Pediatric Weight Management

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Disclosures

- Consultant for Eli Lilly, Nestle
- Speaker for Rhythm

Objectives

- AAP Clinical Practice Guidelines
- Complications and Comorbidities
- Advanced Treatments for Obesity

Evaluation and Treatment of Children and Adolescents with Obesity

An AAP Clinical Practice Guideline

CPG Development

Comprehensive Process

2017

Evidence Review & Technical Reports

Subcommittee Examines TRs & Confirms CPG Outline

Evidence Grading and KAS recs along with narrative

Internal and External Review

Published

2023

CPG By the Numbers

15
Years Since Last Comprehensive Guidance

16K Abstracts Reviewed

1642
Full Text Articles

382
Studies Included

13
CPG Key Action Statements

11
CPG Consensus Recommendations

2
Technical Reports

New from previous recommendations

NEW

- We understand more fully the implications of obesity as a chronic disease
- We understand the physiological impacts of social determinants of health on obesity more completely
- We know more fully that weight bias and stigma is pervasive and harmful and can be a barrier to treatment

New from previous recommendations

NEW

- Offer treatment early and immediately – **there is no benefit to watchful waiting**
- Treat obesity and comorbid conditions **concurrently**
- There are **multiple evidence-based strategies** that can be used collectively to deliver intensive & tailored obesity treatment
- **Structured**, **supervised** weight management interventions **decrease current & future eating disorder symptoms**

Key Takeaways

- Obesity is a complex chronic disease
- There are effective evidence-based strategies for treatment
- Comprehensive whole child evaluations are important
- Treating obesity also means treating comorbidities
- Obesity treatment is safe and effective
- Children with overweight or obesity should be offered treatment upon diagnosis

Obesity is a complex chronic disease

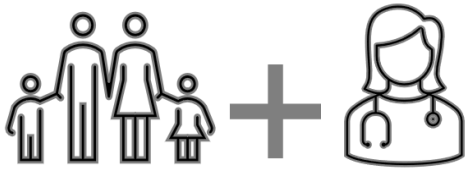
- Obesity is often an indicator of structural inequities like unjust food systems, health inequities and environmental & community factors

- Genetics, obesity-promoting environments, life experiences combined with inequities and structural barriers to healthy living all contribute to overweight and obesity

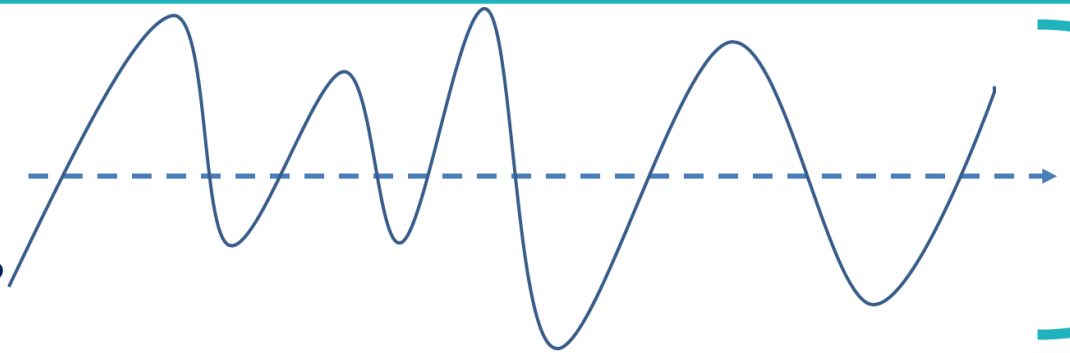
Treatment Experience of Obesity as a Chronic Disease

Longitudinal Non-Stigmatizing Care Coordinated Patient-Centered Treatment Across Lifespan

- Shared decision making with patient & family
- Culturally competent care
- Treatment coordinated in the medical home
- Transition planning



Patient & Family & PCP/PHCP Partnership



Treatment intensity & support vary to address relapsing & remitting nature of obesity as a chronic disease

