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Special considerations for the adolescent with obesity: An obesity medicine association (OMA) clinical practice statement (CPS) 2024.

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ABSTRACT

Background: This Obesity Medicine Association (OMA) Clinical Practice Statement (CPS) details special considerations for the management of the adolescent with obesity. The information in this CPS is based on scientific evidence, supported by medical literature, and derived from the clinical experiences of members of the OMA.

Methods: The scientific information and clinical guidance in this CPS are based on scientific evidence, supported by the medical literature, and derived from the clinical perspectives of the authors.

Results: This OMA Clinical Practice Statement addresses special considerations in the management and treatment of adolescents with overweight and obesity.

Conclusions: This OMA Clinical Practice Statement on the adolescent with obesity is an overview of current recommendations. These recommendations provide a roadmap to the improvement of the health of adolescents with obesity, especially those with metabolic, physiological, and psychological complications. This CPS also addresses treatment recommendations and is designed to help the provider with clinical decision making.

1. Introduction

The purpose of the clinical practice statements (CPS) by the Obesity Medicine Associations (OMA) is to provide clinicians with tools to clinically assess and manage children and adolescents with overweight and obesity (OW/OB). The OMA is an organization of providers in the field of obesity medicine dedicated to the comprehensive care of patients with obesity. OMA members are physicians, nurse practitioners, physician assistants, psychologists, and other healthcare providers who take a comprehensive, evidence-based approach to treating obesity. This approach is comprised of four pillars: nutrition, physical activity, behavior, and medication. While it is hoped clinicians find the recommendations in this CPS helpful, the final decision regarding the care of the patient with OW/OB depends on the individual clinical presentation and the judgment of the treating clinician. Clinicians should construct a treatment plan through shared decision making with the patient, keeping the patient's best interest at the forefront of all decisions.

The current CPS presents special considerations in the management and treatment of an adolescent with obesity. Most adolescents with obesity have lived with the disease since early or mid-childhood. **The cumulative physical and emotional toll that the disease of obesity takes on the adolescent can be significant**. Yet, the adolescent is still a minor and usually dependent on a family support system for domicile, food provision, security, and emotional support. The adolescent progresses through stages of increasing independence from the family support system and the medical management of this developing young person must evolve as well. In this Clinical Practice Statement, we focus on some of the many challenges facing adolescents with obesity.

2. The adolescent with obesity

The adolescent obesity rate has tripled in the past 30 years with over 20 % of U.S. adolescents now affected by this chronic disease. Data from the National Center for Health Statistics reported that between 1976 and 1980, 5.5 % of children ages 2 to 19 met criteria for obesity and 1.3 % met criteria for severe obesity. Data from 2018 find a significant increase to 19.3 % (obesity) and 6.1 % (severe obesity) for US children [1]. A recent cross-sectional study of 15,000 U S. children and adolescents in National Health and Nutrition Examination Survey (NHANES) cohort analyzed changes in obesity rates since 2011. Findings show obesity prevalence increased from 17.7 % in 2011–2012 to 21.5 % in 2017–2020 among youth ages 2–19 years. Prevalence of obesity significantly increased in children aged 2–5 years, adolescents 12–19 years, and all children aged 2–19 years in all races and ethnicities [2]. Early intervention is crucial and adolescents with body mass index (BMI) > 95th%ile have a higher risk of obesity persisting into adulthood than younger children [3,4].

Adolescence is a critical period for the development of obesity. At younger ages, the rate of remission to normal weight in overweight children exceeds the rate of progression to obesity. Every increase in BMI percentile is associated with an increased risk of developing obesity; children who remit back to normal weight being closest to 85th percentile. Black and Hispanic children had lower rates of remission and higher rates of progression to obesity even when socioeconomic status was controlled [5]. In early puberty, children experience mild, physiologic insulin resistance which may set the stage for excessive weight gain and the accompanying comorbidities. Evidence suggests that insulin

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resistance, that does not resolve in youth with obesity who are entering puberty, may result in increased cardiometabolic risk [6]. Early menarche is associated with increased risk for obesity; a two-fold increase in rate of early menarche is associated with BMI greater than the 85th percentile.

Pediatric patients with obesity are at higher risk for several medical conditions including metabolic syndrome, insulin resistance, hypertension, and hyperlipidemia. One in three adolescents has prediabetes and the rate among 12–19 year olds more than doubled between 1999 and 2002 (11.6 %) and 2015–2018 (28.2 %) [7]. A recent systematic review and meta-analysis of 53 studies (8942 participants) found that 75.27 % of children with type 2 diabetes mellitus (T2DM) had obesity, and 77.24 % had obesity at T2DM diagnosis [8]. Pediatric patients who develop T2DM have at least a 50 % chance the disease will progress despite treatment [9–11].Assessment is critical for medical conditions that worsen obesity including nonalcoholic fatty liver disease, obstructive sleep apnea, gastroesophageal reflux disease, cholelithiasis, polycystic ovary syndrome (PCOS) and orthopedic conditions (Blount's disease and slipped capital femoral epiphysis) [12,13].

Early intervention is crucial to obesity management. In a prospective study with data from 31 U S. pediatric weight management programs (PWMP), early BMI reduction in the first month of treatment was significantly associated with greater long-term BMI reduction (defined as ≥5 % BMI reduction from baseline) at 6 and 12 months in adolescents with obesity [14]. Multidisciplinary programs for obesity are also crucial but often limited. In some studies of multidisciplinary programs, positive weight loss results observed that younger children showed a greater reduction in BMI z-score compared to adolescents [3,15]. Other studies of PWMP showed that adolescents with the most severe obesity had the greatest reductions in BMI [3,16].

The American Academy of Pediatrics published its first comprehensive guidance in 15 years in 2023 with recommendations to begin obesity treatment upon diagnosis with no benefit to "watchful waiting" along with concurrent treatment of obesity related comorbid conditions. Comprehensive treatment includes motivational interviewing and intensive health behavior and lifestyle treatment (IHBLT), ≥26 hours of face-to-face, family-based, multi-component treatment over a 3-to-12-month time period. Advanced obesity treatment is added as indicated: anti-obesity medications (AOM; ≥8 years of age) and pediatric MBS as per American Society for Metabolic and Bariatric Surgery Pediatric guidelines [17,18].

Historically, IHBLT was the standard of care for obesity management. Recently, treatment modalities have expanded to include additional anti-obesity medications and MBS options including combination therapies. Prior to 2020, orlistat, an enteric lipase inhibitor, was the only Food and Drug Administration (FDA) approved medication for pediatric patients ≥12 years of age, but rarely used in clinical practice due to abdominal side effects and greasy, malodorous stools. Since 2020, additional medications are now FDA approved for children 12–17 years for chronic obesity management including both daily (liraglutide) and weekly (semaglutide) glucagon-like peptide 1 (GLP-1) receptor agonists and phentermine/topiramate. The melanocortin-4 (MC4R) receptor agonist setmelanotide is FDA approved for patients ≥6 years with obesity from these rare genetic conditions: proopiomelanocortin deficiency (POMC), proprotein convertase subtilisin/kexin type 1 deficiency (PCSK1), Bardet Biedl syndrome (BBS), and leptin receptor deficiency (LEPR). Metabolic and bariatric surgery (MBS) is increasingly available to youth with severe obesity meeting eligibility criteria. Outcomes data from long-term follow-up studies show significant weight loss and resolution of existing comorbidities such as T2DM [19–24].

