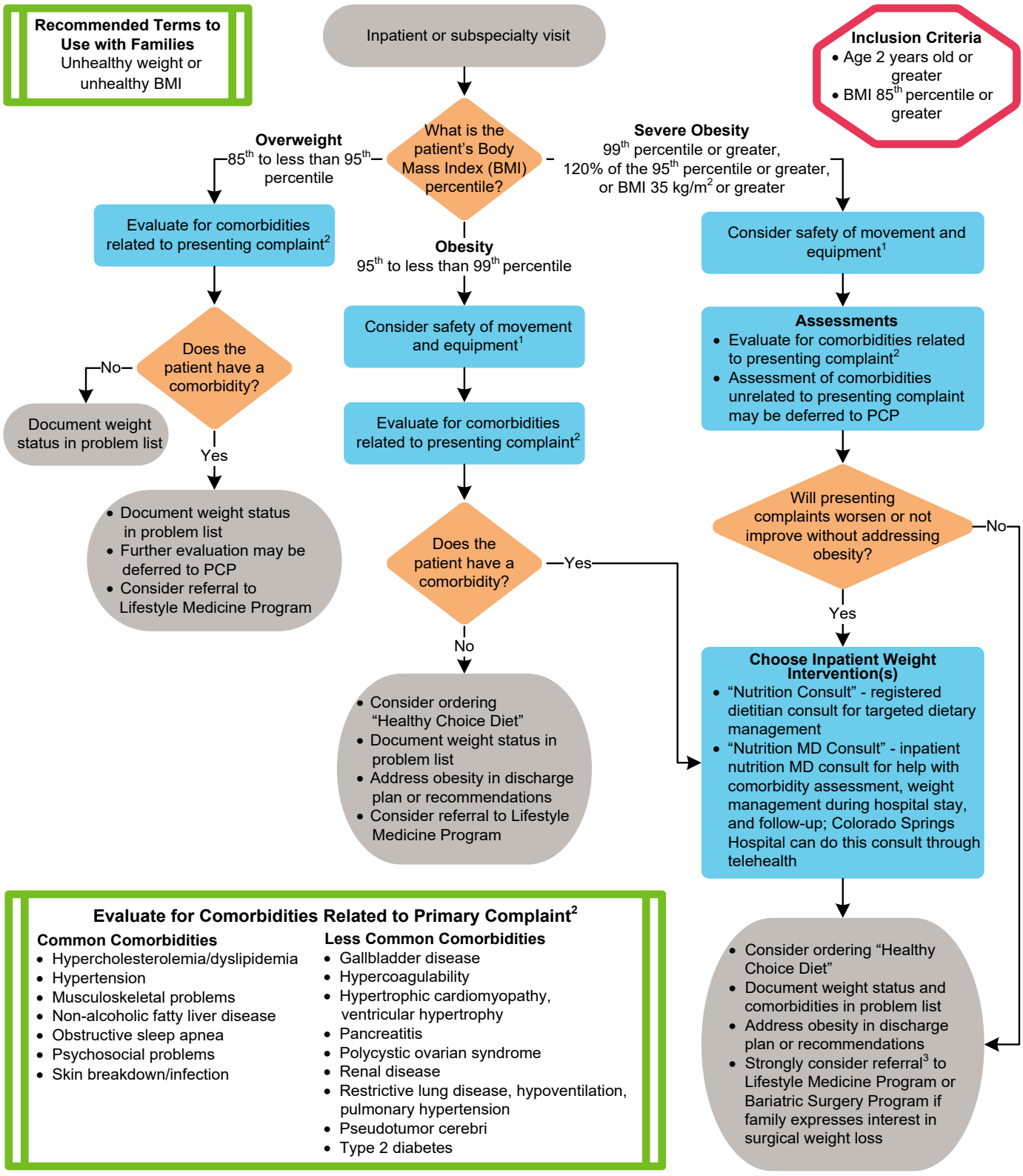
PEDIATRIC OVERWEIGHT AND OBESITY MANAGEMENT

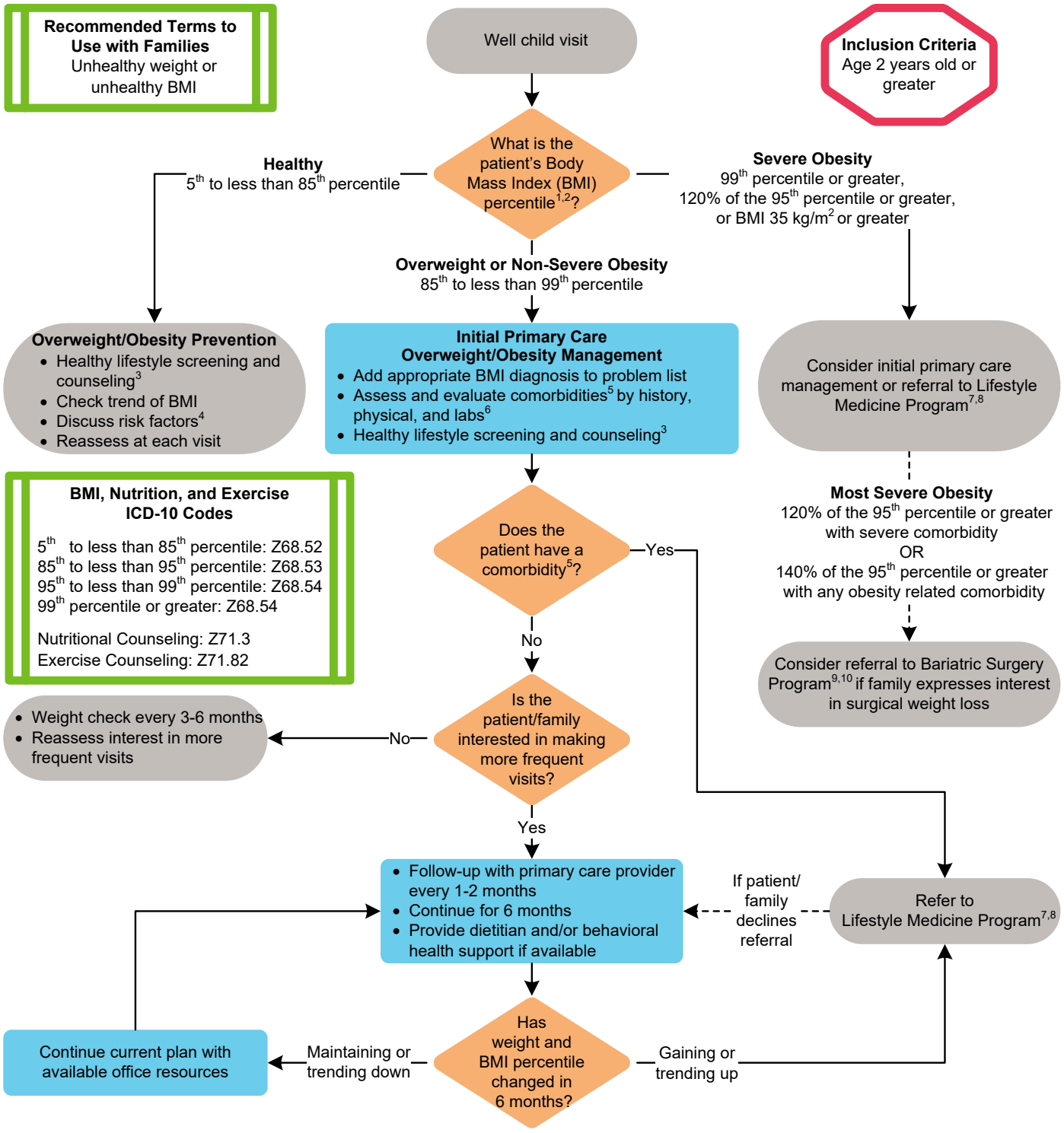
ALGORITHM 1. Overweight and Obesity Management for Inpatient and Subspecialty Care