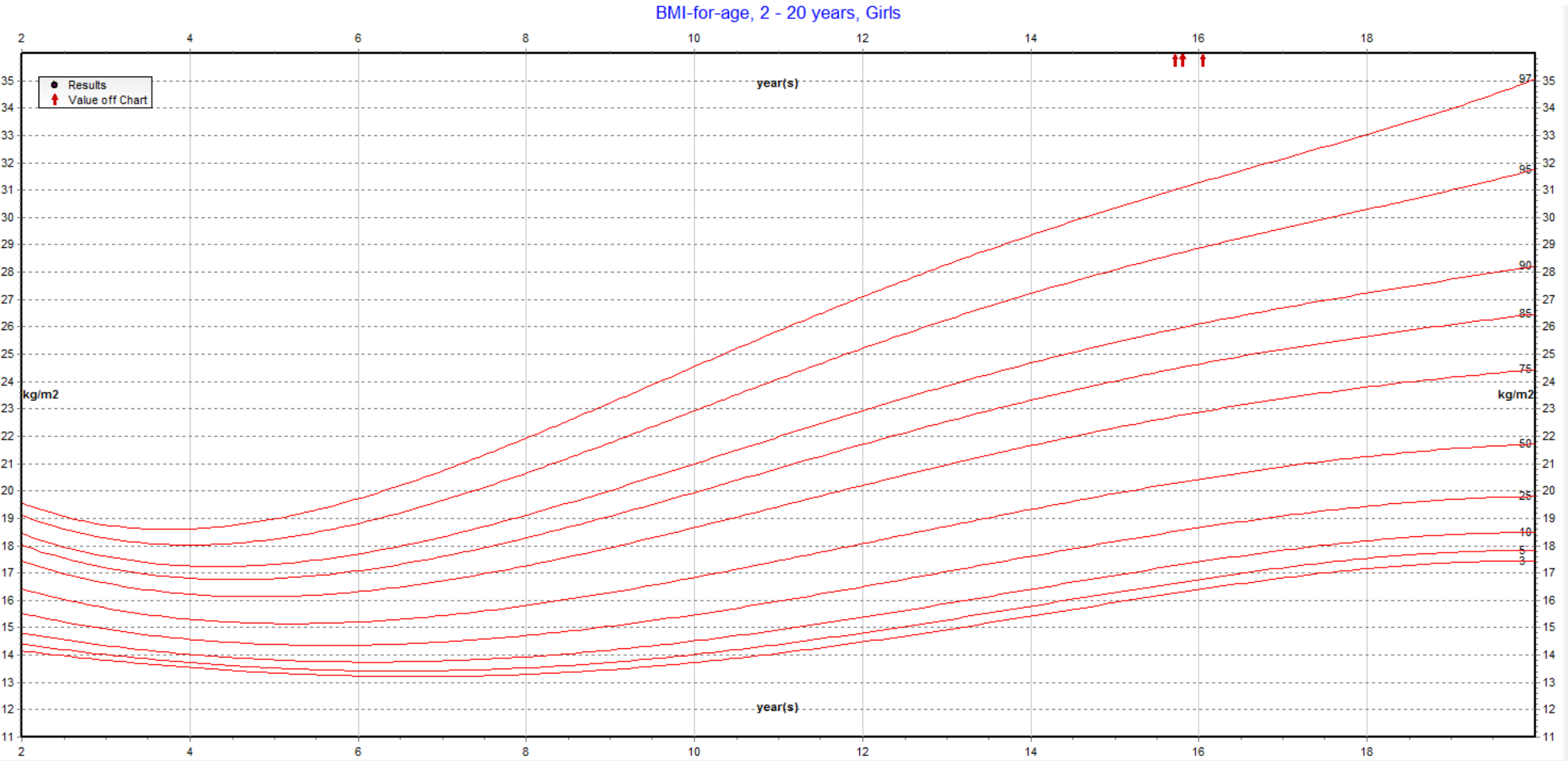
Structural and Contextual Factors That Impede & Influence Health & Treatment

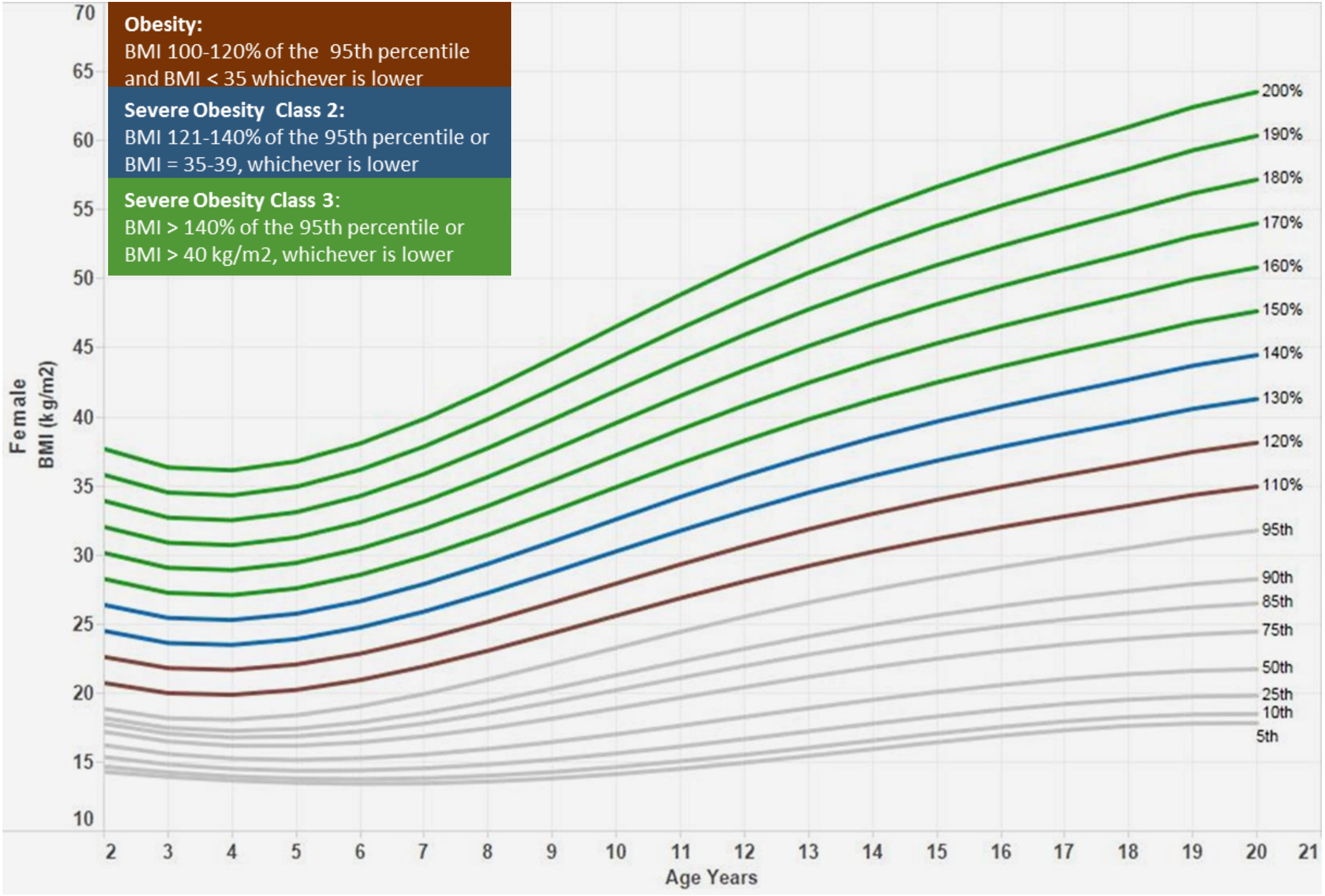
- Access to Care
- Weight Bias and Stigma
- Obesogenic Environments
- Adverse Child Experiences
- Racism
- Health Inequities