Although the prevalence of obesity is rising, more therapeutic options are now available for the treatment of youth with obesity. Understanding the multiple complications associated with obesity allows for concurrent screening and treatment. As children above the BMI >95th percentile are at high risk of maintaining obesity into adulthood, the goal of the pediatric obesity provider is to use all appropriate evidence-based therapies, including psychosocial supports, to improve the health of youth with obesity.

3. The adolescent with special healthcare needs and obesity

3.1. Introduction

For the purposes of this review, children and adolescents with special healthcare needs (SHCN) are defined to broadly include those who have, in addition to obesity, an underlying diagnosis that can lead to intellectual disability, changes in mobility, or changes in metabolism. These conditions include specific diagnoses of autism spectrum disorder (ASD), genetic syndromes such as Down syndrome, Prader-Willi Syndrome, BBS, and other ciliopathies. Children with SHCN have an increased risk of an elevated set point and therefore elevated BMI percentile [25,26].

A systematic review/metanalysis by Maïano et al. (2016) found adolescents with intellectual disabilities to be respectively 1.54 and 1.80 times more at risk of OW/OB than typically developing adolescents [27]. African American and Latinx children with disabilities have an even greater risk compared to White children even though overall literature is still limited [28]. Vigilance to the trajectory of crossing BMI percentiles, whether up or down, in this population can be extremely helpful to identify early changes and rapid intervention for failure to thrive or excessive weight gain [29,30].

3.2. Framing the obesity management visit

Framing the obesity management visit with an understanding that parents know their child with SHCN best can be a helpful division of expertise. Families of adolescents with SHCN have had increased interactions with the healthcare system over time. Increased interaction may lead to significant factors that can impact the healthcare team and the family (both positively and negatively) when addressing the healthcare needs related to overweight and obesity [31].

3.2.1. Addressing weight bias

Families have an increased potential for experiencing weight bias in healthcare settings due to increased interaction with healthcare professionals and settings over time [32]. Families are grateful to experience "no judgment" and an increased understanding of their difficulties helping the adolescent maintain a healthy weight [33]. Families are often tearful when working with an educated weight management team or clinician who validate the family's experiences with weight gain and to understand difficult past interactions that occurred in healthcare settings. Weight management tertiary care centers show success in decreasing BMI percentile in patients with disabilities when offering individualized care [26].

3.2.2. Timing/priority of interventions

Sensitivity to timing and current priorities of the weight management intervention is important. Adolescents with SHCN often have care needs that are more problematic and behavioral dysregulation is often the primary, initial focus. During weight management treatment, when the adolescent experiences increasingly difficult behaviors, these behaviors often need to be addressed first before intensifying interventions for weight management. The team advises families that increased stress can lead to increased adipose tissue storage (proxied by weight gain) [34]. Therefore, any weight management intervention leading to increased stress in the family should be reevaluated until behavioral supports are fully in place and functioning well.

When weight management is the priority, first assess what area within weight management or behavior change is most beneficial. For example, an adolescent with picky eating may have increased food acceptability when eating out or traveling; if these activities decrease stress, they may be more important than adding new, healthier food

choices. Multifactorial causes of weight gain in the patient with SHCN include picky eating, compulsive behaviors, restrictive eating (often due to texture), dysregulated eating patterns, lack of access to adaptive physical activity, decreased metabolism, and iatrogenic weight gain (especially antipsychotic medication) [28,35,36].

3.2.3. Team approach

A multidisciplinary team is essential for coordinating care around weight management for families with SCHN. Key team members include physician or nurse practitioner with experience working with special needs patients, psychologist, dietitian, social worker, occupational therapy and physical therapy as needed [37].

3.2.4. Care coordination

Families with SCHN are at increased risk of experiencing mixed or confusing messaging from their multiple healthcare teams. Coordination between healthcare teams and determining who is the point person for interventions, particularly nutritional plan, can be beneficial. Within the weight management team and support staff, care conferences and coordinated weight management visits with the whole team allow joint problem solving with parents in the moment and development of a comprehensive care plan. Families are appreciative of this approach, allowing clarification of confusing or competing recommendations [37].

3.2.5. Experience with healthcare system

Families of adolescents with SHCN often can handle a "menu of goals" more complex than a typical weight management family due to increased experience interacting with the healthcare system. Often, adolescents with SHCN experience a good response to treatment with less frequent follow-ups, which assists in balancing other medical appointments [37]. Telehealth visits are extremely helpful to allow brief participation of the adolescent who can leave the conversation as needed, allowing the parent to focus with the provider on education and recommendations [38–40]. Height and weight can be obtained from other in-person sub-specialist visits allowing the weight management team to follow the youth's progress with less in-person encounters. The use of portal messaging for brief follow-ups and questions is helpful.

3.3. Considerations for plan implementation

3.3.1. Autonomy

Important considerations for adolescents with SHCN include consideration of autonomy. Partnering with the adolescent to obtain their "buy in" to the treatment regimen by accounting for their developmental level is critical. Depending on the adolescent's disability and developmental level, the clinician may work exclusively with the adolescent's caregiver, but the adolescent's preferences for goal setting are taken into consideration wherever possible. Rules and routines may be well established as a function of the specific SCHN diagnosis and can support achievable diet, activity, and behavioral choice changes. New healthy rules from the care team can progress to structured choices (e.g., "Here is the plate model that we will help you to follow, you get to decide what food choice goes into each spot on your plate.").

3.3.2. Coordination of weight management and special needs plan of care

Tailoring recommendations based on the adolescent's overall, current healthcare needs is essential. When assessing the adolescent patient, factoring in adolescent behavioral and sexual development, severity of obesity, severity of hunger and satiety signals, amount of behavioral dysregulation and food focus is key to plan of care development. Additional obesity related comorbidities [41], changes in weight set point, food selectivity, and medication side effects are also important factors to consider [37].

Normal adolescent growth and development is characterized by resistance to previous limits, increasing desire for independence, time away from parents and more time with friends, and more abilities for cooking and other self-care; the adolescent with SHCN will have similar development within the context of the etiology of SHCN. All adolescents with chronic medical needs are at risk for a period of rebellion and refusal of previous interventions leading to worsening of disease. Consistency with taking medications is a frequent topic of healthcare visits and problem solving; medication adherence is discussed as being a joint effort over time. Preparing families and supporting expansion of healthy boundaries can assist in successfully managing these changing needs.

3.3.3. Intensive health behavior and lifestyle therapy (IHBLT): adjunct to advanced therapies

Components of IHBLT (nutrition, activity, behavioral therapy) used to treat obesity require a special focus for the adolescent with SCHN [42]. During the obesity management visit, a dietician assists with calculating caloric needs, often decreased in patients with SHCN due to underlying diagnosis, decreased muscle tone, or decreased mobility [43]. Assessment of food selectivity by psychology or occupational therapy can be beneficial. Adolescents with SHCN may have gradually developed a limited diet; setting goals to add back in previously tolerated foods expands nutritional options. For "picky eater" adolescents, setting new rules around no "yuck face" and encouraging "the brain, not the tongue to be in control" are helpful. When trying new foods, this strategy can help overcome previous reluctancies. Working on alternating foods, not repeating a food for 48 hours, and limiting portion sizes can lead to improvements in weight status without adding new foods [37].

