8(5): 351-6; quiz 7-8.

141. Sharma AM, Pischon T, Hardt S, Kunz I, Luft FC. Hypothesis: Beta-adrenergic receptor blockers and weight gain: A systematic analysis. Hypertension 2001; 37(2): 250-4.