**Definition:** Pediatric obesity is defined in categories of overweight, obese and severely obese. Although there are limitations to various methods for determining the amount of excess fat, we recommend the use of BMI as an inexpensive and reproducible method. In patients with significantly developed muscle mass, other options such as body composition may be better alternatives. For this guideline, however, overweight is defined as a BMI at or above the 85th percentile and below the 95th percentile for children and teens of the same age and sex. Obesity is defined as a BMI at or above the 95th percentile for children and teens of the same age and sex. Severe obesity is defined as a BMI ≥120% of the 95th percentile. (2)

**Pathophysiology:** Obesity is a complex disease that involves interactions between societal, environmental, metabolic and genetic factors. (3) Excess adipose tissue mass can be seen as a disruption in the balance between energy intake and expenditure. Although 70% of an obese phenotype is related to genetic factors, genetic-environment interactions are key to the promotion of obesity within an individual. Some of these environmental factors include: a sedentary lifestyle (e.g., excessive television viewing, excessive computer use, and insufficient physical activity), increased sugar-sweetened beverages, various unhealthy eating behaviors, and poor sleep. Additionally, excess weight gain causes hormonal and neurochemical alterations that reset the homeostatic “set point”. This results in increased hunger hormones and decreased energy expenditure during weight loss, which likely leads to decreased efficacy of treatments over the long-term.

**Epidemiology:** Pediatric obesity affects 32% of children in the United States. (4) According to the National Survey of Children’s Health, 33% of children in Texas are overweight or obese. Obesity is more likely in low-income and food insecure families and/or in racial/ethnic minorities. One in three children will suffer lifelong health and productivity consequences, and two-thirds will remain obese by the age of 35. As of 2005, obese adults cost Texas businesses $3.3 billion per year. (5) It is predicted that the childhood obesity epidemic will triple Texas’s adult obesity rate by 2040, and obesity-related expenses are projected to skyrocket accordingly.

**Inclusion Criteria**
- Children and adolescents age 6 to 18 years of age

**Exclusion Criteria**
- Children <6 years of age
- Children/Adolescents with genetic or hormonal syndromes associated with childhood obesity
  - Genetic syndromes associated with childhood obesity include the following:
    - Prader-Willi syndrome
    - Pseudohypoparathyroidism
    - Laurence-Moon-Biedl (Bardet-Biedl) syndrome
    - Cohen syndrome
    - Down syndrome
    - Turner syndrome
- Children/Adolescents who currently take medications which cause overweight/obesity (not meant to be an all-inclusive list):
  - Cortisol and other glucocorticoids
  - Megace
  - Sulfonylureas
  - Tricyclic antidepressants (TCAs)
  - Monoamine oxidase inhibitors (MAOIs), such as phenelzine
  - Injectable contraceptives
  - Insulin (in excessive doses)
  - Thiazolidinediones
  - Risperidones
  - Clozapine

**Differential Diagnosis of Pathogenic Causes of Obesity**

(not an inclusive list)
- Obesity with impaired linear growth should prompt investigation of:
  - Growth Hormone Deficiency
  - Hypothyroidism
  - Cushing Syndrome
- Obesity with very early onset or mental/developmental delays should prompt consideration of:
  - Genetic causes (Melanocortin 4 Receptor deficiency, Prader-Willi Syndrome, pseudohypoparathyroidism, leptin deficiency)
  - Iatrogenic (medication-induced) obesity

**Diagnostic Evaluation**

**History:** Assess for
- History and ROS for comorbidities (see Appendix D)
  - Age <5 years old at onset of excess weight
  - Increasing weight trajectory (crossing over 2 percentile lines)†
  - Bullying
- Dietary habits:
  - Sugary beverages ≥1 4-oz serving per day
  - Fast food/restaurant meals
  - Large portions
  - Skipping meals
  - <5 fruit/vegetable servings per day
- Screen time: TV, computer, tablet, phone, video games ≥2 hours per day
- Physical activity: PE, recess, sports, outside play ≤1 hour per day
  - Safety and accessibility of outdoor play
- Sleep history
  - Hours per night
    - <9 hours per night (6-12-year-olds) or <8 hours per night (13-18-year-olds)*
    - Difficulty falling or staying asleep
- Family history
  - Parental/Sibling obesity
  - Type 2 diabetes mellitus
  - Early cardiovascular disease (stroke, MI, death in M<55 yo or F<65 yo) (1st and 2nd degree relatives)
  - Dyslipidemia (1st and 2nd degree relatives)
  - Hypertension
  - Hyperlipidemia
  - Liver or gallbladder disease
  - Respiratory insufficiency or sleep apnea
Physical Examination
- Vitals:
  - Body mass index (BMI) (See Appendix A, B, C)
  - Blood pressure (See Appendix C)
  - Height velocity
- Exam (in italics are items that would normally not prompt additional workup/referral unless severe or in conjunction with other features):
  - Otolaryngology- papilledema, dental caries, enlarged tonsils
  - Chest- wheezing, gynecomastia
  - Back- cervicodorsal hump
  - Gastrointestinal- enlarged liver
  - Genitourinary- buried penis, micropenis
  - Musculoskeletal- gait, scoliosis, hip ROM, genu varum/valgum
  - Skin- acanthosis, hirsutism, acne, striae, intertrigo, edema

Laboratory Tests
See Appendix C for Laboratory and Diagnostic Tests

*Children 6-12 years old may need between 9-12 hours and adolescents 13-18 years old may need 8-10 hours of sleep. Thus, this should be assessed in relation to the needs of the patient.*  
†There is no clear definition of the amount of weight gain that increases medical risks in obesity. Crossing over 2 percentile lines is the standard definition for height/weight issues related to other diseases.