3.3.3.1. Family stress and feeding practices. Families of children with SHCN are at risk for increased stress which may affect feeding practices. Polfuss et al. (2021) examined the relationship between family stress and parental feeding practices in children with developmental disabilities. The authors found that increased family stress was associated with a more controlling approach to feeding practices suggesting that a family centered care model emphasizing strategies to address the family's functioning may be more beneficial than strategies narrowly aimed at food quality and volume [44].

Food focus is another common challenge in patients with SCHN. Adolescents often wake up thinking about food, asking what is for breakfast, and asking about food throughout the day. For an adolescent, with emerging independence and more unsupervised time, high food focus often indicates the need for pharmacological support to manage symptoms as well as more environmental controls.

3.3.3.2. Sleep. Given the prevalence of disrupted sleep patterns in adolescents with SHCN, compounded by general sleep disturbances expected for any adolescent, healthy sleep schedules are critical. Eating after dinner or after caregivers have gone to bed is a prevalent pattern; often, consisting of consumption of large quantities of high energy-dense foods. For youth with severe sleep-wake disturbance, referral to sleep medicine and developmental/behavioral pediatrics regarding behavioral and medication sleep options is warranted [45]. Eliminating eating in front of television/gaming from the perspective of mindless eating and sleep hygiene advise is instituted. Education regarding appropriate sleep goals is provided (approximately 9 hours for most adolescents) with the corresponding rationale of positive impact on hormones and hunger/satiety.

3.3.4. Advanced therapies for obesity for the adolescent with special healthcare needs

For adolescent patients with SHCN presenting with severe obesity, a discussion of all available therapies, including advanced therapies, is appropriate [46]. Reviewing the growth chart to discuss weight set point and variations in weight status can frame the discussion. Commonly, families plan to "work harder" on lifestyle as monotherapy, yet when reviewing all the family's efforts over time while looking at the child's

growth chart, often the opportunity to add advanced therapies to better treat increased adiposity becomes clear.

3.3.4.1. Pharmacotherapy principles. When thinking about medications to support weight loss, in the context of adolescents with SCHN, a tiered approach in the areas discussed next is beneficial.

3.3.4.1.1. Treat comorbid conditions effectively. One goal of pharmacotherapy is to improve the response to overall weight management treatment plan as well as treating conditions associated with obesity. Adolescents with SHCN should be assessed and treated for conditions associated with obesity such as anxiety, depression, or attention-deficit/hyperactivity disorder (ADHD) [46]. Aggression, behavioral dysregulation, and mental health conditions, sometimes seen in the adolescent with SCHN, can lead to increased family stress which can contribute to the patient's weight gain [37]. When anxiety and depression are better controlled, weight loss can ensue due to decreasing the adolescent's stress and eating that accompanies anxiety and/or depression. Medications for ADHD can also be beneficial in decreasing hunger and improving focus and impulsivity [47].

Laboratory evaluation for underlying metabolic disorders leads to early treatment of associated conditions, such as prediabetes, T2DM, hypothyroid disease, liver disorders, or cardiovascular disease. Headaches require a thorough evaluation with additional testing for idiopathic intercranial hypertension especially in presence of visual changes [48].

3.3.4.1.2. Review for weight promoting medication usage. Reviewing the patient's medication list for weight promoting medications (WPM) is critically important [46]. Two common WPM in adolescents with SHCN include atypical antipsychotics (behavioral/mental health management) and steroids used for treatment of uncontrolled asthma. Metformin and topiramate are beneficial in mitigating a medication's weight promoting effects and are used in the setting of obesity management [36]. Additionally, these weight-mitigating medications can lead to decreased hunger, cravings, and improve the adolescent's ability to implement limits around portions and between meal snacking.

3.3.4.2. Anti-obesity medications. For adolescents with SHCN and significant increase in hunger or lack of satiety, choosing anti-obesity medications (AOM) targeting these phenotypes is useful [49]. Common pharmacotherapy choices include phentermine, topiramate, GLP-1 receptor agonists (GLP-1 RAs), and naltrexone. Food craving and food seeking are targeted with topiramate and/or naltrexone [46,49]. GLP-1 RAs address multiple targets and are considered in patients with dysregulation of multiple phenotypes. GLP-1 RAs decrease "food noise", leading to improved implementation of other behavioral changes. Frequently, patients respond to a medication that "turn down the volume of food noise", so that behavioral and environmental changes can be successful.

The AOM setmelanotide may be indicated for adolescents with genetic variants of obesity [50]. Genetic mutations specifically indicated for setmelanotide include BBS, LEPR, POMC, and PCSK1 [49]. Adolescents with a genetic cause of obesity are also treated with other AOM pharmacotherapy used in pediatric obesity care [49]. Free genetic testing and counseling is available for families and clinicians [51].

3.3.4.3. Metabolic and bariatric surgery. MBS is safe and effective for adolescents with and without SHCN [52]. Evidence shows similar or improved response in adolescents with SHCN, due to familiarity with implementing complex medical plans and supportive home life and family structure [53]. Excluding adolescents from the MBS due to their SCHN denies access to a therapeutic option. Further discussion of potential risks is essential but not a barrier to the surgery [18,54].

Preparing the family and team for any medication adjustments needed before and after surgery is important. Using tools to make needed changes simple and trackable for the family can be quite beneficial [55]. Tools might include a different variation of the daily schedule with specific pictures to assist with tracking water intake. Practicing drinking meal replacement shakes and assuring acceptability of two to three assorted flavors is also essential. The adolescent must be comfortable accepting limitations from caregivers as well as following directions (such as increasing fluid intake). Behavioral dysregulation, if present, needs to be well managed prior to MBS. After surgery, frequent follow-up visits for check-in and adjustments of recommendations have been beneficial. Consider weekly appointments after MBS for the first four to six weeks and gradually spread out as tolerated.

Medications prescribed prior to MBS that assisted with weight loss or symptom control, including hunger cravings or behavioral supports, are often continued after MBS. Returning to a regular schedule with school can be greatly beneficial for the adolescent's routine [37]. Close coordination with the school is essential to assure that the adolescent is meeting post-surgical requirements for water goals and protein shakes. Nursing involvement and teacher awareness of the routine is important but this close communication is likely in place due to the structure needed for existing SHCN.

3.4. Plan implementation

Gradual changes over time are key [37]. Strategies in plan implementation for the adolescent with SHCN are listed in Table 1.

3.5. Transition from pediatric to adult care systems

Transition planning for adolescents with SHCN into adult healthcare is a stepwise process. Timing is determined by practice guidelines for the weight management clinic, transition timing for other sub-specialists, and specific patient and family needs and preferences. [56] At a policy level, the Health Resources and Services Administration's Maternal and Child Health Bureau developed a set of core principles and actionable strategies to advance systems in prioritizing optimal health for children and youth with special healthcare needs (CYSHCN). The blueprint for change acknowledges existing needs and disparities experienced by many CYSHCN including health equity, quality of life, and access to and financing of services including transition to adult care models [57].