“Because obesity is a chronic disease with escalating effects over time, a life course approach to identification and treatment should begin as early as possible and continue longitudinally through childhood, adolescence, and young adulthood, with transition into adult care. – CPG”

Assessment & Evaluation KAS Topics

- [x] BMI Measurement
- [x] Comprehensive Evaluation (PE, ROS, Hx, etc)
- [x] Risk Assessment (Whole child)
- [x] Comorbidity Evaluation (labs, tests)


BMI-for-age, 2 - 20 years, Girls
Results
Value off Chart
year(s)
kg/m2
97
95
90
85
75
50
25
10
5
3
year(s)
kg/m2


Obesity:
BMI 100-120% of the 95th percentile and BMI < 35 whichever is lower
Severe Obesity Class 2:
BMI 121-140% of the 95th percentile or BMI = 35-39, whichever is lower
Severe Obesity Class 3:
BMI > 140% of the 95th percentile or BMI > 40 kg/m2, whichever is lower
Female
BMI (kg/m2)
70
65
60
55
50
45
40
35
30
25
20
15
10
200%
190%
180%
170%
160%
150%
140%
130%
120%
110%
95th
90th
85th
75th
50th
25th
10th
5th
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
Age Years

BMI measurement

- Specificity 0.93
  - 7% of children with increased BMI have normal adiposity
- Sensitivity 0.73
  - 27% of children with a normal BMI have excess adiposity

Styne DM, et al. *J Clin Endocrinol Metab*. 2017;102(3):709-757.

BMI

- Vital Sign
  - Not a diagnosis
  - Based on Weight
- Measuring fat mass and lean mass
  - DEXA gold standard
  - Bioimpedance
    - Improving as a clinical tool; 97-98% correlation with DEXA
  - Bod Pod
  - Skin Calipers
  - Hydrostatic weighing

Comprehensive Evaluation

- Family History
  - Excess weight, weight loss surgery
  - T2DM, gestational DM
  - NAFLD, cirrhosis
  - Dyslipidemia, HTN, Heart attack, Stroke (Ask age)
  - Infertility, PCOS, hirsutism
  - Bariatric surgery or AOM
- ROS
- Medications

Styne DM, et al. *J Clin Endocrinol Metab*. 2017;102(3):709-757.

System	Symptom	Possible Obesity-Related Causes
General	Poor or slowed linear growth velocity	Endocrinologic contributor (eg, hypothyroidism, Cushing syndrome)
	Hyperphagia from early childhood, developmental delay, obesity onset under age 5 y, or syndromic features	Various genetic etiologies (see Table 2, genetic syndromes associated with obesity)
Respiratory	Shortness of breath	Obesity-related asthma phenotype, deconditioning
	Snoring, apnea, disordered sleep	Obstructive sleep apnea (OSA)
Gastrointestinal	Asymptomatic vague abdominal pain	NAFLD, NASH
	Heartburn, dysphagia, chest pain, regurgitation	Gastroesophageal reflux disease
	Abdominal pain, enuresis, encopresis, anorexia	Constipation
	Right upper quadrant pain	Gall bladder disease
	Hyperphagia	Prader-Willi, other genetic causes
Endocrine	Polyuria, polydipsia	Diabetes mellitus (DM) type 1 or 2
GYN	Oligomenorrhea, dysfunctional uterine bleeding	Polycystic ovarian syndrome
Orthopedic	Hip, thigh, or groin pain, painful or uneven gait	Slipped capital femoral epiphysis (SCFE)
	Knee pain	SCFE, Blount disease
	Foot pain	Increased weight bearing

	Knee pain	SCFE, Blount disease
	Foot pain	Increased weight bearing
	Back pain	Increased weight
	Proximal muscle wasting	Cushing syndrome
Mental health	Sadness, depression, anhedonia, body dissatisfaction, school avoidance, poor self-image	Depression or anxiety, bullying, sexual, physical, or emotional abuse
	Impulsive eating, distractibility, hyperactivity	ADHD
	Purging, restricting intake, binge-eating, night eating	Disordered eating or eating disorders
	Flat affect	Depression or anxiety
Urinary	Nocturia, enuresis	DM, OSA
Dermatologic	Rash	Intertrigo
	Darkened skin on flexural surfaces	Acanthosis nigricans
	Pustules, abscesses	Hidradenitis suppurativa
	Hirsutism in females	PCOS
	Flesh-colored striae	Rapid weight gain
	Purplish striae	Cushing syndrome
	Skin fold irritation	Candida
Neurologic	Morning headaches	OSA
	Daytime sleepiness	OSA
	Persistent headache	Idiopathic intracranial hypertension (IIH)