Quick Links:

1 Specialized Equipment 2 Comorbidities 3 Consultations/Referrals

ALGORITHM 2. Overweight and Obesity Prevention and Management for Primary Care



Quick Links:

1 Body Mass Index (BMI) Percentile Calculator
2 Extended Body Mass Index (BMI) Growth Charts
3 Healthy Lifestyle Screening and Counseling:
Visit Outline for Healthy Child Weight
Healthy Lifestyle Questions: English, Spanish
Adolescent Healthy Lifestyle Questions
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TARGET POPULATION

Inclusion Criteria

- Age 2 years old or greater
- Body mass index (BMI) 85th percentile or greater

Weight Status Definitions

Weight Status	Body Mass Index (BMI)
Overweight	85th to less than 95th percentile
Obesity	95th percentile or greater
Severe obesity	99th percentile or greater OR 120% of the 95th percentile or greater OR 35 kg/m^2 or greater

BMI as a percentage of the 95th percentile is measured in EPIC on the Figure 1. Extended BMI Female/Male Growth Charts

BACKGROUND

Key considerations that will alter therapeutic or safety approach to a patient with obesity

- Appropriate equipment size/capacity

- Medication dosing
- Genetic conditions
- Behavioral concerns and cognitive ability
- Intervening for psychosocial needs/concerns
- Communicating and acting in a non-stigmatizing way
- Family centered care
- Selecting appropriate nutrition support

INITIAL EVALUATION I CLINICAL ASSESSMENT

Comorbidities

Strongly consider assessing comorbidities that may affect the patient's inpatient course. The remainder may be deferred to outpatient assessment.

Common comorbidities include:

- Hypercholesterolemia/dyslipidemia
- Hypertension
- Musculoskeletal problems
- Non-alcoholic fatty liver disease (NAFLD)
- Obstructive sleep apnea (OSA)
- Psychosocial problems
- Skin breakdown/infection

Less common comorbidities include:

- Gallbladder disease
- Hypercoagulability
- Hypertrophic cardiomyopathy or ventricular hypertrophy
- Pancreatitis
- Polycystic ovarian syndrome (PCOS)
- Renal disease
- Restrictive lung disease, hypoventilation, pulmonary hypertension
- Pseudotumor cerebri
- Type 2 diabetes

History

- Family history: early myocardial infarction (age less than 55 in women, less than 60 in men), Type 2 diabetes mellitus, severe obesity
- Sleep: patient history of obstructive sleep apnea (OSA), need for durable medical equipment (DME) such as supplemental oxygen, CPAP, bi-level PAP, etc.

Physical Assessment

- Neurological: if history of recurrent headaches, visualize optic discs as part of assessment for pseudotumor cerebri; consider neuro-ophthalmology consult
- Abdomen: consider limitations of exam for acute abdominal concerns due to size
- Respiratory: habitus may impair ability to detect signs of respiratory distress and limit auscultation; consider placement of pulse oximetry to improve detection of respiratory compromise; abdominal and chest wall mass may cause restrictive lung disease (see labs and imaging section for further evaluation)
- Cardiovascular: deep vein thrombosis risk assessment; edema; blood pressure cuff must be accurate size/placement (see Figure 2: Obtaining an Accurate Blood Pressure)

Skin Assessment

- Obesity increases risk for skin breakdown and decreased healing
- Evaluate skin folds for rashes and lesions
- Request a skin/wound nurse consult in EPIC if breakdown noted
- Intertrigo, which is an inflammatory condition of skin folds (i.e. axilla, perineum, inframammary creases, and abdominal folds)
  - Use antifungal powder if necessary
  - Presence of fissures at base of creases
  - Consider using non-sterile, soft material to keep skin folds separated (ensure product extends beyond folds to ensure visibility) (i.e. Mepilex® Lite)
- Incontinence associated dermatitis (IAD)
  - Use skin sealants and/or barrier creams as needed

Airway Assessment

- Assessment of the airway, including Mallampati grade, overbite/under bite, retrognathia/micrognathia, tonsil size, and nasal patency is critical to anticipate difficulties with mask ventilation, tracheal intubation, and obstructive sleep apnea (OSA)
- Mallampati grade 3 or 4 airway classification predicts difficult intubation

LABORATORY STUDIES I IMAGING

- The following lab tests are *NOT* routinely recommended during the admission unless deemed necessary; these tests may be deferred to the outpatient setting at the discretion of the PCP
  - Lab tests (for patients greater than 10 years of age):
    - Fasting: Lipid panel, ALT, hemoglobin A1c
    - Complete blood count (CBC)
    - Thyroid stimulating hormone (only with positive family history or faltering of linear growth compared to expected trend)
- Assessments of respiratory status: consider arterial blood gasses (ABGs) more reliable but capillary or venous blood gas analysis are accepted alternatives to painful ABGs to assess hypoventilation; serum bicarbonate level to assist evaluation of chronic hypoventilation
- Chest x-ray/EKG/Echo to assess for right ventricular hypertrophy
- Order sleep study if positive review of symptoms
  - Polysomnogram