3.5.1. Determine recommended timing for transition to adult healthcare in your practice setting

For patients with SCHN, a transition between 19 and 23 years can be helpful for families to successfully progress through changes occurring at 18 years of age. Families often need help establishing guardianship and navigating the change from a pediatric to an adult system.

Table 1
Strategies for successful implementation of plan of obesity care for the adolescent with obesity and special healthcare needs (SHCN).

Strategy 1	Decreasing highly processed foods and added sugar in the diet leads to decreased hunger and cravings, decreasing set point over time.
Strategy 2	Improved sleep schedule and sleep quality improves sleep hormones, leading to decreased storage of adiposity and increases in metabolism.
Strategy 3	Increase in water consumption decreases hunger and improves hunger versus thirst discrimination.
Strategy 4	Increased activity builds muscle mass, decreases boredom, and increases distraction.
Strategy 5	Physical activity alone has limited effectiveness compared to nutritional interventions but does support other weight loss interventions.
Strategy 6	Promoting healthy weight and managing health behaviors can contribute to improved health outcomes and quality of life.
Strategy 7	Increased protein and fiber intake from non-starchy vegetables can lead to decreased hunger and improved exercise performance and endurance.

3.5.2. Families appreciate assistance in determining which adult subspecialists they will need

Establishing the adolescent's adult primary care provider is a critical first step and allows coordinated decision making for which outside subspecialties are needed. Resources exist to aid families and clinicians in facilitating the transition from pediatric to adult health care [58].

3.5.3. For patients with intellectual disability, support around maintaining healthy lifestyle changes can be challenging

Particularly for patients who are in state custody as minors, establishing limits on food is often seen as a restriction. Careful coordination and letters describing medical care including prescribed medical nutrition therapy are helpful. For adolescents with access to their own finances, maintaining a healthy diet and limiting unhealthy foods can be challenging. As for all patients on a limited budget, processed foods are less expensive and becomes a barrier for some patients transitioning to increased independence.

3.6. Outcomes

Killian et al. (2022) evaluated outcomes of youth with ASD enrolled in special needs specific pediatric weight management clinic at one year [59]. The study sought to identify factors that positively influenced treatment success. Results suggest that higher baseline BMI category, medications at baseline (including WPM), and absence of sleep disturbances predicted greater reduction in BMI after a year of treatment [59]. An earlier study by Pona et al. (2017) found similar reductions in BMIz with sex, ethnicity, disability type, and moderating change in BMIz over the course of treatment [60].

3.7. Summary

Adolescents with SHCN can be successful in weight management treatment through access to comprehensive care including dietary, behavioral, pharmacological, and surgical interventions. Each adolescent requires a personalized approach to ensure their SCHN, as well as their transition plan to adult care providers, are addressed [37].

4. Use of AOM therapy post MBS in adolescents

4.1. Introduction

Obesity is a complex, chronic disease in children and adults. Responses to all proposed forms of therapy are very heterogenous. The complexity of the disease is manifest in the variety of responses to each form of therapy. Some patients are responders, some are super-responders, some are non-responders, and some are temporary responders. No widely accepted objective guidelines exist to define each of these categories.

We now have recommendations for pediatric obesity treatment that include multiple forms of IHBLT, AOMs, MBS, and combination therapy [17–19,61–65]. All of the recommendations use IHBLT either alone or as a background to the other forms of therapy. None of them supply guidelines to define the various forms of response.

Until recently, for children with obesity, the only effective treatment alternative to IHBLT was MBS. We now have data regarding safety and efficacy of MBS in children with obesity both short term and long term [20–24,66]. This data demonstrates the variability of response to MBS in children with obesity. We also have data regarding safety and efficacy of AOM's including FDA approval of orlistat, phentermine, phentermine and topiramate, liraglutide, and semaglutide for adolescents ages 12–17 years [46].

Now that we have multiple forms of therapy available for adolescents with obesity, we need objective guidelines to define the categories of response to therapy. This will provide guidance for efficient use of each therapy and for the use of combinations of forms of therapy.

This section focuses on adolescents who are post-MBS and when they may benefit from the addition of AOM's as an adjunct therapy. The available MBS data for children [20–24,66] and adults [67–72] is examined for the variety of responses to MBS (Table 2). This information is provided as guidance for the pediatric obesity medicine team. This section does not address the following: AOM's vs. MBS, the question of AOM's before MBS, or the question of *planned* use of AOM's with MBS (combination therapy). Of note, in the MBS literature, weight loss is reported as either Excess Weight Loss (ESWL or EWL) or total body weight loss (TBWL). When comparing results between MBS studies, ESWL is roughly 2× TBWL (or TBWL is ½ of ESWL).

4.2. Discussion

Obesity is a complex, chronic disease. Approaching the whole patient, with ongoing re-assessment and monitoring of the multiple factors that impact the disease of obesity, is essential. Many tools are now available to improve the health of a patient with obesity. How to sequence or combine these tools is an increasingly important question.

In this section, the specific question of how and when to use AOM's in patients who have had MBS is examined. Evidence for the safety and effectiveness of MBS and AOMs exists in both adults and children. There is evidence for both the need and effectiveness of using AOM's in adults who have had MBS [67–72], but the reports suffer from a lack of consistent methods, techniques, and definitions. Despite the variety of responses of adolescents with obesity to MBS and the obvious rationale for using AOM's in some select situations, we could find no reports discussing the use of AOMs after MBS in adolescents.

In reviewing this data, many challenges and gaps in the literature are identified.

1) BMI is a flawed measurement to diagnose the disease of obesity, categorize variations in the disease, and follow progression of the disease.
2) General agreement is needed on a common set of definitions of categories of response to treatment tools and algorithms.
3) Studies are needed with adequate numbers of patients to allow meaningful analysis of the results.
4) Studies in children and adolescents are needed concurrently with adult studies.

Despite these and other challenges, the rationale for using AOM's to improve the health of select children post-MBS exists and AOM's should be used after MBS with the same holistic approach used when deciding on any anti-obesity treatment tool sequences and combinations. Re-evaluation of existing co-occurring diseases and factors that impact the disease of obesity can also guide choice of optimal AOM therapy for the post-MBS patient, like guidance for the use of AOMs in non-surgical patients with obesity. These considerations are key components of the longitudinal, chronic care model that require ongoing shared decision making with each individual patient and family.

5. Polycystic ovarian syndrome (PCOS) and the adolescent

Polycystic ovarian syndrome (PCOS) is a heterogenous disorder heralded by a state of hyperandrogenism and insulin resistance. PCOS presents in either adolescence or adulthood and may result in diminished fertility, as well as increased risk of metabolic syndrome and the syndrome's individual components. PCOS affects 6–18 % of adolescent females. Not all females with PCOS have obesity and not all females with obesity have PCOS; however, a high prevalence of obesity exists in those with PCOS and those with obesity have a higher risk of PCOS than those with normal weight [73].