Comprehensive Evaluation

- Family History
- ROS
  - Polyuria/polydipsia, blurry vision, fungal vaginitis/discharge, weight loss
  - Headaches
  - Snoring, restless sleep, AM HA, tiredness, hyperactive/inattentive behavior
  - GI discomfort, constipation, enuresis
  - Leg, foot, arm, back pain
  - Acne, hirsutism, pattern of menses
  - Exercise intolerance, asthma sx, chest pain, edema
- Medications

Styne DM, et al. *J Clin Endocrinol Metab*. 2017;102(3):709-757.

Comprehensive Evaluation

- Family History
- ROS
- Medications
  - Weight gain promoting medicines
  - Non-obesogenic medications

Styne DM, et al. *J Clin Endocrinol Metab*. 2017;102(3):709-757.

Medication	Obesogenic Medications	Nonobesogenic Medications
Allergies and asthma management	• antihistamines • steroids (systemic)	• inhaled nasal steroids • montelukast
Antidepressants	• amitriptyline • nortriptyline • paroxetine • sertraline	• bupropion • imipramine HCL • buspirone • trimipramine maleate • citalopram • protriptyline HCL • desipramine HCL • trazadone • venlafaxine • doxepin • escitalopram • fluoxetine • fluvoxamine
Antiepileptics	• carbamazepine • gabapentin • pregabalin • valproate • vigabatrin	• felbamate • lamotrigine • levetiracetam • phenytoin • topiramate • zonisamide
Antipsychotics	• aripiprazole • clozapine • haloperidol • mirtazapine • olanzapine • perphenazine • quetiapine • risperidone • sertindole • thioridazine • ziprasidone	• molindone • pimozide
Anxiolytics	not applicable	• alprazolam

Antipsychotics	• aripiprazole • clozapine • haloperidol • mirtazapine • olanzapine • perphenazine	• quetiapine • risperidone • sertindole • thioridazine • ziprasidone	• molindone • pimozide
Anxiolytics	not applicable		• alprazolam • lorazepam
Migraine management	• amitriptyline • atenolol • divalproex sodium • flunarizine • gabapentin	• imipramin • nortriptyline • pizotifen • propranolol	• lamotrigine • levetiracetam • protriptyline • timolol • topiramate • zonisamide
Mood stabilizers and antimania	• carbamazepine • gabapentin • lithium • valproate		• lamotrigine • topiramate • zonisamide
Psychostimulants	not applicable		• amphetamine • methylphenidate • dextroamphetamine sulfate

Medication Optimization

- Headaches
  - Topiramate
- IFG, IGT, PCOS
  - Metformin
    - Increased HgA1C
    - Increased ALT; increased TG
- T2DM
  - Liraglutide, semaglutide
- Depression
  - Bupropion, fluoxetine
- ADHD
  - Lisdexamphetamine
  - Other stimulant (?rebound hunger)
- Binge eating symptomatology
  - Lisdexamphetamine, Topiramate, Naltrexone
- Atypical antipsychotic induced Sx and weight gain
  - Metformin, Topiramate

Sweeney, et al. Clin Obes. 2021;11:e12417

Comprehensive Evaluation

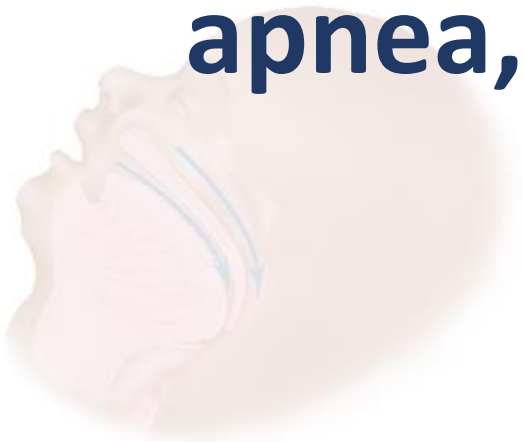
- Physical Exam
  - BMI, consider body fat analysis (BIA)
  - Blood pressure: use tables; CV exam for murmur
  - Skin: acanthosis, skin tags, skin folds, acne, hirsutism, hidradenitis suppurativa
  - Neurologic: fundoscopic, cranial nerves, strength
  - Musculoskeletal: hips, knee, pes planus, gait, back, sit/stand without hands
  - Peripheral edema, thyroid exam
  - ENT: tonsils, nasal mucosa, neck size
  - Abdomen: liver size, epigastric tenderness, stool
  - Genetics: syndromic features

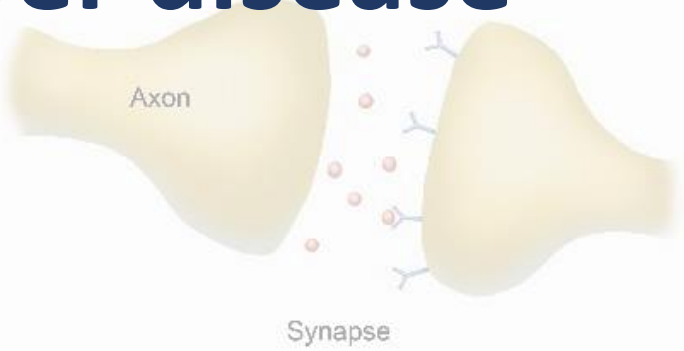
Styne DM, et al. *J Clin Endocrinol Metab*. 2017;102(3):709-757.