- Radiology: Radiologic evaluation can pose technical difficulties and obesity may impact image quality. The limitations of Children's Hospital Colorado equipment are below. If a patient exceeds these specifications, they may be referred to an Open MRI location.
  - CT
    - Weight maximum: 499 lbs
    - Diameter maximum: 78 cm
  - MRI
    - Weight maximum: 550 lbs
    - Diameter maximum: 70 cm
  - Fluoroscope
    - Anschutz: 19.3" clearance between the table top and image intensifier
    - Colorado Springs: 21.5" clearance between the table top and image intensifier

RESPIRATORY CONSIDERATIONS

Airway Management

- **Preoxygenation** is extremely important as obese children desaturate more quickly (decreased functional residual capacity and increased oxygen consumption)
- Bag-valve-mask ventilation can be more difficult due to:
  - reduced pulmonary compliance
  - increased chest wall resistance
  - increased airway resistance
  - abnormal diaphragmatic position
  - increased upper airway resistance
- **"Ramped" position** prior to direct laryngoscopy
- Stack blankets behind the patient's back to provide elevation of the head, upper body and shoulders significantly above the chest
- Imaginary horizontal line should connect the patient's sternal notch with the external auditory meatus
- Similar positioning can be accomplished using a commercially available elevation pillow
- Controlled ventilation via a tracheal tube is the best way to protect the airway and provide adequate ventilation. Addition of moderate levels of Positive End Expiratory Pressure (PEEP)/Positive Airway Pressure (PAP) (5 to 10cm H_2O) can be used to optimize oxygenation
- Laryngeal mask airway (LMA) or an intubating LMA with failed oral intubation

Obstructive Sleep Apnea (OSA)

- Obesity is risk factor for OSA in children
- Obesity increases risk of persistent OSA despite adenotonsillectomy
- History of snoring, daytime sleepiness, gasp/gag/ need to shake to make breathe are history questions likely to lead to OSA diagnosis
- Down syndrome and those with craniofacial abnormalities are at particularly increased risk of OSA
- Patients with a history of OSA should be advised to bring their own CPAP or NIPPV for elective procedures

- In the absence of clear data, especially at higher altitude (approximately 5,000 feet or higher), providers may consider Echocardiogram in children with a BMI greater than 99th percentile or BMI greater than or equal to 40kg/m^2 or weight greater than or equal to 260 lbs (118 kg) *AND* one of the following:
  - Sleep study data showing any one of the following:
    - OSA and hypoxemia: Apnea hypopnea index (AHI) greater than 5/hour AND oxygen saturations lower than 90% for more than 5-10% total sleep time

      OR
    - Moderate or severe OSA: AHI greater than 10-15/hour regardless of oxygen saturations

      OR
    - Hypoventilation: End tidal or transcutaneous measurement of CO_2 greater than 50mmHg for greater than 25% of sleep time

Postoperative Airway Care

- Children with OSA have a diminished ventilatory response to CO_2 stimulation. Sedatives and anesthetic medications alter the CO_2 response curve, making OSA patients at higher risk of sedation and anesthesia-induced respiratory complications. CO_2 should be monitored non-invasively if medications that depress respiratory drive (such as sedative or painkillers) are administered
- Recurrent hypoxemia in children with OSA predisposes them to increased analgesic sensitivity to opiates, often requiring half the dose
- Pediatric patients with OSA are at increased risk for postoperative complications depending on their age, severity of OSA and comorbidities. Children less than 3 years of age have twice the risk of children who are 3 to 6 years of age. Complications include:
  - oxygen desaturation to less than 90%
  - increased work of breathing
  - changes on chest radiograph (CXR) (e.g. edema, atelectasis, infiltrate)
  - pulmonary edema, pulmonary hypertensive crisis, pneumonia and perioperative death
- Postoperatively, for children with OSA:
  - Position: Place in non-supine position (if possible) when recovering
  - Positive Airway Pressure: Consider CPAP or NIPPV with severe airway obstruction or hypoxemia during postoperative monitoring
  - Supplemental Oxygen: CPAP or NIPPV with/without supplemental oxygen should be used when feasible, unless contraindicated by the surgical procedure
  - Administer supplemental oxygen until able to maintain baseline oxygen saturation with room air
    - Continuous pulse oximetry monitoring as long as patient is at risk
    - Monitoring of CO_2 (typically transcutaneous CO_2 or capillary/venous blood gas) should be considered as supplemental oxygen blunts the hypoxemic ventilatory response
    - CPAP is the preferred modality to overcome upper airway obstruction
  - Patients with obesity hypoventilation syndrome (OHS) should be admitted overnight post operatively. Most should be extubated to CPAP in the OR

THROMBOSIS CONSIDERATIONS

- Patients with severe obesity may be at increased risk for venous thromboembolism (VTE)
- For patients with severe obesity *and mobility decreased from baseline*, consider consulting Hematology for recommendations regarding VTE prophylaxis, particularly if they have an indwelling central catheter (PICC,

Broviac, Mediport, etc.), a flare of autoimmune disease associated with increased risk of VTE (e.g. SLE, IBD), personal or family history of clot, or acute infection (systemic or severe localized)

BEHAVIORAL HEALTH CONSIDERATIONS

Compared to children and adolescents with healthy weight, patients with obesity are at risk for lower self-esteem, impaired quality of life, and psychological disorders, including depression, anxiety, disruptive behavior disorders, and disordered eating behaviors.

Weight stigma (the devaluation of individuals with overweight or obesity) has been identified as a prevalent problem among interactions with peers, family members, educators, and health care professionals from all disciplines.