The pathophysiology of PCOS is complex, with factors from birth through adolescence contributing to its development. Females born with intrauterine growth restriction or small for gestational age who have

Table 2
Response to MBS in children and adults Abbreviations: anti-obesity medication = AOM; body mass index = BMI; % excess weight loss = %EWL; % total body weight loss = %TBWL; metabolic and bariatric surgery = MBS; Roux-en-Y gastric bypass = RYGB; type 2 diabetes mellitus = T2DM; sleeve gastrectomy = SG.

Study-Pediatrics	Population/Design	Results	Comments
Inge et al., 2016 [66] **(3-year follow-up data)** **Inge et al., 2019** [20] **(5-year follow-up data)**	- Teen-LABS, prospective, 5 site study. - Report short & long-term risks/benefits of MBS in adolescents −242 adolescents, 13–19 years of age -mean BMI: 50.5 kg/m^2 − 3 non-randomized MBS procedures utilized	− 3 years post MBS: - mean weight 27 % decrease - weight above baseline in 4 % of SG patients and 2 % of RYGB patients − 5 years post MBS: − 4% (6 patients) of 140 subjects with available data had weight above baseline.	-Did not differentiate between "non-responders" (never lost weight) or "regainers" (some degree of weight loss followed by weight regain). -no mention of adding AOMs to the post MBS treatment
Alqahtani et al., 2021 [21]	− 2504 children/teens (Saudi Arabia) − 5 to 21 years - mean %EWL of 71.1 % - 7-10 year follow-up	19 % post MBS patients lost <25 % EWL after 7 years - did not identify as non-responders or poor responders - implication this group "regainers".	-no mention of adding AOMs to the post MBS treatment
de la Cruz-Muñoz et al., 2022 [22]	−96 adolescents −10-18 years post MBS outcomes −74 % patient follow-up −31 % mean total body weight loss	-weight regain 10 years: 26% up from lowest weight	-did not identify as non-responders or poor responders -did not mention additive AOM therapy
Chu et al., 2019 [23]	-retrospective review -n = 28 -%EWL loss at 3-, 12-, & 24-months following MBS in adolescents	-greater %EWL at 3 months associated with better outcomes at 24 months. -defined success as 50 % EWL at 24 months: predictor of >30 % EWL at 3 months.	-Did not mention AOM's, weight regain, non-response, or poor response
Goldenshluger et al., 2023 [24]	-Prospective study −10.84-year follow-up −31 patients -<18 years old -% TBWL 32.31	−3 patients regained weight (not defined) and had reoperation.	-No mention of non-response, poor response, or AOM use post MBS

Study: Adult	Population/Design	Results	Comments
Stanford et al., 2017 [67]	- reviewed 319 patients post-MBS and treated with AOM's - All patients had inadequate weight loss or weight regain after their MBS - All study patients achieved weight loss >5 % of their post-surgical weight nadir & 30.1 % lost >10 %.	- Patient characteristics affecting response to post-MBS AOM: type of surgery, gender, & presence of co-morbidities. - RYGB procedure & female gender: more likely to achieve >5 % post-surgical weight loss. - history of psychiatric co-morbidity were more likely to lose >15 % postsurgical weight loss with medication. Patients with OSA less likely to achieve a >10 % post-surgical weight loss.	- Most frequently prescribed AOM in study: topiramate, phentermine, metformin, bupropion, & zonisamide. - No patients received GLP-1 agonists.
Lautenbach et al., 2022 [68]	− 53 adult patients - Procedure SG or RYGB - weight regain or insufficient weight loss -prescribed semaglutide 0.25 mg weekly or 0.5 mg weekly post MBS	− 3 months of semaglutide treatment: −61 % reached weight loss of >5 % −16 % achieved >10 %. −6 months of semaglutide treatment: −85 % of patients achieved >5 % weight loss −45 % reached >10 % weight loss −5% achieved >15 % weight loss. -No weight loss difference based on type of MBS	Patients started semaglutide on average 64.7 months after MBS
Mok et al., 2023 [69]	− 70 participants -poor weight loss response following RYGB or SG -randomized to receive 3.0-mg liraglutide (n = 35) or placebo (n = 35). -Poor response defined as < 20 % TBWL more than 1 year after MBS.	-Estimated change in % body weight from baseline to week 24 was −8.82 (4.94) with liraglutide, 3.0 mg (n = 31) vs. −0.54 (3.32) with placebo (n = 26). – -mean difference in % body weight change for liraglutide, 3.0 mg, vs placebo was −8.03 (95 % CI, −10.39 to −5.66; $P < .001$).	-All participants received at least 1 dose of the trial drug. −8 subjects discontinued treatment (4 per group) −2 subjects (3.0-mg liraglutide group) & 1 subject (placebo group) lost to follow-up.
Wong et al., 2022 [70]	−44 patients reviewed post MBS receiving AOM -Weight regain defined as 10 % above nadir -time of nadir in relation to MBS not defined	-AOM's in study included: GLP-1RA, phentermine, topiramate, metformin, setmelanotide, lisdexamphetamine, bupropion, naltrexone. –selection of specific AOM's based on clinical decision making for each patient.	-discussed: - differences in frequency of weight regain by race - AOM weight loss differences by type of MBS.
Jensen et al., 2023 [71]	-retrospective review -Swiss cohort −108 post-MBS patients -treated with both liraglutide and semaglutide. -Weight regain defined: any weight gain following weight nadir at least 12 months after MBS −50 patients (82 % female) in analysis.	-baseline prior to AOM: patients regained 15.1 % of total body weight. -After 6 months of AOM treatment: -overall total body weight loss of 5 % was achieved by 76 % of participants - > 10 % by 38.0 %, - > 15 % loss by 3.5 % of participants. - patients treated with semaglutide were more successful than patients with liraglutide −3 patients did not lose weight on either semaglutide or liraglutide treatment.	-review does not separate poor responders and responders to the original MBS. -Patient population was heterogeneous: -patients with 2 or 3 MBS revisions -patients with or without T2DM.

(*continued on next page*)

Table 2 (*continued*)

Study: Adult	Population/Design	Results	Comments
Lucas et al., 2023 [72]	review which lists clinical studies that evaluated the weight loss effect of AOMs in patients who were post MBS.	summarize findings in general about orlistat, phentermine, topiramate, phentermine/topiramate, liraglutide, naltrexone, bupropion, naltrexone/bupropion, semaglutide, and tirzepatide. They note selection of AOMs post MSB can follow similar decision-making process as for AOMs in general.	authors stress there are no official guidelines on perioperative weight optimization in patients undergoing MBS and that there is no consensus on the pharmacologic management of weight regain, inadequate weight loss, or weight loss plateau after MBS. They call for research that looks at best practice of AOM therapy post MBS in regard to timing, medication mechanism, combinations, and outcome benefit.

rapid post-natal weight gain are at risk for PCOS, as the weight gain tends to be more centrally located and more visceral than subcutaneous. Excess fat gain has been linked to accelerated linear growth and maturation due to earlier onset of adrenarche and pubertal maturation. Following menarche, ovarian hyperandrogenism persists, in part due to an increase in luteinizing hormone (LH) production, which increases androgen production, as well as a decrease in follicle stimulating hormone (FSH) production, which reduces aromatization and diminishes ovarian follicular maturation. These changes are linked to the insulin resistant state. Insulin promotes ovarian and adrenal androgen secretion, reduces sex hormone-binding globulin (SHBG) secretion, and increases LH release. In turn, androgens promote visceral obesity, reduce glucose uptake in adipose tissue and promote inflammation, which increase insulin resistance [74–76]. This cycle of insulin resistance and hyperandrogenism play a large role in the development of PCOS.