Critical Points of Evidence*

Evidence Supports
- Screening of children ≥6 years for obesity and offering services or referral to comprehensive, intensive behavioral intervention to promote improvement in weight status. *(15-18) – Strong recommendation, high quality evidence*
- Participation in a ≥26-hour, family-based interventions with the following components: dietary, physical activity and reduction of sedentary behaviors, and behavioral modifications has been shown to be effective in the short term (<2 years) in a research setting. The use of this approach in real world settings is not well described. *(19-38) – Strong recommendation, moderate quality evidence*
- Support for weight loss maintenance for at least two years after successful completion of weight loss interventions. *(40-43) – Strong recommendation, moderate quality evidence*
- The utilization of technology to support interventions for weight loss maintenance. *(44-48) – Weak recommendation, moderate quality evidence*
- Consider pharmacological intervention after family-based, behavioral interventions are unsuccessful and BMI is greater than 120% of the 95th percentile. Orlistat should be considered in children ages ≥12. Phentermine should be considered for adolescents ≥17 years. *(51-63) – Strong recommendation, moderate quality evidence*
- Consider referral of adolescents to the bariatric surgery program who are suffering from severe obesity (BMI ≥40 kg/m\(^2\)) and severe comorbidity, or who are extremely obese (BMI ≥50 kg/m\(^2\)) and who despite attempts to lose weight after at least 6 months of organized weight loss, are Tanner Stage IV or V; are committed to medical and psychological evaluation before and after surgery; are committed to avoid pregnancy for 1 year after surgery; are capable and willing to adhere to postoperative nutritional guidelines; live in a supportive family environment; and are able to provide informed assent (patient) and consent (family). *(64-69) – Strong recommendation, high quality evidence*

Evidence Against
- The use of pharmacological interventions in children <12 years of age. *(49-63) – Strong recommendation, moderate quality evidence*
- Bariatric surgery for overweight or obese children and/or who have not attempted weight loss through appropriate family-based, behavioral interventions, dietary changes, increased physical activity and reduction of sedentary behaviors. *(64-71) – Strong recommendation, high quality evidence*

Evidence Lacking/Inconclusive
- The off-label use of pharmacologic interventions in children
- The appropriate timing between repeat screening labs for comorbidities especially with regard to increased weight gain

*NOTE: The references cited represent the entire body of evidence reviewed to make each recommendation.*

Use of This Guideline
The Texas Children’s Hospital Childhood Obesity content expert team acknowledges the vast scope and complexity surrounding the care of obese patients. This guideline is meant to serve as both a resource for the care of these children and also as overall guidance for where resources are needed to improve care within our system. Obesity is a multifactorial problem whose management cannot be solely focused in a health care system (e.g., clinic or hospital). Societal commitment to the problem in the context of local, state, and federal government supports, school system involvement, and family commitment are critical for an effective preventative approach to this problem. We recognize that Texas Children’s Hospital does not have a family-based intervention which utilizes >26 hours of face-to-face contact time for all children ages 6-18. Given the significant number of children with obesity in our system and the mild beneficial effects seen in research settings, we are not advocating for such a program to be implemented system-wide at this time
(although implementing one for a subset of the population may be indicated). Unfortunately, there is very clear evidence that small-scale interventions have limited effects on their own. Thus, in order to deliver high-level care to these patients with the necessary frequency to see lasting results, we encourage support for innovative care models. These models would likely include involvement of neighborhoods, families, schools, and governments as well as Texas Children’s Hospital. Additionally, we have included an appendix of resources in the community (as well as through Texas Children’s Hospital) to help with engaging families in healthy behaviors/eating/activities (see Appendix E). These resources are also listed on the Texas Children’s Weight Management website under “Provider Resources”. As this guideline is a living document, we will continue to update it with the most recent evidence-based interventions to improve care of the obese child at Texas Children’s Hospital.

**Condition-Specific Elements of Clinical Management**

**Consults/Referrals**
- Individualized referral to specialists

**Follow-Up Care**
- Support for weight loss maintenance for at least 2 years

**Measures**

**Structure**
- Guideline utilization
- Cost efficiency from reduced treatment of obesity-related comorbidities

**Process**
- Attrition
- Adherence

**Outcome**
- BMI reduction
- Reduced incidence of comorbidities
- Quality of life
**Screening for Pediatric Overweight and Obesity**

**Well Child Exam**
Ages 5-18 y
Assess all children for obesity

**Identification**
- Calculate BMI based on height and weight
- Determine percentile by plotting BMI on growth chart
- Assess height velocity
- Diagnose nutritional status

**Assessment**
- Physical examination
- Blood pressure (see Appendix C)
- Assess risks (see table below)
- Review Medications for obesogenic drugs
- Labs for those with BMI ≥ 85th percentile (see Routine Care below)
- Assess behaviors and attitudes

**Medical History Risks:**
- Any mental health diagnosis
- Age < 5 years old at onset of excess weight-Increasing weight trajectory (crossing over 2 percentile lines)
- Any disorder listed in Appendix D
- Presence of Bullying (if present, consider referral to psychology)
- Obesity (1st degree relatives)
- Stroke, MI, death in Male <55yo or Female <65yo
- Dyslipidemia; hypertension; diabetes mellitus type II; and/or liver or gallbladder disease
- Respiratory insufficiencies or sleep apnea