Assessment

- Screen for mental health / behavioral concerns; consult for additional psychological assessment and referral for therapy:
  - Depressive and anxious symptoms (CES-D/PHQ-9)
  - Binge eating and loss of control behaviors (ADO-BED)
- Role model non-biased language and behavior:
  - Use people-first language during discussions on weight ("patients with obesity" not "obese patient")
  - Acknowledge the complex, multiple components that contribute to obesity beyond simply the patient's behavioral choices (e.g., genetics, physical environment, social environment)
  - Use neutral words, including "weight", "body mass index" instead of "weight problem", "fat", and "extremely obese"
  - Motivation to change is enhanced when positive behaviors (replacement behaviors) are focused on (e.g., going outside to play or tasting vegetables) instead of what *not* to do (stop eating junk food)
  - Reward the completion of healthy behaviors; avoid goals that only target the reduction of weight without a behavioral mechanism

Intervention

- Refer patients with positive screening to outpatient-based psychological assessment and treatment for comorbid symptoms of depression, anxiety, disruptive behaviors, and disordered eating behaviors.
- Considerations for Behavioral Clinical Intervention:
  - Create a daily routine for self-care, meals, appropriate physical activity, play, sleep and wake times, and limits for screen use. Post the schedule in the room. Provide reminders and daily praise for the completion of tasks.
  - Tracking or self-monitoring daily behaviors related to goals for improved diet and activity are key to develop in either inpatient or outpatient settings.
  - Setting clear goals with rewards for success is recommended for all patients.
  - Caregivers of typically developing younger children (10 years and younger) will need to be more involved with goal setting and management of feeding practices. Children with obesity often do not have the independent ability to appropriately self-select the type, amount, or timing of food. Oversight of meals during hospitalization and a monitoring plan upon discharge is recommended. Older children can be given more autonomy in the process but still require oversight to prevent poor eating behaviors.
  - Caregivers should be encouraged to eat with children and to model healthy eating practices, including eating a variety of nutritious foods aligned with dietitian recommendations.
  - Problematic eating behaviors, including picky eating and food sneaking are common for younger children and associated with overweight and obesity. Repeated food exposure and planned meals with reinforcement for success (e.g., tasting vegetables, asking for permission to eat versus sneaking) are recommended.

Special Considerations:

- Children with developmental disorders: children with developmental disabilities, including intellectual disabilities and autism spectrum disorder have as high or higher prevalence of obesity compared to typically developing peers
- Children exhibiting hyperphagia: establishing food security requires two concurrent steps:
  - Create certainty on when the next meal and snack are served (set a reliable food schedule); no second servings, no family style servings, use smaller plates
  - Provide no chance to obtain unauthorized food (eliminate access to food and lock doors containing food). Food access creates hope for food which can create food anxiety. Food anxiety predicts problematic food seeking behaviors.

THERAPEUTICS

Definitions

Name (Abbreviation)	Definition	Calculation
Ideal body weight (IBW)	Ideal body weight, reflective of lean body mass in children (age 2-20)	(50% BMI for age) x (height [m])^2
Total body weight (TBW)	Total body weight, reflective of actual body mass in children	Actual patient weight
Adjusted body weight (AjBW)	Adjusted body weight, reflective of lean body mass plus a proportion of excess mass determined by a cofactor	IBW + pre-specified cofactor (TBW – IBW)

Medication Considerations

- Children with obesity are at risk for both over- and under-dosing of medications.
- Obesity results in physiologic alterations that will affect pharmacokinetic parameters (see Table 1). These alterations may affect loading dose, dosage interval, plasma half-life, and time to reach steady-state concentration for various medications. Longer IV and IM catheter trocars may be required to deliver the medication. Subcutaneous and transcutaneous locations may be less well perfused.
- The provider, in collaboration with the pharmacist, should adjust medication doses using the best dosing scalar for each individual medication. The decision on which weight scalar to use is based on the lipophilic and hydrophilic properties of an individual medication and the site of drug metabolism/elimination.
- Weight-based dosing [e.g., total (TBW), adjusted (ABW), ideal (IBW)] should be used in patients less than 18 years old who are less than 40 kg.
- For children who are 40 kg or greater, weight-based dosing should be used, unless the patient's dose or dose per day exceeds the recommended adult dose for the specific indication. Doses should not exceed the maximal adult dosing except where therapeutic monitoring guides dosing.
- In general, the *loading dose* of a given medication is affected by distribution while the *maintenance dose and dosing interval* is affected by metabolism and elimination.
- Dosing guidance should be drawn from pediatric studies of that specific medication or class, but when no pediatric studies are available, then evidence from adults with obesity may be used.
- CHCO drug formulary contains links to obesity dosing and there is an index with commonly prescribed medications and the recommended dosing scalar to use. When published evidence is not available regarding dosing, a decision support tool (Figure 1, p.545) may be helpful. This tool integrates drug properties with therapeutic index and risk of over/undertreating and then proposes the best weight scalar to use for dosing.

Table 1. Expected physiologic changes in patients with obesity and suggested impact on pharmacokinetics

Factor	Expected Change with Obesity	Pharmacokinetic Parameter Influenced	Comment and Implications for Dosing
Weight **Fat mass** **Lean body mass** **Lean to fat mass ratio**	 Increased Increased Decreased	Volume of Distribution (Vd)	In general, 75% of excess weight is fat mass and the remainder is lean mass Hydrophilic drugs may exhibit a modest increase in Vd whereas lipophilic drugs will generally exhibit a larger increase in Vd (except for drugs with high (greater than 90%) protein binding) • Loading doses of hydrophilic drugs should be based on IBW • Loading doses of medications that partially distribute in fat tissue should be based on ABW • Loading doses of lipophilic drugs should be based on TBW (options for serial mini-loads may be appropriate in certain situations) • Ideal body weight should be used for maintenance doses because it is most closely related to lean body mass
Cardiovascular **Cardiac output** **Blood volume** **Plasma proteins** **Plasma lipids**	 Increased Increased Inconclusive Increased	Volume of Distribution (Vd)	Generally, NOT clinically significant and no change in drug dosing is indicated
Gastrointestinal **Emptying** **Blood flow** **Permeability**	 Increased Increased Increased	Oral absorption	Generally, NOT clinically significant and no change in drug dosing is indicated
Hepatic Function **CYP enzyme activity** **Phase II metabolism** **Hepatic blood flow**	 Variable Increased Increased	$CL_{hepatic}$	Increased clearance through CYP2E1, 2C9, 2C19, and 2D6 Reduced clearance through CYP3A4 Metabolism is increased through UGT, xanthene oxidase, and n-acetyltransferase
Renal Function **Kidney size** **GFR** **Tubular secretion** **Tubular reabsorption** **Renal blood flow**	 Increased Variable Increased Variable Increased	CL_{Renal}	Patients may require more frequent dosing of renally eliminated medications to attain therapeutic concentrations

Pharmacology post Bariatric Surgery

Important physiologic changes occur following bariatric surgery. The most acute change is the functional surface of the gastrointestinal tract. Oral absorption (and bioavailability) of medications can be dramatically affected. The majority of medications are absorbed in the proximal small intestine - and this is bypassed with surgery. In addition, gastric emptying, lower mucosal exposure and changes in GI pH will impair drug absorption. Lastly, intestinal CYP450 enzymes and intestinal efflux transporters are affected. Please consult with your pharmacist regarding drug therapy

following bariatric surgery. Patients status post roux-en-Y gastric bypass or sleeve gastrectomy require lifelong supplementation in addition to dietary intake to avoid deficiency of vitamins and micronutrients including iron, zinc, vitamin D, folate, and vitamin B12. Adherence to supplementation recommendation among adolescents post-bariatric surgery has been documented to be very low, so clinical suspicion for deficiencies should be high in this group.