	Physical Examination Finding	Definition	Other Causes and Differential
Vital signs	Hypertension	SBP or DBP ≥ 95th percentile on at least 3 readings	Numerous, including essential, stress-induced, renal parenchymal or vascular disease, cardiovascular disorders, obstructive sleep apnea syndrome, substance abuse or medication side effect, pheochromocytoma, anemia, hyperthyroidism, Cushing syndrome, Williams syndrome, Turner syndrome
	Increased HR	Heart rate above upper limit of normal for age	Numerous, including fever, anemia, drugs, anxiety, pain, arrhythmia, myocarditis, substrate deficiency, hypovolemic shock, sepsis, anaphylaxis, toxic exposure, hyperthyroidism, Kawasaki disease, acute rheumatic fever, pheochromocytoma
Anthropometric	Changes in height velocity	Early height velocity increase	True pattern characteristic of obesity, but early height increases can also be: familial tall stature, precocious puberty, gigantism, pituitary gland tumor
	Changes in weight gain	Early weight gain before age 5 y	Genetic causes, overfeeding
	Slowing of height age 8–18 y	Earlier onset of peak height velocity	Slowing of height can be attributable to medications, inflammatory bowel disease, hypothyroidism, hypercortisolism, dysplastic or genetic syndrome, constitutional delay, growth hormone deficiency
HEENT	Papilledema	Edema of the optic disc secondary to increased intracranial pressure (Frisen scale)	Intracranial mass lesion, hydrocephalus, cerebral venous thrombosis, medications, autoimmune disorders, anemia, and cranial venous outflow abnormalities
	Dental caries	White, brown, or black spots (noncavitary) or eroded areas of enamel or dentin (cavitary)	Developmental disease of the tooth and gum, trauma, infection
	Tonsillar hypertrophy	Tonsils occupy at least 50% of the oropharynx (Brodsky classification 3+ and 4+).	Infectious causes
Chest	Gynecomastia	>2 cm of breast tissue in biological males	Hyperaromatase syndrome; hypogonadism, hyperprolactinemia, chronic liver disease, and medications, particularly H2 antagonists
	Cervicodorsal hump	Fibrous fatty tissue over the upper back and lower neck	Endogenous (Cushing syndrome) or exogenous corticosteroid exposure, adrenal carcinoma, adrenal adenoma; HIV with secondary hyperinsulinemia
Gastrointestinal	Liver enlargement (hepatomegaly)	Liver span >5 cm in 5-y-olds and 15 cm in adults or liver edge palpable below the right costal margin by >3.5 cm in adults or >2 cm in children	Multiple, including hepatitis, storage disorders, infiltrative, impaired outflow, and biliary tract disorders
Genitourinary	Buried penis	Suprapubic fat accumulation leading to the appearance of a shortened penile shaft	Trapped penis, webbed penis, and micropenis

Musculoskeletal	Gait	Collapse into hip (“waddle”), Trendelenburg or antalgic gait (external rotation or out-toeing on affected side)	Arthritis, SCFE
	Lordosis	Trunk sway associated with postural adaptations	Spondylolisthesis, achondroplasia, muscular dystrophy, other genetic conditions
	Hip pain and/or limp	Knee or hip pain, subacute onset, pain with external rotation of hip	Multiple problems present with chronic hip, knee, or thigh pain including slipped capital femoral epiphysis (SCFE), growing pains, femoral neck fracture, groin injury, Perthes disease, osteonecrosis associated with systemic disease, juvenile idiopathic arthritis, reactive arthritis, overuse injuries, chondrolysis, tumors, osteitis pubis
	Genu varum or valgum	Genu varum (bow legs)	Tibia vara (Blount disease), rickets, skeletal dysplasia, celiac sprue, collagen disorder and hypermobility syndromes (eg, Marfan syndrome), Loeys-Dietz, classic Ehler Danlos syndrome)[15]
		Genu valgum (knock-kneed)	Physiologic in children under 6 y; in older children and adolescents, consider postaxial limb deficiency, neoplasms, genetic and metabolic disorders, neurofibromatosis, and vitamin D–resistant rickets
	Pes planus	Rigid versus flexible, sometimes with pain	Posterior tibial tendon insufficiency, tarsal coalition, congenital vertical talus, rheumatoid arthritides, trauma, neuropathy
Skin	Acanthosis	AN is thickened and darker skin, occasionally pruritic at the nape of the neck (99%), axillae (73%) and, less commonly, groin, eyelids, dorsal hands, and other areas exposed to friction	Medication side effect, and uncommonly, visceral malignancy.
	Hirsutism or acne	Acne: physiologic, folliculitis, rosacea	Hirsutism: familial, Cushing syndrome, thyroid disorders
	Striae	Linear, usually symmetrical smooth bands of atrophic skin that initially appear erythematous, progressing to purple then white; perpendicular to the direction of greatest tension in areas with adipose tissue	Pregnancy, Cushing syndrome, and topical corticosteroid use
	Intertrigo	Macerated, erythematous plaques in skin folds	Inflammatory diseases, metabolic disorders, malignancies (rare in pediatrics), and various infections by site
	Pannus	Excess skin and subcutaneous fat below the umbilicus	Pregnancy, malignancy