**Family History Risks**
- Any mental health diagnosis
- Stroke, MI, death in Male <55yo or Female <65yo
- Dyslipidemia; hypertension; diabetes mellitus type II; and/or liver or gallbladder disease
- Respiratory insufficiencies or sleep apnea

**Prevention**
- Target behavior
  - Identify problem behaviors
  - If none, reinforce healthy habits
- Patient/Family Counseling:
  - Review risks
  - Use motivational interviewing to encourage behavior change

**Intervention**
- Exit screening algorithm & go to management & treatment algorithm

**BMI PERCENTILE**
<5th %ile
5th - 84th %ile
85th - <95th %ile
≥95th %ile
≥120% of 95th %ile (see Appendix C)

**NUTRITIONAL STATUS**
Underweight
Healthy Weight
Overweight
Obese
Severely Obese

**Behaviors**
- Sedentary time < 2 hours per day
- Sugary beverages ≤ 1 four-ounce serving per day
- Meals at home
- Eating 3 meals per day
- Normal portion sizes
- ≥ 5 fruit/vegetable servings per day
- >1 hour of moderate activity per day
- At least 9 Hours per night (6-12 year olds) or 8 hours per night (13-18 year olds)

**Attitudes**
- Family and patient concerns
- Motivation

**Routine care**
- Provide ongoing positive reinforcement for healthy behaviors
- Follow weight and BMI at every well child visit
- For patients with BMI ≥ 85th %ile, draw the following labs: HgbA1c, ALT, non-fasting lipid panel. If lipid panel is abnormal, perform a fasting lipid panel and also obtain a fasting glucose
- If labs are normal, repeat every 2 years as long as BMI ≥85th %ile or sooner if patient gains excessive weight or if symptoms arise specific to a comorbidity
- If labs are abnormal, move to treatment algorithm and consider referral to subspecialist (refer to Appendix C for guidelines)

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BMI = 85th to <95th percentile (overweight) with medical risks, BMI > 95th percentile (obese or severely obese)

**LEVEL 1**

*Management and Treatment Strategies (see Appendix E)*
- Implement family-based, behavioral interventions with the following components:
  - Assessment for readiness for change for family and patient
  - Motivational interviewing to promote healthy behaviors
  - Family-based counseling sessions targeting both the parent and child
  - Individual sessions (both family and group, as needed)
  - Education and information on healthy eating, safe exercise, and reading food labels (reinforce 5-2-1-0 teaching)
  - Encourage the use of stimulus control (e.g., limiting access to tempting foods and screen time)
  - Goal setting, self-monitoring (e.g., maintenance of food diary), contingent rewards for success, and problem solving
  - Supervised physical activity sessions (recommend at least 60 minutes of physical activity daily)
  - Consider referral to specialist for management of comorbidities

**3-6 month evaluation:**
Improvements or stabilization of BMI/weight status?

**LEVEL 2**

- Continue interventions from Level 1
- Consider referral to weight management program
- Consider referral to specialist for management of comorbidities
- Consider pharmacological intervention:
  - Orlistat can be considered for children ages 12 and older
  - Phentermine can be considered for adolescents ages 17 and older

**Support successful weight loss with at least 2 years of maintenance weight loss support**

**3-6 month evaluation:**
Improvements or stabilization of BMI/weight status?

**LEVEL 3**

*Management and Treatment Strategies*
- Refer adolescents for bariatric surgery program who are:
  - Suffering from severe obesity (BMI ≥ 40 kg/m2) and severe comorbidity OR who are extremely obese (BMI ≥ 50 kg/m2) and who failed to lose weight despite persistent compliance to lose weight after at least 6 months of organized weight loss
  - Tanner Stage IV or V
  - Committed to medical and psychological evaluation before and after surgery
  - Committed to avoidance of pregnancy for 1 year after surgery
  - Are capable and willing to adhere to post-operative nutritional guidelines
  - Live in a supportive family environment
  - Are able to provide informed assent (patient) and consent (family)
- Continue interventions from Level 1 and 2
Appendix A: Boys - CDC Body mass index for age percentiles

*To Calculate BMI: Weight (kg) + Stature (cm) + Stature (cm) x 10,000
or Weight (lbs) + Stature (in) + Stature (in) x 703
Appendix B: Girls- CDC Body mass index for age percentiles

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

<table>
<thead>
<tr>
<th>Date</th>
<th>Age</th>
<th>Weight</th>
<th>Stature</th>
<th>BMI*</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703

Published May 30, 2006 (modified 11/19/06).
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

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Appendix C: BMI, Laboratory, and Diagnostic Tests

## BMI, Laboratory, and Diagnostic Tests

### BMI Percentile and Definitional Categories of Childhood Weight

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentile Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;10th percentile</td>
</tr>
<tr>
<td>Normal</td>
<td>10th to 84th percentile</td>
</tr>
<tr>
<td>Overweight</td>
<td>85th to 94th percentile</td>
</tr>
<tr>
<td>Obese</td>
<td>≥95th percentile</td>
</tr>
<tr>
<td>Severe obesity</td>
<td>≥120% of the 95th percentile</td>
</tr>
</tbody>
</table>