Diagnostic criteria of PCOS in adults differs from that in adolescents. Adult criteria include the presence of polycystic ovaries on ultrasound, oligo/anovulation and clinical or biochemical hyperandrogenism, based on the Rotterdam criteria [73]. Oligo/anovulation is defined as cycles that are <21 days or >35 days or lack of menstruation for 3 consecutive months and clinical hyperandrogenism as hirsutism, alopecia or severe acne. Criteria for adolescents include: abnormal menstruation for age/post menarche age as well as biochemical or clinical evidence of hyperandrogenism. The diagnosis cannot be made in females who are less than 1 year post menarche, as irregular cycles are expected during this time. Between 1- and 3-years post menarche, irregular cycles are defined as <21 or >45 days, and over 3 years post menarche, irregular cycles are defined as <21 or >35 days, or fewer than 8 cycles per year.

Clinical evidence of hyperandrogenism includes severe acne as well as hirsutism. A Ferriman Gallway score can be calculated based on the body hair location and extent to aid in assessment of clinical hyperandrogenism. Biochemical hyperandrogenism is evidenced by elevated levels of free testosterone or bioavailable testosterone or a high free androgen index. Polycystic ovaries on ultrasound are not part of the diagnostic criteria in adolescents due to the findings of polycystic ovaries in normally menstruating adolescent females.

As PCOS is a diagnosis of exclusion, other causes of irregular menses and hyperandrogenism need to be ruled out. These include causes of either symptom separately, as well as together [76]. History and physical exam are important to determine what other laboratory testing is necessary, which may include, in addition to free testosterone and bioavailable testosterone levels, dehydroepiandrosterone sulfate (DHEAS; to rule out adrenal tumor), 17-OH progesterone (rule out late onset congenital adrenal hyperplasia), thyroid function tests (rule out hypothyroidism), Beta-human chorionic gonadotropins (beta HCG; rule out pregnancy), prolactin (rule out hyperprolactinemia), cortisol (rule out Cushing's syndrome), and LH/FSH/estradiol (rule out hyper or hypogonadotropic hypogonadism). Ultrasound of the ovaries is not recommended in adolescents given the high prevalence of physiologic polycystic ovaries in the absence of disease. While insulin resistance is associated with PCOS, insulin levels are not part of the work up. Anti-Müllerian hormone (AMH) levels, while a good marker of ovarian reserve, are also not part of the work up. An increase in the ratio of LH to FSH is linked to PCOS but is not part of the diagnostic criteria.

Treatment of adolescent PCOS in the setting of obesity focuses on both reducing insulin resistance to improve androgen levels and restore menstrual function and fertility. This can be accomplished through decreasing stored adiposity measured by weight loss and by pharmacotherapy. Treatment should be directed at symptom improvement as well as disease remission and prevention of further comorbidities. There is no consensus regarding what treatment to first initiate and when to add a second or third line of treatment. Treatment options are reviewed with the patient and family and the best option initiated, with monitoring and reassessment until a stable treatment plan is found [77].

The 2018 guidelines for management of PCOS recommend a low-calorie diet to promote weight loss in women with PCOS and obesity [77]. There are no recommendations on which diet works best. Studies have looked at low glycemic index, low carbohydrate, plant based, high fiber and low-fat diets on weight and PCOS symptoms in both adult and adolescent females, with limited data in the latter group. All modifications showed a small reduction in BMI with improvements in menstrual function and androgen levels. In general, a diet that results in lower calorie intake and weight loss will improve insulin sensitivity and can improve biochemical and clinical parameters of PCOS [77]. If possible, dietitian guidance can be helpful in finding the best option for an individual patient.

Nutritional supplements have been studied for their impact on weight as well as insulin sensitivity. Supplements include fiber, B complex vitamins, vitamins E, K, D, chromium picolinate, flaxseed, coenzyme Q, myo-inositol, omega 3 fatty acids, berberine, curcumin and fennel. While some studies have noted improvements in markers of insulin sensitivity, androgens and menstrual function, others have not. Thus, there is not enough evidence to recommend supplements in the treatment of PCOS [74,78].

The addition of exercise can further improve insulin sensitivity and enhance weight loss, both of which can improve androgen levels and menstrual function. The type of exercises studied have varied and one type was not found to result in better outcomes than another, however, at least 60 minutes of moderate to vigorous activity at least 3 days a week has been suggested. Mindfulness based approaches such as cognitive behavioral therapy, yoga and acupuncture have shown limited improvement in PCOS symptoms and require further study to formulate conclusions about these treatment options.

Adjunctive weight loss options such as AOMs or MBS are considered to optimize weight loss (decrease stored adipose tissue) and improve insulin resistance in patients with obesity [79]. GLP-1 agonists have been studied in women with obesity and PCOS and found to reduce body weight and improve hyperandrogenism and ovulatory function. Other medications that are currently FDA approved to treat childhood and adolescent obesity, such as phentermine/topiramate combination or orlistat, have seldom been studied with respect to improvement in PCOS morphology. Elkind-Hirsch et al. (2021) studied the impact of phentermine/topiramate combination and a SGLT2 inhibitor with or without a GLP-1 agonist on weight and markers of PCOS in women with obesity. Results suggest that all options improved BMI and androgen levels, with the combination GLP-1/SGLT2 inhibitor leading to the biggest improvement in insulin resistance [80]. MBS as a treatment for PCOS has not been studied in adolescents; however, numerous studies in adults indicate that MBS leads to weight loss as well as improvement in ovarian function, insulin resistance, menstrual regulation, and androgen

levels [81,82].

Medications that focus on improving hirsutism and menstrual irregularity are well studied in adults and adolescents. Combined oral contraceptive pills are well known to restore menstrual cycles. No specific dose combinations are recommended but achieving desired outcomes with the lowest amount of hormones reduces the risk of unwanted side effects. If hirsutism is not resolving with the combined oral contraceptive pill alone, the addition of spironolactone can further reduce hair growth.

Metformin is used for its insulin sensitizing properties to improve ovarian insulin resistance and menstrual regulation but is less effective in reducing unwanted hair growth. Studies of metformin in adults with PCOS have assessed combination therapy with insulin sensitizers. Findings suggest that compared to monotherapy, metformin plus GLP-1 agonist therapy leads to a significant improve in glycemic status, while metformin plus thiazolidinediones can improve menstrual regulation and hyperandrogenism [83]. Studies are underway with a combination pill of spironolactone, pioglitazone, and metformin for PCOS treatment; pilot studies indicate an improvement in symptoms and signs of PCOS [77].