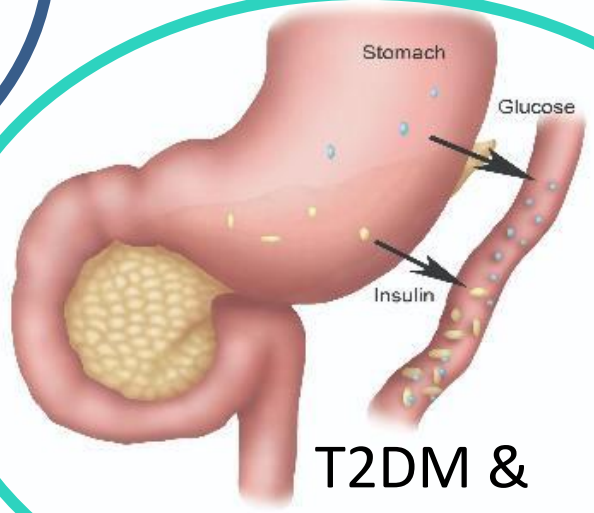
Children with overweight and obesity are susceptible to many diseases like type 2 diabetes, hypertension, sleep apnea, nonalcoholic fatty liver disease and depression



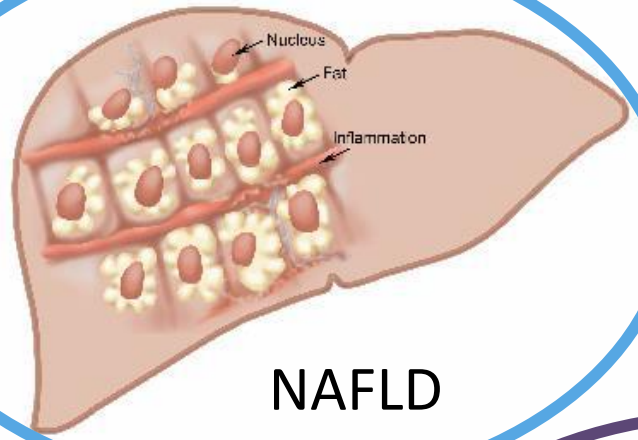


Comorbidities Addressed Include

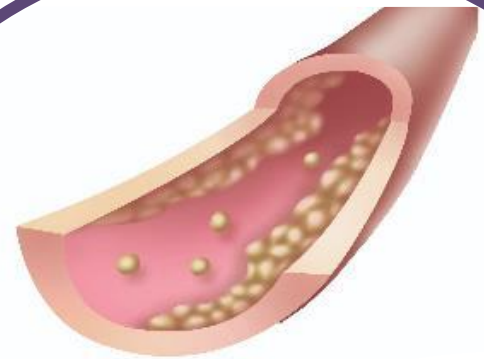
Hypertension



T2DM &
Prediabetes

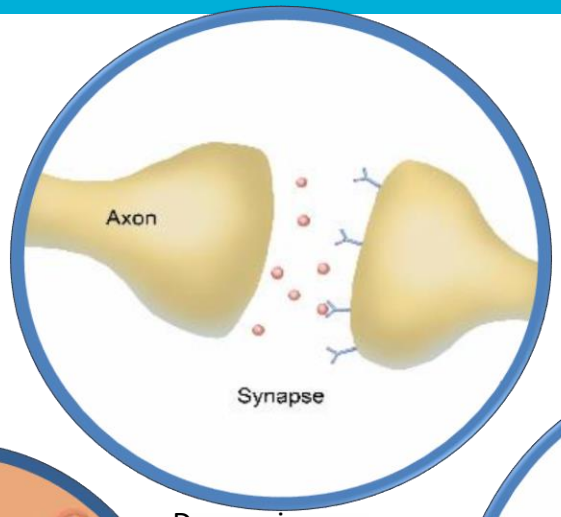


NAFLD

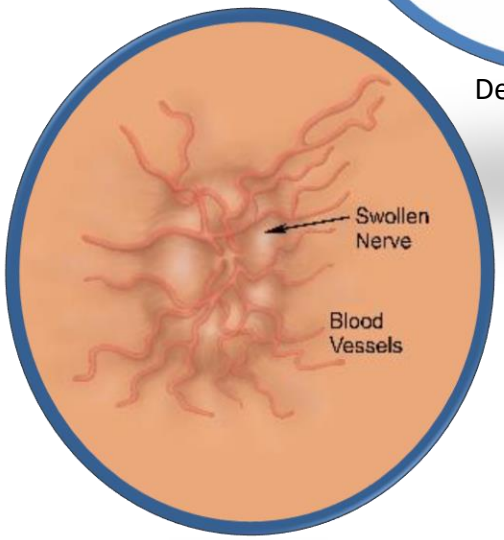


Dyslipidemia

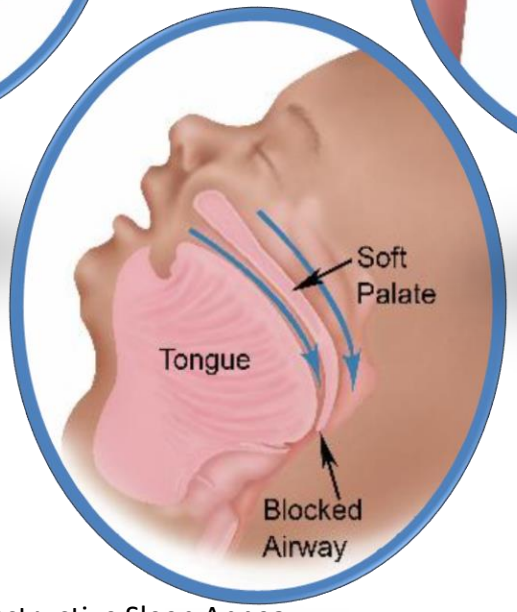
Comorbidities Addressed Include



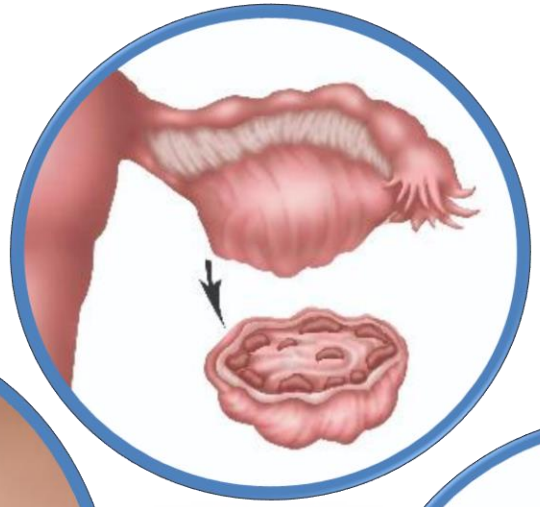
Depression



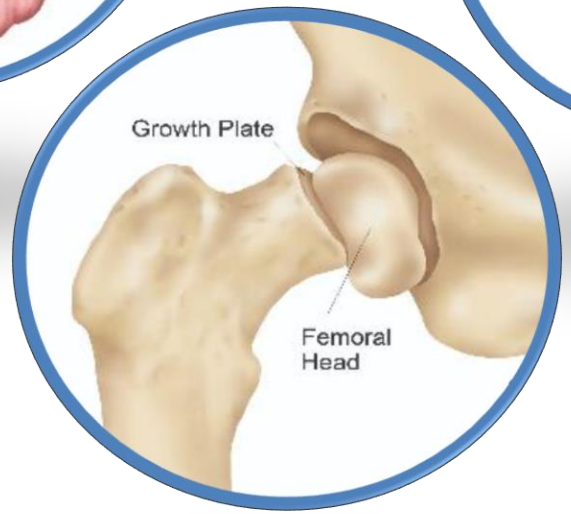
Idiopathic Intracranial Hypertension



Obstructive Sleep Apnea



PCOS



SCFE

Blount disease

Comorbidity Evaluation

- Laboratory
- Additional Testing

Comorbidity Evaluation

- Laboratory
  - Screening: HgA1C, Fasting lipid, Liver function panel, FPG
    - Prediabetes: HgA1C 5.7% to 6.4%;
    - T2DM: HgA1C 6.5%+
    - Cholesterol: See table
    - Liver enzymes: ALT 25+ Boys, 22+ Girls
- Additional Testing

Styne DM, et al. *J Clin Endocrinol Metab*. 2017;102(3):709-757.