### Body Mass Index at the 95th Percentile and 120% of the 95th Percentile, by Age and Gender

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>18.39</td>
<td>22.07</td>
</tr>
<tr>
<td>7</td>
<td>19.12</td>
<td>22.94</td>
</tr>
<tr>
<td>8</td>
<td>20.03</td>
<td>24.03</td>
</tr>
<tr>
<td>9</td>
<td>21.05</td>
<td>25.25</td>
</tr>
<tr>
<td>10</td>
<td>22.09</td>
<td>26.5</td>
</tr>
<tr>
<td>11</td>
<td>23.17</td>
<td>27.8</td>
</tr>
<tr>
<td>12</td>
<td>24.2</td>
<td>29.04</td>
</tr>
<tr>
<td>13</td>
<td>25.18</td>
<td>30.22</td>
</tr>
<tr>
<td>14</td>
<td>26.4</td>
<td>31.25</td>
</tr>
<tr>
<td>15</td>
<td>26.84</td>
<td>32.21</td>
</tr>
<tr>
<td>16</td>
<td>27.56</td>
<td>33.07</td>
</tr>
<tr>
<td>17</td>
<td>28.26</td>
<td>33.91</td>
</tr>
<tr>
<td>18</td>
<td>29.96</td>
<td>34.75</td>
</tr>
</tbody>
</table>

### Laboratory testing

Apart from guidelines on obtaining initial screening labs, there are no clear guidelines on when to repeat labs, how weight gain affects the screening schedule, or how to interpret abnormal labs. Below is guidance on screening labs from our combined expert opinion, as well as taking into account referral patterns/requirements by different subspecialty services.

- **Tests to draw:** While fasting labs are diagnostic, we understand that obtaining a fasting sample is sometimes difficult. Thus, we agree a provider could either (1) perform a fasting glucose, fasting lipid panel, ALT, and hemoglobin A1c, or (2) perform ALT, hemoglobin A1c, and non-fasting lipid panel with a repeat fasting lipid panel if the non-fasting lipid panel was abnormal (and recommend adding a fasting blood glucose level as hemoglobin A1c has variable predictive value for diabetes in children).

- **Effect of age:** Some obesity algorithms call for testing all children for comorbidities as young as age 6 (and younger for some). However, practice guidelines on each comorbidity recommend screening at different ages. Since lipids can be drawn as early as 2 years of age in an overweight patient, bloodwork is likely indicated in the entire population this guideline is targeting (patients ≥6 yo with BMI ≥85th %ile). For simplicity, we recommend drawing all labs in an overweight/obese patient. However, listed below are the recommendations for screening according to the appropriate clinical practice guideline per comorbidity:
  - **Diabetes:** HgbA1c, fasting glucose, or oral glucose tolerance test at age ≥10 years or at the start of puberty, whichever is sooner, in those who have a BMI ≥85th %ile + ≥1 of the following: maternal history of diabetes or gestational diabetes during child’s gestation; family history of 1st or 2nd degree relative with T2D; race/ethnicity of Native American, African American, Latino, Asian American, Pacific Islander; acanthosis nigricans; dyslipidemia, PCOS; or small-for-gestational-age birth weight
  - **NAFL:** ALT at age ≥9 years
  - **Dyslipidemia:** Lipid panel beginning between 2-10 years
  - **Hypertension:** Blood pressures in all children ≥3 years

- **Testing interval:** Many guidelines recommend repeating normal labs between 2-3 years. For simplicity, we recommend repeating normal labs every 2 years in an overweight/obese child who is not crossing over percentiles (i.e., 85, 95, 97, 99 or >10 %ile change when calculated as a percent of the 95th %ile) or developing symptoms. If a patient is moving up percentiles in BMI, we recommend yearly screening.

- **Specialist referral:** For many comorbidities, mildly abnormal labs do not necessarily require specialist intervention. Thus, in the table below, we have listed when to consider referral to a specialist vs. when to definitely refer (though this does not necessarily mean it is an urgent referral).
**Screening Laboratory and Diagnostic Tests for Overweight and Obese Children** *(71,72,73)*