CONSULTATIONS OR REFERRALS FOR EVALUATION AND TREATMENT

Lifestyle Medicine

- All inpatients with BMI 99th percentile or greater OR 95th percentile or greater with at least one comorbidity will be assessed by a dietitian (see the Nutrition: Obese Patients: Interventions Based on Screening policy for additional information).
- The medical team should order a nutrition medical provider consult if the patient's obesity contributes directly to the admitting diagnosis and is likely to complicate treatment outcome without weight loss. Examples of severe conditions comorbid with obesity that can lead to hospitalization include but are not limited to: respiratory failure, pulmonary hypertension, restrictive lung disease associated with obstructive sleep apnea, hypertensive emergency, type 2 diabetes, and orthopedic conditions affecting the knee (Blounts Disease) or hip (SCFE).
    - **Colorado Springs Hospital**: Consider a GI consult if Nutrition MD telehealth consult is unavailable.
- The nutrition medical provider may consider more intensive intervention options such as indirect calorimetry, calorie-controlled diet plan or low carb-high protein diet, or entrance to the bariatric surgery program if appropriate.

Bariatric Surgery

Children and adolescents should be considered for weight loss surgery:

1. BMI 140th percentile or greater on the BMI growth chart (or BMI 40 kg/m^2 or greater) with less severe obesity related health conditions such as hypertension, dyslipidemia, musculoskeletal abnormalities, or decreased quality of life

OR

2. BMI 120th percentile or greater on the BMI growth chart (or BMI 35 kg/m^2 or greater) with major obesity related diseases such as type 2 diabetes, severe obstructive sleep apnea, or biopsy proven non-alcoholic fatty liver disease

Genetic disorders, cognitive disabilities, a history of mental illness or eating disorders that are treated, immature bone growth or pubertal development should NOT be considered contraindications for weight loss surgery.

Reference the Bariatric Surgery Inpatient clinical pathway for care of bariatric patients from day of surgery until discharge.

Consider consultations based on findings:

- Anesthesia
- Cardiology
- Endocrinology
- Gastroenterology
- Hematology
- Orthopedics
- Physical therapy
- Psychiatry/Pediatric Psychology
- Pulmonary

- Education
- Child Life (Quality of Life)
- Skin/wound nurse

SPECIALIZED EQUIPMENT

When caring for an overweight or obese patient it is important to ensure their safety and comfort with equipment utilized in their care. Oversight of these things can lead to unsafe and uncomfortable situations for patients and caregivers. On admission, the bedside nurse will be prompted to select the appropriate room/bed via an Epic alert based on the patient's BMI. This alert shall also serve as a reminder to obtain appropriate sized gowns, booties, clothing, incontinence supplies, etc. to provide for the patient.

- Monitoring and safety devices: blood pressure cuffs with extended widths and lengths are necessary for accurate assessment of blood pressure (see Figure 2: Obtaining an Accurate Blood Pressure). Appropriately sized sequential compression devices are also imperative to have on hand. Due to obstructive sleep apnea association with obesity, continuous positive airway pressure devices (CPAP) or bilevel positive airway pressure devices (BIPAP) should also be available.
- In emergency situations, the CODE cart contains (Standard Code Cart Contents List) longer length (1.88inch) angiocatheters and adult sized masks and bag ventilation rescue equipment. In a CODE event response, the CODE team will also bring adult sized Laryngeal Mask Airways on the stretcher. All Zoll defibrillators are biphasic defibrillators, which are recommended for use in overweight and obese patients.
- Beds: most regular hospital beds accommodate patients up to 200kg (440lb), they can however be too narrow for comfort and accessibility to side rail buttons. A Bariatric bed is wider and offers more support by providing a larger surface area for the patient who is obese to fit more comfortably. Mattresses should be of the low air loss variety to avoid having patients sinking into the bed, this will also assist in the patient's ability to get out of bed and decrease the risk of skin breakdown. Patients who weight greater than 227kg (500lb) and/or have a wide physical girth should be in a Bariatric bed (Size Wise/Hill-rom). Bariatric specific beds and equipment can be ordered by the Bed Transport Request in Epic. There are a limited number of bariatric beds in the hospital, if needed one can be rented by notifying both the Sterile Processing Department x76570.
  - Please reference the Clinical Policy for Specialty Bed Mattresses and Surfaces. Some mattresses at CHCO have weight maximums please reference the policy (Specialty Bed Mattresses and Surfaces).
  - **Colorado Springs Hospital**: All bariatric beds must be rented. One can be rented by contacting the Sterile Processing Department at x5-6690.
- Wheelchairs, Chairs & Stretchers: Bariatric wheelchairs and stretchers are available through the patient transport department. When requesting transport ensure that a request is specific to accommodate for size and weight of the patient. Stretchers have a 318kg (700lb) weight limit. Most pediatric wheelchairs have a weight limit of 114kg (250lb) whereas a bariatric wheelchair can support up to 227kg (500lb).
  - **Colorado Springs Hospital**: All bariatric wheelchairs, chairs, and stretchers must be rented. They can be rented by contacting the Sterile Processing Department at x5-6690.
- Toilets: Floor-mounted toilets help to prevent patient falls and able to support up to 453kg (1000lb) while wall-mounted commodes regularly have a 114kg (250lb) weight limit. A bedside commode accommodates 170kg (375lb). Bedside commodes are ordered by individual departments to meet patient census needs.
  - **Colorado Springs Hospital**: Floor-mounted toilets accommodate up to 453kg (1000lb) while wall mounted toilets accommodate 227kg (500lb).
- Showers: Handheld nozzles assist with ease in bating, ensure long enough hose length to accommodate size. Shower benches that are wall-mounted are able to accommodate 180kg (400lb).
  - **Colorado Springs Hospital**: Does NOT have handheld nozzles. Wall mounted shower benches to assist with bathing can accommodate up to 114kg (250lb).
- Patient Lifts: Ceiling mounted standard lifts are typically able to accommodate up to 273kg (600lb). Use of proper lifting equipment protects staff from injury and improves safety for patients.

- **Colorado Springs Hospital**: Ceiling mounted standard lifts are typically able to accommodate up to 350kg (770lb).