Comorbidity Evaluation

- Laboratory
- Additional Testing
  - Sleep study
  - Mental health specialist
  - Genetic testing
  - Ambulatory blood pressure monitoring
  - Indirect Calorimetry/DEXA
  - Physical therapy/exercise testing
  - Pulmonary Function testing

Blood Pressure

BP Category	Children 1–13 Years of Age	Children ≥13 Years of Age	Number of Visits to Diagnosis
Normal	BP < 90th percentile	BP <120/80 mm Hg	NA
Elevated	BP ≥ 90th percentile to <95th percentile	120/<80 to 129/<80 mm Hg	3
Stage 1	BP ≥ 95th percentile to <95th percentile + 12 mmHg	130/80 to 139/89 mm Hg	3
Stage 2	BP ≥ 95th percentile + 12 mm Hg	≥140/90 mm Hg	2

Used with permission and adapted from the AAP HTN CPG,[87] Fig 2, and AAP Pediatric Obesity Clinical Decision Support Chart.[494]

Lipid parameters (mg/dL)

Category	Low	Acceptable	Borderline	High
Total cholesterol		<170	170-199	≥200
LDL cholesterol		<110	110-129	≥130
Non-HDL cholesterol		<120	120-144	≥145
Triglycerides				
0-9 year olds		<75	75-99	≥100
10-19 year olds		<90	90-129	≥130
HDL cholesterol	<40	>45	40-45	

Wilson DP, et al. *South Med J*. 2015;108(1):7-14.