<table>
<thead>
<tr>
<th>Laboratory Test</th>
<th>Normal Value</th>
<th>Values to consider Specialist Referral</th>
<th>Values for Definitive Specialist Referral</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-Diabetes/Diabetes (Referral to Endocrinology)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>&lt;100 mg/dL</td>
<td>100 - 125 mg/dL</td>
<td>≥126 mg/dL</td>
</tr>
<tr>
<td>Hemoglobin A1c</td>
<td>&lt;5.7%</td>
<td>5.7 - 6.4%</td>
<td>≥6.5%</td>
</tr>
<tr>
<td><strong>Non-alcoholic Steatohepatitis (Referral to Gastroenterology – Fatty Liver Clinic)</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ALT</td>
<td>≤22 mg/dL girls</td>
<td>≥44 U/L girls</td>
<td>≥80 U/L</td>
</tr>
<tr>
<td></td>
<td>≤26 mg/dL boys</td>
<td>≥52 U/L boys</td>
<td></td>
</tr>
<tr>
<td><strong>Fasting Lipid (Referral to Cardiology – Preventative Clinic, lipids)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total cholesterol</td>
<td>&lt;170 mg/dL</td>
<td>≥180 mg/dL</td>
<td>≥200 mg/dL</td>
</tr>
<tr>
<td></td>
<td>&lt;120 mg/dL</td>
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<tr>
<td>LDL cholesterol</td>
<td>&lt;110 mg/dL</td>
<td>≥130 mg/dL</td>
<td>&gt;160 mg/dL (fasting on 2 different occasions)</td>
</tr>
<tr>
<td>Non-HDL cholesterol</td>
<td>&lt;120 mg/dL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>&gt;45 mg/dL</td>
<td></td>
<td>&lt;30 mg/dL</td>
</tr>
<tr>
<td>Apolipoprotein A-I</td>
<td>&gt;120 mg/dL</td>
<td>&lt;115 mg/dL</td>
<td>&lt;110 mg/dL</td>
</tr>
<tr>
<td>Apolipoprotein B</td>
<td>&lt;90 mg/dL</td>
<td>≥110 mg/dL</td>
<td>&gt;120 mg/dL</td>
</tr>
<tr>
<td>Triglycerides (fasting)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- 0-9 years</td>
<td>30 - 104 mg/dL</td>
<td>≥200 mg/dL</td>
<td></td>
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<tr>
<td>- 10-14 years</td>
<td>33 - 129 mg/dL</td>
<td></td>
<td></td>
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<tr>
<td>- 15-19 years</td>
<td>38 - 152 mg/dL</td>
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<tr>
<td><strong>Hypertension (Referral to Cardiology – Preventative Clinic, hypertension)</strong></td>
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<tr>
<td>(Referral to Cardiology for hypertensive patients who are obese will default to the Multidisciplinary Clinic which is staffed by both Cardiology and Nephrology)</td>
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<tr>
<td>Blood pressure</td>
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<tr>
<td>(all % are references to systolic or diastolic blood pressure percentile for age/height/gender)</td>
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<tr>
<td>1-12 yo: &lt;90th %ile</td>
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<td></td>
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<tr>
<td>≥13 yo: &lt;120/80 mmHg</td>
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<tr>
<td>Elevated blood pressure</td>
<td>3 separate visits (0, 6 mo, 12 mo)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-12 yo: ≥90th% but &lt;95th%</td>
<td>120/80-139-89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥13 yo:</td>
<td>120/80-139-89</td>
<td></td>
<td></td>
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<tr>
<td>Stage 1 Hypertension</td>
<td>3 separate visits (0, 2 wk, 3 mo)</td>
<td></td>
<td></td>
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<tr>
<td>1-12 yo: ≥95th% - 95th% + 12 mmHg</td>
<td>≥130/80 to 139/89 mmHg</td>
<td></td>
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<tr>
<td>≥13 yo:</td>
<td>140/90 mmHg</td>
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<tr>
<td>Stage 2 Hypertension after 2 separate visits (0, 1 wk)</td>
<td></td>
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<tr>
<td>1-12 yo: ≥95th% + 12 mmHg</td>
<td>≥130/80 to 139/89 mmHg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥13 yo:</td>
<td>≥140/90 mmHg</td>
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<tr>
<td>Immediate referral to Emergency room</td>
<td>≥140/90 and symptoms (e.g., headache)</td>
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<tr>
<td>or</td>
<td></td>
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<tr>
<td>1-12 yo: 95th% + &gt;30 mmHg</td>
<td>≥13 yo: &gt;180/120 mmHg</td>
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</tbody>
</table>

Notes on hypertension screening: Blood pressure (BP) should be taken with appropriate size cuff after sitting quietly for 10 minutes. If initial BP is elevated, repeat 2 more times at that visit and average the last 2 readings to stage the BP. If the repeat BP is done by oscillometry (machine), and the average of the 2 is still high, then it should be repeated again x 2 by auscultation. Together, these measurements are equal to one occasion of elevated blood pressure. To establish a diagnosis of hypertension, 3 separate occasions of elevated blood pressure must be noted.

*Adapted from the 2017 AAP Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents, the 2017 NASPGHAN Guideline for the Diagnosis and Treatment of Nonalcoholic Fatty Liver Disease in Children, the 2018 American Diabetes Association Standards of Medical Care in Diabetes, the 2011 Expert Panel on Integrated Guidelines for Cardiovascular Health, and the 2012 Endocrine Society Clinical Practice Guideline on Hypertriglyceridemia*
## Appendix D: Obesity-Related Conditions & Comorbidities

### Obesity-Related Conditions & Comorbidities

The following conditions are associated with obesity and should be considered for further work-up. Additional lab tests may be warranted if indicted by the patient’s clinical condition.

<table>
<thead>
<tr>
<th>Endocrine:</th>
<th>Neurological:</th>
<th>Orthopedic:</th>
<th>Psychological/behavioral health:</th>
<th>Respiratory:</th>
<th>Miscellaneous:</th>
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<tbody>
<tr>
<td>- Polycystic ovarian syndrome (PCOS)</td>
<td>- Hearing loss</td>
<td>- Blount’s disease (Tibia vara)</td>
<td>- Anxiety</td>
<td>- Obstructive sleep apnea (OSA)</td>
<td>- Vitamin D deficiency</td>
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<tr>
<td>- Precocious puberty</td>
<td>- Idiopathic intracranial hypertension</td>
<td>- Slipped capital femoral epiphysis (SCFE)</td>
<td>- Attention deficit/hyperactivity disorder (ADHD)</td>
<td>- Hypoventilation syndrome</td>
<td>- Iron deficiency</td>
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<tr>
<td>- Premature adrenarche</td>
<td>- Stroke</td>
<td>- Fractures</td>
<td>- Binge eating disorder</td>
<td>- Asthma</td>
<td>- Cancer</td>
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<tr>
<td>- Prediabetes: Impaired fasting glucose and/or impaired glucose tolerance as demonstrated during a GTT</td>
<td></td>
<td>- Gout</td>
<td>- Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Type 2 diabetes</td>
<td></td>
<td></td>
<td>- Distorted body image</td>
<td></td>
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<tr>
<td>- Acanthosis nigricans</td>
<td>- Neurological:</td>
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<td>- Psychological/behavioral health:</td>
<td>- Psychological/behavioral health:</td>
<td>Psychological/behavioral health:</td>
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<tr>
<td>- Hirsutism</td>
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<td>- Furunculosis</td>
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<td>- Hidradenitis suppurative</td>
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<td>- Cholelithiasis</td>
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<td>- Pancreatitis</td>
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<tr>
<td>- Gastroesophageal reflux disease (GERD)</td>
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<tr>
<td>- Nonalcoholic fatty liver disease (NAFLD)</td>
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<td>- Proteinuria</td>
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# Appendix E: Weight Management, Nutrition, and Community Resources