Adolescents and adults with PCOS often have several other conditions also prevalent in people with obesity, such as obstructive sleep apnea or disordered sleep, depression, anxiety, and components of metabolic syndrome (hypertriglyceridemia, low HDL, T2DM); ongoing assessment, management and/or referrals for these conditions is integral to the overall management of patients with PCOS.

PCOS is a complex disease whose treatment should focus on an improvement in insulin resistance and hyperandrogenism. Guidelines have directed providers toward treatment options but there is still a lack of consensus. More studies are needed to help providers individualize therapy for their patients.

6. The adolescent athlete with obesity

The epidemic of obesity in our children extends to adolescent athletes with obesity (AAWO). Weight management protocols commonly include counseling to increase physical activity with little to no counseling about potential injuries. AAWO suffer higher rates of both physical and psychological injuries than do healthy weight adolescents. Exercise is a foundational component of health that both increases cardiorespiratory fitness and serves as an important social outlet for youth. Encouraging physical activity and both competitive and noncompetitive sports participation is part of the baseline counseling included in care for adolescents, both those with and without obesity. However, recognizing the increased risk for injury during physical activity is important in improving health and preventing injury in AAWO. In addition, the clinician providing care for the AAWO should address the high frequency of weight-based victimization including bullying and teasing, humiliation, and feelings of insecurity about appearance. Key concepts in the care of AAWO are depicted in Fig. 1.

Adolescent athletes with obesity are at higher risk for injuries, in particular lower extremity injuries [84]. AAWO have an increase in body mass as compared to adolescent athletes with healthy weight. The increase in body mass increases the load on lower limb joints, muscles, and tendons. Biomechanics are altered and shear stress is increased. In addition, AAWO are at higher risk of exertional heat injury during activity [85]. The higher risk for exertional heat injury is due to an increase in metabolic heat production in combination with a relatively low surface area for heat dissipation through evaporation.

Studies report that AAWO are twice as likely to sustain injuries, in particular lower extremity injuries, as compared to adolescents who are healthy weight [86]. Common lower extremity injuries include genu valgum, pes planus, hyperlordosis, genu recurvatum, and tight quadriceps. In females, tibial trabecular thickness is lower in young women with obesity [87]. Many clinicians assume that AAWO have normal or increased bone mineral density. However, studies such as the one by van Leeuwen and colleagues [87] and the much higher frequency of vitamin D deficiency in AAWO point to compromise of bone health in AAWO. Children with obesity are also more likely to have osteochondritis dissecans in the elbow, knee, and ankle [88].

Injuries to the feet are common in AAWO. The higher overall load on the feet results in higher foot contact area, a higher load on the arch, higher peak pressure and higher force-time integral [89]. When AAWO stand, they have greater knee valgus than adolescent athletes at healthy

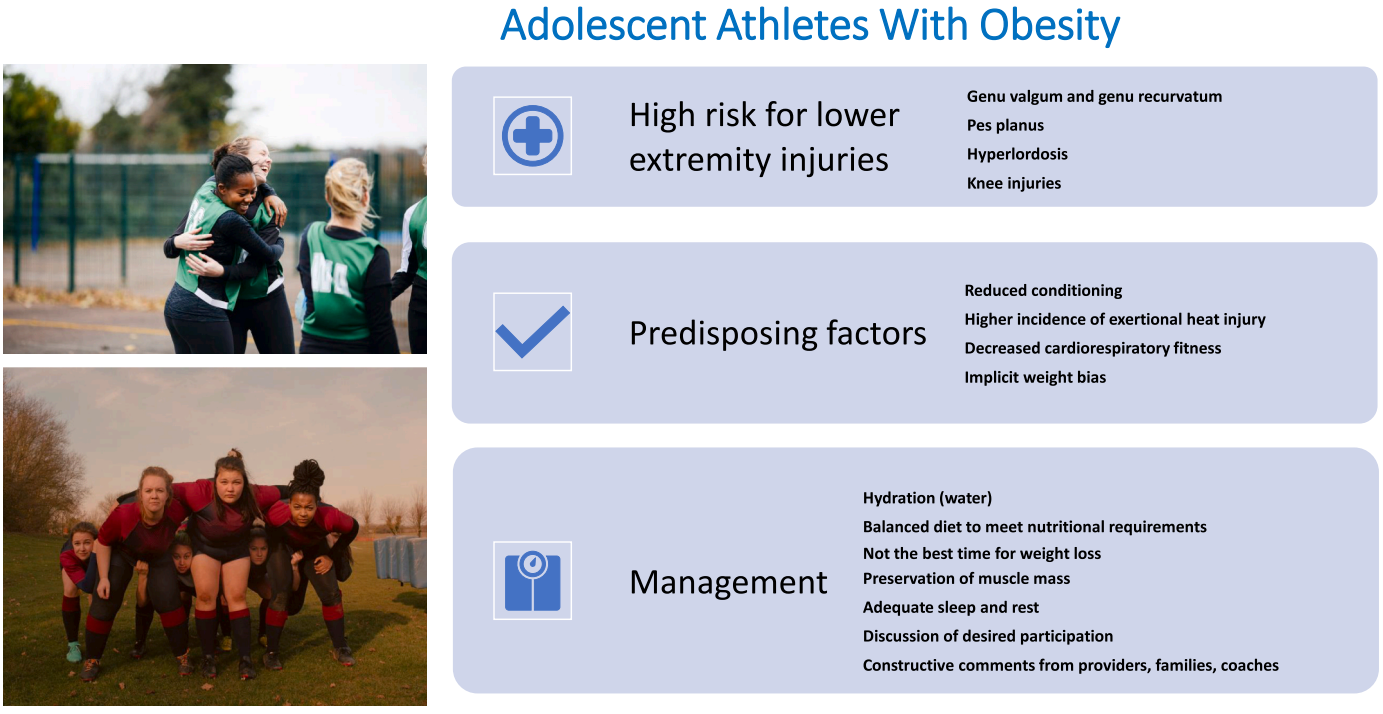

Fig. 1. Key concepts regarding AAWO. Image from Microsoft Powerpoint. Microsoft365.

weight and when walking AAWO have lower external knee adduction. During running, AAWO have greater external knee extension than healthy weight youth. Knee injuries are among the most common injuries seen in any adolescent athlete, and AAWO are more vulnerable than healthy weight youth.

Not only are altered biomechanics a problem, but AAWO suffer with reduced conditioning. AAWO may present for clearance for sports participation and may indicate the complaint of shortness of breath with exertion. Rates of deconditioning are higher in AAWO than in adolescents with healthy weight and both rate and degree of deconditioning are more severe with increases in BMI. AAWO with BMI greater than 40 kg/m^2 have decreased cardiorespiratory fitness. This decrease in cardiorespiratory fitness should be considered during clearance [90]. Encouraging preseason conditioning and acclimatization is important to forestall injury.

When treating an AAWO who is actively working to reduce weight, the clinician should ensure that the youth stays hydrated and that they consume a diet that meets their nutritional requirements. Weight loss may not be the focus during active sports participation, instead the conversion of fat mass to muscle mass may be more clinically important. If weight loss is pursued, it should be gradual with a goal of preserving muscle mass [91]. Preventing injury in AAWO is extremely important as injury frequently results in time away from participation or ceasing participation entirely.