- Walkers: can support up to 341kg (750lb), these can be ordered from Sterile Processing x76570.
  - **Colorado Springs Hospital**: Bariatric walkers must be rented. They can be rented by contacting the Sterile Processing Department at x5-6690.

Pay particular attention when ordering radiologic exams. The patient's girth and weight may influence the type of study available within the facility. Additionally, due to the density of the body, there may be technical difficulty with the quality of the image obtained.

- See equipment specifications in the labs and imaging section.

STAFF TRAINING AND EDUCATION

- Role model non-biased language and behavior
- Lifting – Staff should be trained on appropriate body mechanics and lifting to avoid injury. Staff operating ceiling lifts require additional training.
  - Use manual and ceiling lifts when available
  - Know the weight limitations of the lift
  - Never lift alone
- Healthy Diet – The "Healthy Choice Menu" may be offered to any patient and ordered in EPIC. It is suggested to be presented as an option for patients with obesity. This menu contains a subset of CHCO menu items that are lower in fat and sugar, highlighting fruits, vegetables, whole grains, and lean protein choices.

PARENT | PATIENT EDUCATION

- Education on association of comorbidities with obesity
- Nutrition consult is automatic for patients with BMI 99th percentile or greater OR 95th percentile or greater with at least one comorbidity (see the Nutrition: Obese Patients: Interventions Based on Screening policy for additional information)
- Educational handouts (In Care of Kids and MD Consult)

PARENT | CAREGIVER EDUCATION MATERIALS

English	Spanish
Healthy Feeding for Your Child: Ages 2-3 Ages 4-5 Ages 6-11 Age 12 and Up	Healthy Feeding for Your Child: Ages 2-3 Ages 4-5 Ages 6-11 Age 12 and Up
How to Avoid Portion Size Pitfalls	How to Avoid Portion Size Pitfalls
Eat More, Weigh Less: How to Manage Your Weight Without Being Hungry	Eat More, Weigh Less: How to Manage Your Weight Without Being Hungry
When Being Overweight is a Health Problem	When Being Overweight is a Health Problem
Emotional Eating	Emotional Eating
Cholesterol	Cholesterol
Type 2 Diabetes: What Is It?	Type 2 Diabetes: What Is It?
Acanthosis Nigricans	Acanthosis Nigricans
Polycystic Ovarian Syndrome (PCOS)	Polycystic Ovarian Syndrome (PCOS)

PRIMARY CARE MANAGEMENT

Risk factors for obesity and cardiovascular disease

- Obesity, especially in parent(s)
- Hyperlipidemia in patient, parents, siblings, and/or grandparents
- Any of the following in patient, parents, siblings, and/or grandparents:
  - Type 2 diabetes
  - Hypertension
  - Cardiovascular disease/early deaths from heart disease:
    - Myocardial infarction less than 55 years old in women, less than 60 years old in men
    - Stroke less than 60 years old

Parental obesity has been found to be an independent risk factor for obesity in children. Parental obesity more than doubles the risk of adult obesity among both obese and non-obese children under 10 years of age. However, by adolescence, a child's obesity, rather than the parents' obesity, is the most important predictor of being obese as an adult. Obesity in childhood often continues into adulthood. Nearly 65 percent of obese adolescents will still be obese as adults, even if neither parent is obese.

Labs for obesity management: glucose, ALT, lipids

Indications for Obtaining Lab(s)

Indications for Obtaining Lab(s)	ALT	Fasting Glucose and/or HbA1c	Lipids
Age greater than or equal to 9 years old or Tanner 2+ AND BMI greater than or equal to the 95th percentile	x	x	x
Age 2-9 years old AND BMI greater than or equal to 99th percentile or greater than or equal to 120 percent of the 95th percentile	x		
Age 2-9 years old AND Family history of early coronary disease			x