## Comprehensive Weight Management

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>BMI</th>
<th>Content</th>
<th>Referral required</th>
<th>Cost</th>
<th>Location</th>
<th>Days/Times</th>
<th>Enroll/Info</th>
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<tbody>
<tr>
<td><strong>TCH Resources</strong></td>
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<tr>
<td>Adolescent/Teen WOW</td>
<td>12-18</td>
<td>&gt;95th %ile</td>
<td>Medical, nutrition, and behavioral interventions Evaluation and preparation for surgery or alternate treatments</td>
<td>Yes</td>
<td>Insurance/Self</td>
<td>Wallace Tower</td>
<td></td>
<td>EPIC*(&quot;referral to Adol Med&quot;)/832-822-4887</td>
</tr>
<tr>
<td>Adolescent Bariatric Surgery</td>
<td>15-18</td>
<td>≥40 kg/m²</td>
<td>Medical, nutrition, and behavioral interventions Evaluation and preparation for surgery or alternate treatments</td>
<td>Yes</td>
<td>Insurance/Self</td>
<td>Wallace Tower</td>
<td></td>
<td>EPIC*(&quot;referral to Pediatric Surgery&quot;)/832-822-4868</td>
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<td><strong>Non-TCH Resources</strong></td>
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<tr>
<td>Weight Management Clinic – Harris Health</td>
<td>1-18</td>
<td>≥85th %ile</td>
<td>Medical, nutrition, and psychology</td>
<td>Yes</td>
<td>Insurance/Self</td>
<td>3925 Fairmont Parkway, Pasadena, 77504</td>
<td>Monday PM</td>
<td>Families need to be ready to make changes</td>
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## Behavior Modification Programs

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
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<th>Cost</th>
<th>Location</th>
<th>Days/Times</th>
<th>Enroll/Info</th>
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<tr>
<td>Weigh of Life</td>
<td>1-18</td>
<td>≥85th %ile</td>
<td>15-week behavior program, individual</td>
<td>No</td>
<td>Insurance/Self</td>
<td>Wallace Tower, Cy-Fair HC</td>
<td>M-F, 8a-5p</td>
<td>EPIC*(&quot;AMB referral to childhood Obesity&quot;)/832-822-3065</td>
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<td></td>
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<tr>
<td>Healthy Weight and Your Child</td>
<td>7-13</td>
<td>≥95th %ile</td>
<td>4-month program through YMCA (2x/wk x 10wks + 1x/wk x 5wks)</td>
<td>Yes</td>
<td>free</td>
<td>Houston Texans, West Orem, Vic Coppinger</td>
<td>M&amp;W T&amp;F T&amp;H TBD</td>
<td>Available in Spanish at <a href="mailto:healthy.kids@ymcahouston.org">healthy.kids@ymcahouston.org</a></td>
</tr>
<tr>
<td>Weight Watchers</td>
<td>≥13</td>
<td>Any</td>
<td>Group behavior modification program</td>
<td>Yes - requires physician approval</td>
<td>Self ($3-9/wk)</td>
<td>Multiple</td>
<td></td>
<td>For TCHP members, may be covered after case management supervision for at least 3 months (832-828-1197)</td>
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## Physical Activity Resources

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<tr>
<th>Name</th>
<th>Age</th>
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<th>Content</th>
<th>Referral required</th>
<th>Cost</th>
<th>Location</th>
<th>Days/Times</th>
<th>Enroll/Info</th>
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<td><strong>TCH Resources</strong></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Physical Assessment Clinic</td>
<td>6-18y</td>
<td>Any</td>
<td>Assessment of physical conditioning by a physical therapist</td>
<td>Yes</td>
<td>Insurance/Self</td>
<td>Wallace Tower</td>
<td>T, 1-4p</td>
<td>EPIC (PT-evaluate and treat, Main campus, Evaluate and Treat, and Plan of Care to include “Education/Home Exercise Program” and put “Brandon Achane” in Comments)</td>
</tr>
</tbody>
</table>