Exertional heat injury is most frequently seen in youth participating in American football. American football is also the sport with the highest rate of obesity among participants [92]. Exertional heat injuries commonly occur 2 or more hours into practice or play and are greater during the warmer months, especially August [93]. AAWO are as susceptible as adolescent youth without obesity to peer pressure. Football is commonly associated with an expectation of physical hardship on the athlete. When these stressors are placed on an AAWO who is already compromised physically, the risk for injury escalates.

Clinicians who treat AAWO must be prepared to counsel on prevention and treatment of conditions more commonly seen in this population. Acclimatization to hot weather is important, stressing hydration and preseason conditioning. Adequate sleep and rest are equally important, especially in summer when the lack of the structure provided by school allows disruption of the circadian rhythm. Hydration fluids should be addressed, with the emphasis on water as the primary rehydration liquid and minimizing sugar containing fluids.

In addition to the increased risk of physical injury, AAWO are subject to weight bias. Negative attitudes about AAWO are prevalent and may involve assumptions of poor sports performance and lower levels of endurance. AAWO may be relegated to certain sports or positions in sports. For example, the youth may be encouraged to join the golf team instead of the track team, or if on the track team be assigned to the shot put or discus throw. A discussion with the AAWO should include what sport and position they want to perform. The clinician should discuss a plan on how to achieve this goal and potential barriers to achieving the goal. Adults in charge of sports participation frequently have implicit biases towards AAWO that can be acutely perceived by the youth. A frank and open discussion between the clinician and the youth can help the AAWO develop coping strategies for the complex biopsychological environment they are navigating through [94].

The clinician should be aware that a discussion with an adolescent about sports participation, no matter how well intended, can be perceived negatively. The AAWO may assume that the encouragement to participate in sports is because of their obesity. The AAWO may perceive the recommendations punitively and may feel that the clinician is condescending. This can be compounded by parents who use descriptors such as “lazy” and language that suggests that all the AAWO needs to do to improve their weight status is “get off the phone” and exercise more. Such negative attitudes towards sports participation can result in the AAWO dropping out or losing interest in activity. A more successful approach includes allowing the AAWO to choose both the activity and the degree of participation. Commentary should be limited to constructive comments. Parents should be encouraged to be role models and provide encouragement [95].

AAWO are extremely vulnerable to weight-based victimization. Puhl et al. (2017) observed increased weight gain and obesity in a 15-year longitudinal study [96]. Victimization occurred regardless of age, baseline BMI, ethnicity, and socioeconomic factors. Although weight-based victimization can come from multiple sources, the major barriers to physical activity in girls were self-consciousness and concern about boys’ weight related teasing [97]. Another source of weight-based victimization is teasing by the adolescents’ own family [98]. Lewis et al. (2014) reported that weight-based victimization was worse in the school environment than when AAWO participate in community activities [99]. Some studies suggest that girls with obesity are more likely to avoid physical activity as compared to boys. Of note, an interesting study by Li & Rukavina (2012) reports that not all AAWO experienced weight-based victimization. Reasons for a lack of victimization included a more family-oriented school environment, peers who also had obesity, personality traits in which the child was perceived as “outgoing and cool,” academic or athletic achievement, or teasers afraid of the AAWO [100]. Sports participation with other AAWO was identified by adolescents as providing an environment in which they felt more confident [101].

The obesity medicine specialist who manages AAWO should be familiar with common and preventable injuries. Sports participation can be a rewarding and positive experience for all youth. AAWO can and should participate in sports if they choose to do so. Preseason conditioning and counseling to increase endurance, avoid exertional heat injury and prevent physical injuries, especially to the lower extremities, can help keep AAWO “in the game.” Weight based victimization should be addressed by the clinician with open ended questions, carefully helping the AAWO to express their specific concerns. Family should be counseled to provide support and avoid negative comments on appearance or performance. Other positive aspects of the AAWO should be reinforced and used to bolster the desire to participate. Clearly, we as obesity medicine specialists want to encourage the youth we care for to be as active as possible and as emotionally stable as possible.

7. Conclusion

This CPS provides an overview of multiple challenges facing adolescents with obesity. The CPS opens with a general discussion, detailing increased prevalence and severity of this chronic disease in adolescents which despite advanced therapy options, compromises health in one third of every adolescent in the US. The CPS then discusses the adolescent with special health care needs who faces many of the metabolic and psychosocial challenges of any adolescent with obesity but does so through the lens of ongoing behavioral and physical disabilities. The Statement then proceeds to review the latest research on MBS and the evidence for effective use of AOM post MBS for select youth. The CPS review of PCOS discusses a comorbid condition which is common among adolescent females and is characterized by obesity with menstrual irregularities, hyperandrogenemia and severe insulin resistance. Finally, we discuss the adolescent athlete who is at higher risk for specific injuries, exertional heat injuries and weight bias.

Although sharing similar issues with younger children and adults with obesity, adolescents with obesity experience unique problems due to their continued dependent status, rapid growth and development, and emerging independence. Despite these challenges, management of this vulnerable population is critical to prevent progression of obesity into adulthood. More research is critical to improve management and ultimately clinical outcomes.

Transparency [164]

Since 2022, the Obesity Medicine Association Clinical Practice

Statements have represented a diverse range of clinicians, allied health professionals, clinical researchers, and academicians. The authors reflect a multidisciplinary and balanced group of experts in obesity science, patient evaluation, and clinical treatment.

Author contributions

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Ethics review

This OMA Clinical Practice Statement manuscript was peer-reviewed and approved by the OMA Board of Trustee members prior to publication. Edits were made in response to reviewer comments and the final revised manuscript was approved by all the authors prior to publication. This submission did not involve human test subjects or volunteers. Responsibility for the journal editorial, peer review, and/or decision process for this article was delegated to non-author Editors or non-author Associate Editors.

Conclusions and recommendations

This Clinical Practice Statement is intended to be an educational tool that incorporates the current medical science and the clinical experiences of obesity specialists. The intent is to better facilitate and improve the clinical care and management of patients with pre-obesity (overweight) and obesity. This Clinical Practice Statement should not be interpreted as "rules" and/or directives regarding the medical care of an individual patient. The decision regarding the optimal care of the patient with pre-obesity (overweight)and/or obesity is best reliant upon a patient-centered approach, managed by the clinician tasked with directing an individual treatment plan that is in the best interest of the individual patient.

Updating

It is anticipated that sections of this Clinical Practice Statement may require future updates. The timing of such an update will depend on decisions made by Obesity Pillars Editorial team, with input from the OMA members and OMA Board of Trustees.

Disclaimer and limitations

In areas regarding inconclusive or insufficient scientific evidence, the authors used their professional judgment. This Clinical Practice Statement is intended to represent the state of obesity medicine at the time of publication. Thus, this Clinical Practice Statement is not a substitute for maintaining awareness of emerging new science. Finally, decisions by practitioners to apply the principles in this Clinical Practice Statement are best made by considering local resources, individual patient circumstances, patient agreement, and knowledge of federal, state, and local laws and guidance.

Declaration of Artificial Intelligence (AI) and AI-assisted technologies in the writing process

AI was not used in the research or drafting of this submission.

Disclosures

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