Interpretation of Lab Results

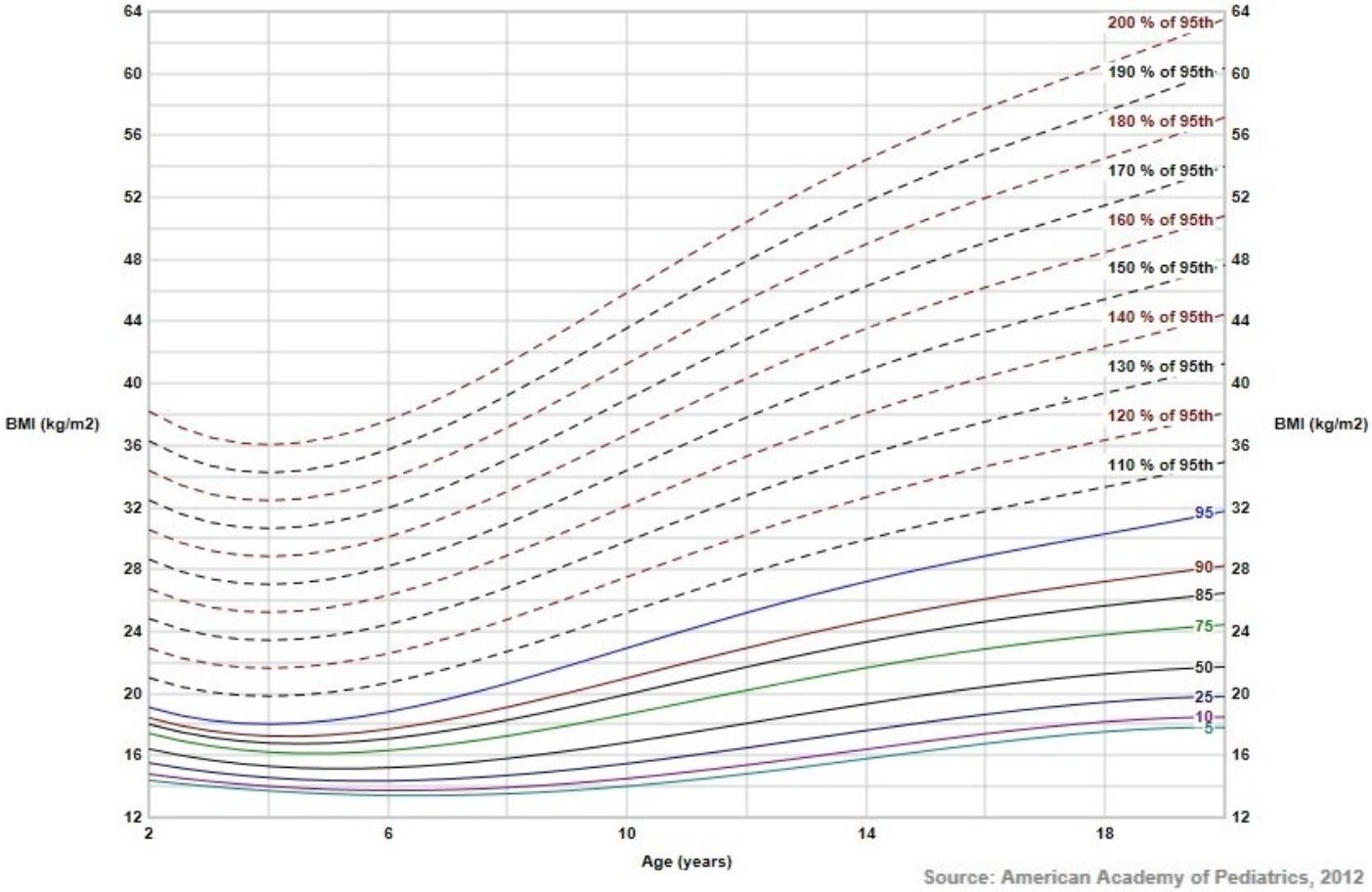
Lab	Indication	Results	Action
ALT	Order every 1-2 years to assess for non-alcoholic fatty liver disease (NAFLD)	**Normal** Boys: ALT less than or equal to 26 units/L Girls: ALT less than or equal to 22 units/L	Repeat in 1-2 years
		Abnormal Boys: ALT greater than 26 units/L Girls: ALT greater than 22 units/L	Refer to Lifestyle Medicine Program
		Severely Abnormal ALT greater than or equal to 80 units/L	Refer to Lifestyle Medicine Program AND Repeat within 12 weeks
Fasting Glucose and/or HbA1c	Order every 1-2 years to assess for diabetes	**Normal** Fasting glucose less than 100 mg/dL OR HbA1c less than 5.7%	Repeat in 1-2 years
		Pre-Diabetes Fasting glucose 100-124 mg/Dl OR HbA1c 5.7-6.4%	Refer to Lifestyle Medicine Program
		Diabetes Fasting glucose greater than 124 mg/dL OR HbA1c greater than 6.5%	Repeat urgently AND Call CHCO OneCall to page the Endocrinology MD on-call
Lipids	Order non-fasting or fasting lipids every year to assess for dyslipidemia	**Non-Fasting**	
		Normal Non-HDL less than or equal to 145 mg/dL OR TG less than or equal to 400 mg/dL	Repeat in 1 year AND Consider referral to Lifestyle Medicine Program if clinical concerns arise
		Abnormal Non-HDL greater than 145 mg/dL OR TG greater than 400 mg/dL	Order fasting lipids; see fasting results and actions below
		Fasting	
		Normal LDL less than or equal to 130 mg/dL OR TG less than or equal to 400 mg/dL	Repeat in 1 year AND Consider referral to Lifestyle Medicine Program if clinical concerns arise
		Abnormal LDL greater than 130 mg/dL OR TG greater than 400 mg/dL	Repeat fasting lipids in 2-4 weeks If 2nd fasting lipid sample is normal, repeat in 1 year If 2nd fasting lipid sample is abnormal, refer to Lifestyle Medicine Program AND If average of 2 LDL results is greater than 130 mg/dL, repeat in 6-12 months

Conditions Comorbid with Obesity

Condition	Note	Assessment
Respiratory		
Obstructive Sleep Apnea (OSA)	13-33% of all youth with obesity; risk of OSA increases with more severe obesity	Polysomnogram is indicated for children with obesity and snoring most nights. Additional symptoms are NOT required to proceed with sleep study. These include witnessed apnea, interrupted sleep, nocturnal enuresis, AM headaches, fatigue, poor school performance
Obesity Hypoventilation	Very severe obesity can infrequently cause restrictive lung disease and chronic hypercarbia. The drive to breathe may rely on hypoxemia instead of hypercarbia. Monitor closely for respiratory failure if patient shows respiratory distress and seek Emergency Care	Symptoms include dyspnea, edema, somnolence. Right heart failure can be ruled out by serum B-type Natriuretic Peptide and Echocardiogram. Evaluation for heart failure or pulmonary hypertension should occur in emergency or inpatient setting
Asthma	Obesity increases asthma severity. Asthma contributes to obesity if poorly controlled	PFTs may help to distinguish obesity-related deconditioning from asthma
Cardiovascular		
Hypertension	3 measures greater than 95th percentile on NHLBI tables for age, sex, and height	Use cuff wide enough to cover 75% of upper arm length. Consider ambulatory BP monitoring, available to order from CHCO or through Lifestyle Medicine referral, if elevated BP readings are inconsistent or borderline
Lipid Abnormalities	See Lab Results Table	Lifestyle Medicine lipid specialists follow risk-stratified NHLBI guidelines for prescription of statins for severe hyperlipidemia above 8 years and fenofibrates for severe hypertriglyceridemia
Gastrointestinal		
Non Alcoholic Fatty Liver Disease (NAFLD)	Affects 8-35% of youth with obesity. May progress to fibrosis, cirrhosis, and liver failure in adulthood	NASPGHN cutoffs for elevated ALT: Boys greater 26 Girls greater than 22 Typically asymptomatic
Endocrine		
Impaired glucose metabolism	See Lab Results Table for prediabetes and diabetes labs and cutoffs	
Polycystic Ovarian Syndrome (PCOS)	A syndrome of insulin resistance, inherited and/or due to excess weight; hyperinsulinemia dysregulates cycles; excess estrogen is converted to testosterone; carries risk of infertility and endometrial cancer	Diagnosed by 1 and 2, #3 not required: 1. oligomenorrhea (menses less than 9/year or 6+ weeks apart, at least 1 year post menarche) 2. hyperandrogenism – hirsutism, cystic acne, and/or high free testosterone 3. polycystic ovaries – ultrasound not recommended in adolescents Refer to Lifestyle Medicine for confirmatory labs and treatment
Musculoskeletal		
Blount Disease	Stress injury to medial tibial growth plate, often painless	Bowed legs with or without knee pain, peak incidence in toddlers and adolescents
Slipped Capital Femoral Epiphysis	More likely to progress to bilateral disease in children with obesity	Hip, groin, or knee pain, limp with leg held in external rotation
Skin		
Acanthosis Nigricans	Secondary effect of insulin resistance and hyperinsulinemia. Blood glucose measures normal in large majority.	Darkening of skin on neck, axillae, groin with or without skin tags, nonspecific T2DM risk factor
Intertrigo/ furunculosis	Examine skin creases, beneath abdominal pannus	Rash/infection in skin folds, inflammatory papules
Hydradenitis Suppurativa	Draining cysts in axillae or groin	Recurrently blocked glands, can be treated medically or surgically