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11
## Non-TCH Resources

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>BMI</th>
<th>Content</th>
<th>Referral required</th>
<th>Cost</th>
<th>Location</th>
<th>Enroll/Info</th>
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</thead>
<tbody>
<tr>
<td>Houston Parks and Recreation</td>
<td>6-13y</td>
<td>Any</td>
<td>Multiple offerings of sport teams and fitness</td>
<td>No</td>
<td>Free</td>
<td>M-F, 3-6p</td>
<td><a href="http://www.houstontx.gov/parks/youthsports.html">http://www.houstontx.gov/parks/youthsports.html</a></td>
</tr>
<tr>
<td>Instructional Sports Play</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Marathon Kids Running Clubs</td>
<td>pre K-12 grade</td>
<td>Any</td>
<td>Running clubs at various schools running for 10-30 minutes</td>
<td>N/A</td>
<td>$15</td>
<td></td>
<td><a href="http://www.marathonkids.org">www.marathonkids.org</a></td>
</tr>
<tr>
<td>Greater Houston</td>
<td>3rd-8th grade</td>
<td>Any</td>
<td>Running clubs at various schools for 10 weeks each Fall/Spring</td>
<td>N/A</td>
<td>$30-155</td>
<td></td>
<td><a href="http://gotrgreaterhouston.org/">http://gotrgreaterhouston.org/</a></td>
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<tr>
<td>Neighborhood Centers Houston</td>
<td>Any</td>
<td>Any</td>
<td>Some offer nutrition and physical fitness classes</td>
<td>N/A</td>
<td>$150/family/yr</td>
<td></td>
<td><a href="http://www.neighborhood-centers.org/locations">http://www.neighborhood-centers.org/locations</a></td>
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<tr>
<td>YMCA</td>
<td>Any</td>
<td></td>
<td>Group and individual fitness options</td>
<td>N/A</td>
<td>varies</td>
<td>multiple</td>
<td><a href="https://www.ymcahouston.org">https://www.ymcahouston.org</a></td>
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<tr>
<td>Healthy children.org (AAP)</td>
<td>Any</td>
<td>Any</td>
<td>Online collection of articles on physical fitness for families</td>
<td>N/A</td>
<td>Free</td>
<td></td>
<td><a href="https://www.healthychildren.org/English/healthy-living/fitness/Pages/default.aspx">https://www.healthychildren.org/English/healthy-living/fitness/Pages/default.aspx</a></td>
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</tbody>
</table>

## Camps

<table>
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<th>Name</th>
<th>Age</th>
<th>BMI</th>
<th>Content</th>
<th>Referral required</th>
<th>Cost</th>
<th>Location</th>
<th>Enroll/Info</th>
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</thead>
<tbody>
<tr>
<td>Kamp K’aana</td>
<td>10-14</td>
<td>≥95th %ile</td>
<td>2-week overnight camp program</td>
<td>No</td>
<td>Self</td>
<td>University of Houston Stephen Power Farish Hall 3657 Cullen Blvd.</td>
<td><a href="https://www.ymcacampcullen.org/summer-camp/specialty-tracks">https://www.ymcacampcullen.org/summer-camp/specialty-tracks</a></td>
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<tr>
<td>BOUNCE</td>
<td>9-14</td>
<td></td>
<td>4-week summer programs with nutrition, exercise, and counseling</td>
<td>No</td>
<td>Up to $1000 - free for the 2017 summer</td>
<td>University of Houston Stephen Power Farish Hall 3657 Cullen Blvd.</td>
<td>Must be a resident of the Third Ward for the summer program <a href="http://www.uh.edu/education/bounce/">http://www.uh.edu/education/bounce/</a></td>
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## Nutrition Resources

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<th>Name</th>
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<th>Content</th>
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<th>Cost</th>
<th>Location</th>
<th>Days/Time</th>
<th>Enroll/Info</th>
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<tr>
<td>Healthy Beginnings</td>
<td>8-12</td>
<td>≥85th %ile</td>
<td>6 weeks of 1 hour classes, 8-12 years</td>
<td>No</td>
<td>Self ($50)</td>
<td>West</td>
<td>Th 4:45-6p</td>
<td>832-227-1440</td>
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<tr>
<td>Program</td>
<td>Age</td>
<td>Clients</td>
<td>Description</td>
<td>Fee</td>
<td>Contact Information</td>
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<td>----------------------------------------------</td>
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<tr>
<td>Healthy Eating Group</td>
<td>6-17</td>
<td>≥ 85th %ile</td>
<td>1 hour group class with new topic every 3 months</td>
<td>Yes</td>
<td>Woodlands 1-3rd Th, 8:30-9:30 am 4th Th 1:30-2:30 pm 936-267-7699</td>
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<tr>
<td>Saturday Wellness Program</td>
<td>6-16</td>
<td>≥95th %ile</td>
<td>Family based, 4 wks of 3-hr nutrition &amp; activity.</td>
<td>Free</td>
<td>Different HCs 3 x/year Saturdays Spanish interpreter available at sessions</td>
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<tr>
<td>Keep Fit!</td>
<td>10-18</td>
<td>Any</td>
<td>Group classes with cooking demos, recipes, and exercises</td>
<td>No</td>
<td>The Center for Children and Women Sat Texas Children's Health Plan (TCHP) Members Only 832-828-1430</td>
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<tr>
<td>Cooking classes</td>
<td>Any</td>
<td>Any</td>
<td>Cooking demos</td>
<td>No</td>
<td>The Center for Children and Women Saturdays 1p English, 2p Spanish Texas Children's Health Plan (TCHP) Members Only 832-828-1430</td>
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<td>Non-TCH Resources</td>
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<td>ChopChop Cooking Club</td>
<td>Any</td>
<td>N/A</td>
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<td>No</td>
<td>Free <a href="http://www.chopchopcookingclub.org">http://www.chopchopcookingclub.org</a></td>
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<td>ChooseMyPlate.gov</td>
<td>Any</td>
<td>N/A</td>
<td>Online nutrition and physical activity facts</td>
<td>No</td>
<td>Free <a href="http://www.choosemyplate.gov">www.choosemyplate.gov</a></td>
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<td>Cooking with Heart for Kids (American Heart</td>
<td>Any</td>
<td>N/A</td>
<td>Online videos and recipes for kids to cook</td>
<td>No</td>
<td>Free <a href="https://recipes.heart.org/Articles/1033/Simple-Cooking-for-Kids">https://recipes.heart.org/Articles/1033/Simple-Cooking-for-Kids</a></td>
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<td>Association</td>
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<td></td>
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<td>What's Cooking? (USDA)</td>
<td>Any</td>
<td>N/A</td>
<td>Online recipes with filters for type and cost</td>
<td>No</td>
<td>Free <a href="https://whatscooking.fns.usda.gov/search/recipes">https://whatscooking.fns.usda.gov/search/recipes</a></td>
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<td>HealthyChildren.org (American Academy of</td>
<td>Any</td>
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<td>Online articles on nutrition</td>
<td>No</td>
<td>Free <a href="https://www.healthychildren.org/English/healthy-living/nutrition/Pages/default.aspx">https://www.healthychildren.org/English/healthy-living/nutrition/Pages/default.aspx</a></td>
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<td>Pediatrics)</td>
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<tr>
<td>SWAY nutrition videos (Stanford University)</td>
<td>Any</td>
<td>N/A</td>
<td>Online nutrition video series</td>
<td>No</td>
<td>Free <a href="https://www.youtube.com/playlist?list=PL61Cx01GKzUmt2vr3PkJQAix-1N_JP_R">https://www.youtube.com/playlist?list=PL61Cx01GKzUmt2vr3PkJQAix-1N_JP_R</a></td>
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References


Clinical Standards Preparation
This clinical standard was prepared by the Evidence-Based Outcomes Center (EBOC) team in collaboration with content experts at Texas Children's Hospital. Development of this clinical standard supports the TCH Quality and Patient Safety Program initiative to promote clinical standards and outcomes that build a culture of quality and safety within the organization.

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Anne Dykes, MSN, RN, Assistant Director
Kathy Carberry, MPH, RN, Director

No relevant financial or intellectual conflicts to report.

Development Process
This clinical standard was developed using the process outlined in the EBOC Manual. The literature appraisal documents the following steps:

1. Review Preparation
   - PICO questions established
   - Evidence search confirmed with content experts

2. Review of Existing External Guidelines
   - Recommendations on The Assessment, Prevention, And Treatment Of Child And Adolescent Overweight And Obesity; Recommendations for Prevention of Childhood Obesity; Obesity Evaluation and Treatment; CDC Growth Charts; Pediatric Obesity- Assessment, Treatment, and Prevention; Obesity: Identification, Assessment and Management; Clinical Practice Guideline for the Prevention and Treatment of Childhood and Juvenile Obesity; Screening for Obesity & Intervention for Weight Management in Children and Adolescents

3. Literature Review of Relevant Evidence
   - Searched: PubMed, Cochrane, CINAHL

4. Critically Analyze the Evidence
   - 15 systematic reviews/meta-analyses, 28 randomized controlled trials, and 15 nonrandomized studies

5. Summarize the Evidence
   - Materials used in the development of the clinical standard, literature appraisal, and any order sets are maintained in a Management of Overweight and Obese Children evidence-based review manual within EBOC.

Evaluating the Quality of the Evidence
Published clinical guidelines were evaluated for this review using the AGREE II criteria. The summary of these guidelines are included in the literature appraisal. AGREE II criteria evaluate Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity and Presentation, Applicability, and Editorial Independence using a 4-point Likert scale. The higher the score, the more comprehensive the guideline.

This clinical standard specifically summarizes the evidence in support of or against specific interventions and identifies where evidence is lacking/inconclusive. The following categories describe how research findings provide support for treatment interventions.

“Evidence Supports” provides evidence to support an intervention
“Evidence Against” provides evidence against an intervention.
“Evidence Lacking/Inconclusive” indicates there is insufficient evidence to support or refute an intervention and no conclusion can be drawn from the evidence.

The GRADE criteria were utilized to evaluate the body of evidence used to make practice recommendations. The table below defines how the quality of the evidence is rated and how a strong versus weak recommendation is established. The literature appraisal reflects the critical points of evidence.

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Quality</th>
<th>Type of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRONG</td>
<td>Desireable effects clearly outweigh undesirable effects or vice versa</td>
<td></td>
</tr>
<tr>
<td>WEAK</td>
<td>Desireable effects closely balanced with undesirable effects</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Evidence from RCTs with important limitations (e.g., inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Evidence for at least 1 critical outcome from observational studies, RCTs with serious flaws or indirect evidence</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>Evidence for at least 1 critical outcome from unsystematic clinical observations or very indirect evidence</td>
<td></td>
</tr>
</tbody>
</table>

Recommendations
Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible. The Content Expert Team and EBOC team remain aware of the controversies in the management of overweight and obese in children. When evidence is lacking, options in care are provided in the clinical standard and the accompanying order sets (if applicable).

Approval Process
Clinical standards are reviewed and approved by hospital committees as deemed appropriate for its intended use. Clinical standards are reviewed as necessary within EBOC at Texas Children's Hospital. Content Expert Teams are involved with every review and update.

Disclaimer
Practice recommendations are based upon the evidence available at the time the clinical standard was developed. Clinical standards (guidelines, summaries, or pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his or her independent judgment in the management of any specific patient and is responsible, in consultation with the patient and/or the patient’s family, to make the ultimate judgment regarding care.

Version History
<table>
<thead>
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<th>Date</th>
<th>Comments</th>
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