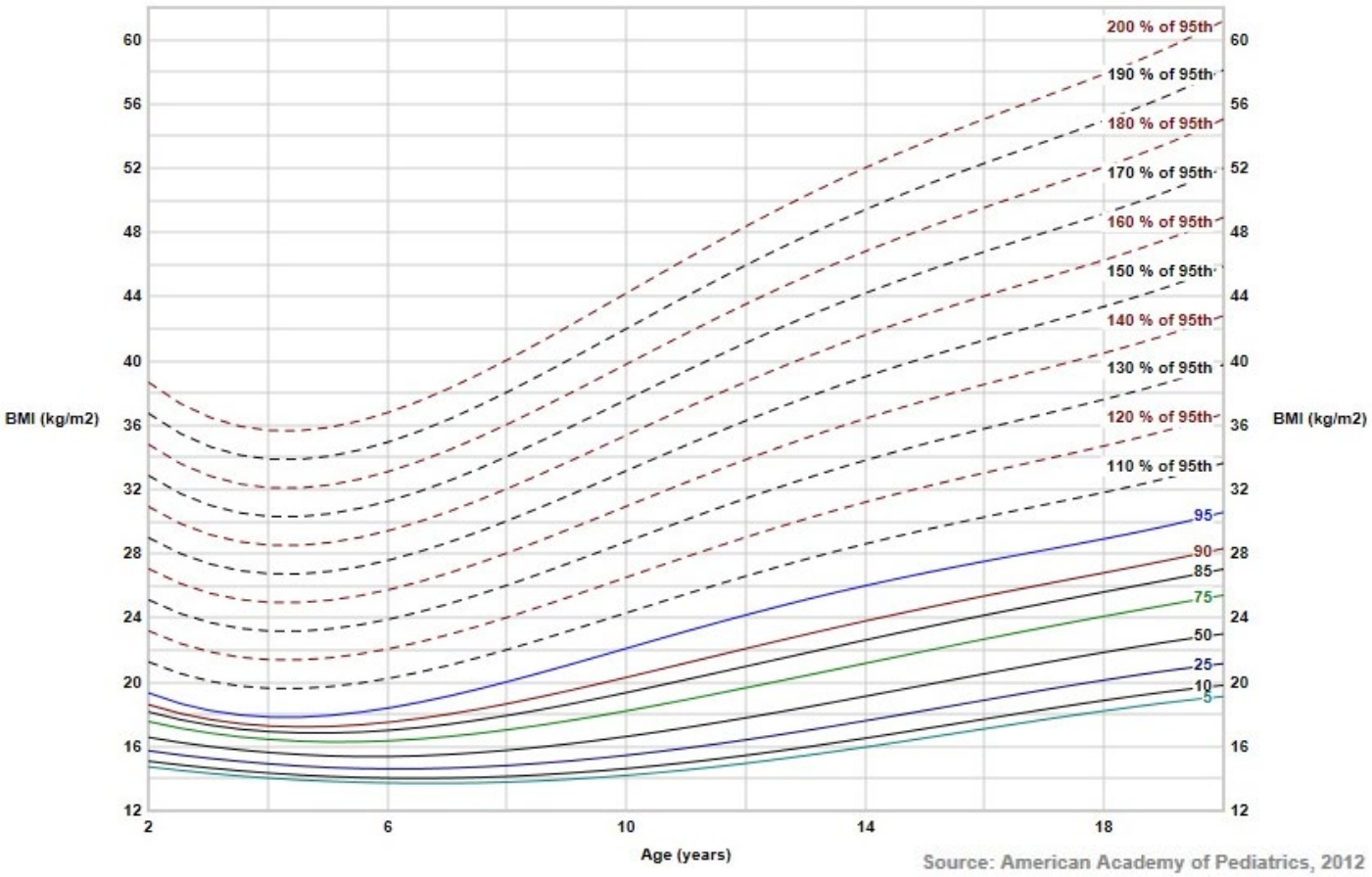
FIGURE 1. EXTENDED BODY MASS INDEX (BMI) GROWTH CHARTS

Girls ages 2 to 20 years:



Source: American Academy of Pediatrics, 2012

Boys ages 2 to 20 years:



Source: American Academy of Pediatrics, 2012

FIGURE 2. OBTAINING AN ACCURATE BLOOD PRESSURE

Cuff size:

- Always choose the larger cuff; a cuff that is too small can lead to overestimate of blood pressure
- Bladder length: 80% of the arm circumference
- Bladder width: 40% of upper arm length
- Obese adolescent arm circumference at midpoint:
  - If less than 33 cm, use adult cuff
  - If between 33 cm and 44 cm, use large adult cuff
  - If greater than 45 cm, use thigh cuff*

Position:

- Arm resting on surface (not tense) at level of heart (not above or below)
- Patient must be resting (3 to 5 minutes) and not talking
- Sitting in chair not on exam table
- Legs uncrossed, feet resting flat on floor or stool

Cuff placement:

- No clothing under cuff; no rolling sleeve up tightly
- Center of the bladder over brachial artery pulse

Manual BP reading:

- Use right arm
- Estimate the systolic occlusion level beforehand:
  - Palpate the brachial artery
  - Inflate cuff until pulsation disappears
  - Deflate cuff
  - Estimate systolic pressure

  Next, inflate to 30 mmHg above the estimated systolic level needed to occlude the pulse. Place the stethoscope diaphragm over the brachial artery and deflate at a rate of 2 to 3 mmHg/sec until you hear regular tapping sounds
- Measure systolic (first sound) and diastolic (disappearance) pressures to nearest 2 mmHg
- Take BP reading twice and record the average

*Thigh cuff on forearm:
In the rare patient with an arm circumference greater than 50 cm, when a thigh cuff cannot be fitter over the arm, it is recommended that the health care practitioner wrap an appropriately sized cuff around the patient's forearm, support it at heart level, and feel for the appearance of the radial pulse at the wrist

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COLORADO SPRINGS REVIEW

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Pharmacy & Therapeutics Committee – June 6, 2019

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REVIEW/REVISION SCHEDULE

Scheduled for full review on June 6, 2023

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