Cholesterol

- Elevated TG, Low HDL
  - Carbohydrate excess for their body
  - NO SSB, decreased sugar/processed grains
- Familial: refer
  - Higher levels
  - Increased LDL

Fatty Liver

- Normal ALT
  - Boys 25, Girls 22
  - Mild increase = 40
- Refer to Liver Care Center if:
  - ALT > 200 IU/dL
  - ALT > 80 IU/dL and not improving after 6 months of successful weight loss
  - ALT > 80 IU/dL after 1 year of unsuccessful weight loss
  - BMI < 25 and ALT greater than 80 IU/dL
- Counseling
  - Soda is toxic to liver
  - Liver loves exercise
  - FV, water, eliminate processed carbs

Schwimmer et al, 2010

Consensus Recommendations for Other Comorbid Conditions

Comorbid Condition	Consensus Recommendation
OSA	• Obtain a sleep history, including symptoms of snoring, daytime somnolence, nocturnal enuresis, morning headaches, and inattention, among children and adolescents with obesity to evaluate for OSA. • Obtain a polysomnogram for children and adolescents with obesity and at least one symptom of disordered breathing.
PCOS	• Evaluate for menstrual irregularities and signs of hyperandrogenism (ie, hirsutism, acne) among female adolescents with obesity to assess risk for PCOS.
Depression	• Monitor for symptoms of depression in children and adolescents with obesity and conduct annual evaluation for depression for adolescents 12 years and older with a formal self-report tool.
Blount	• Perform a musculoskeletal review of systems and physical examination (eg, internal hip rotation in growing child, gait) as part of their evaluation for obesity.
SCFE	• Recommend immediate and complete activity restriction, non–weight-bearing with use of crutches, and refer to an orthopaedic surgeon for emergent evaluation, if SCFE is suspected. PHCPs may consider sending the child to an emergency department if an orthopaedic surgeon is not available.
IIH	• Maintain a high index of suspicion for IIH with new-onset or progressive headaches in the context of significant weight gain, especially for females.

Provide the most intensive longitudinal treatment in the medical home….

Provide or ensure ongoing medical evaluation & monitoring
What is happening with this patient and family physically, emotionally, and socially?

Develop & implement an individualized comprehensive treatment plan, using evidence-based strategies
What can help the patients & family develop & reach treatment foals and treat comorbidities?

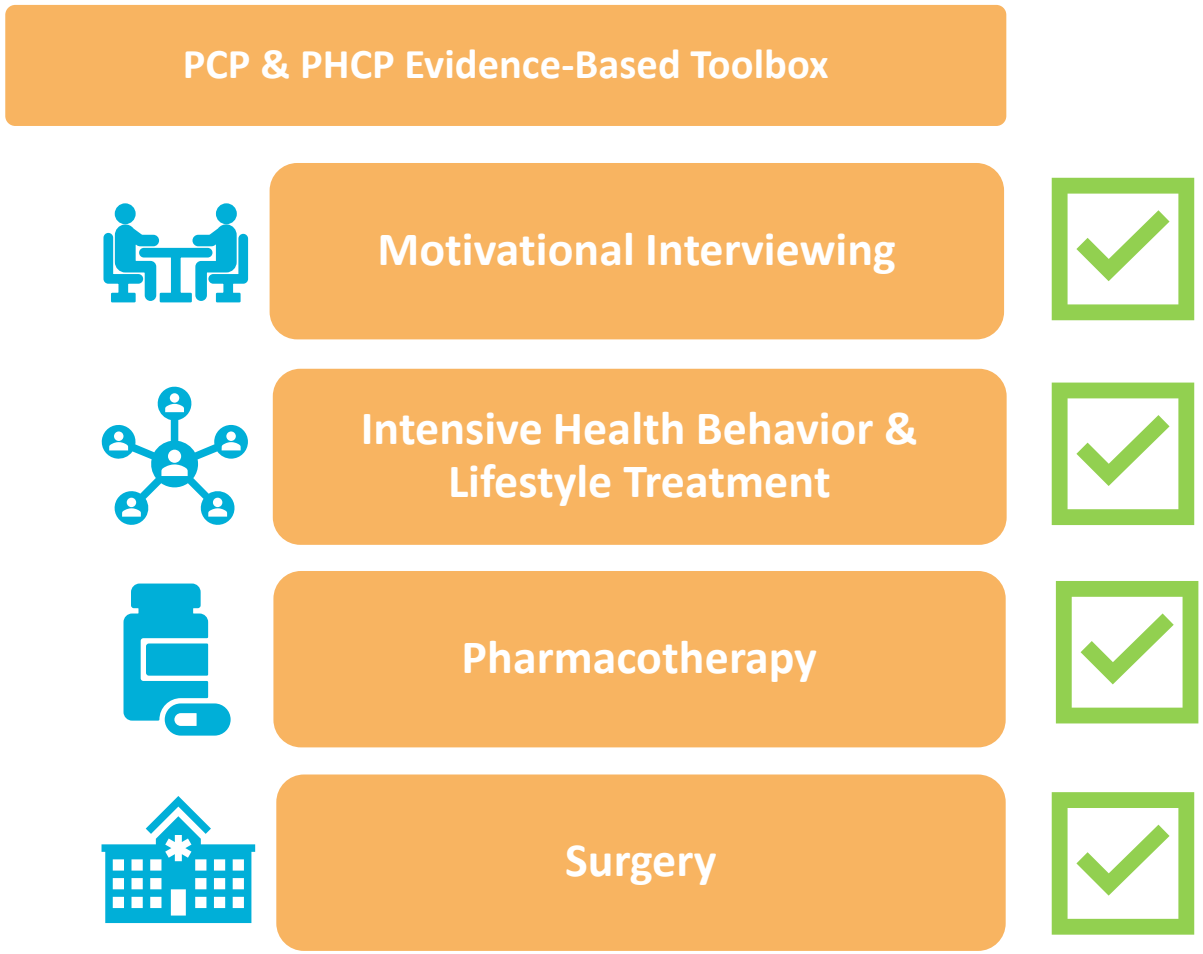
Tailor treatment as needed
What else is needed to support the patient & family's immediate needs & longitudinal treatment progress?

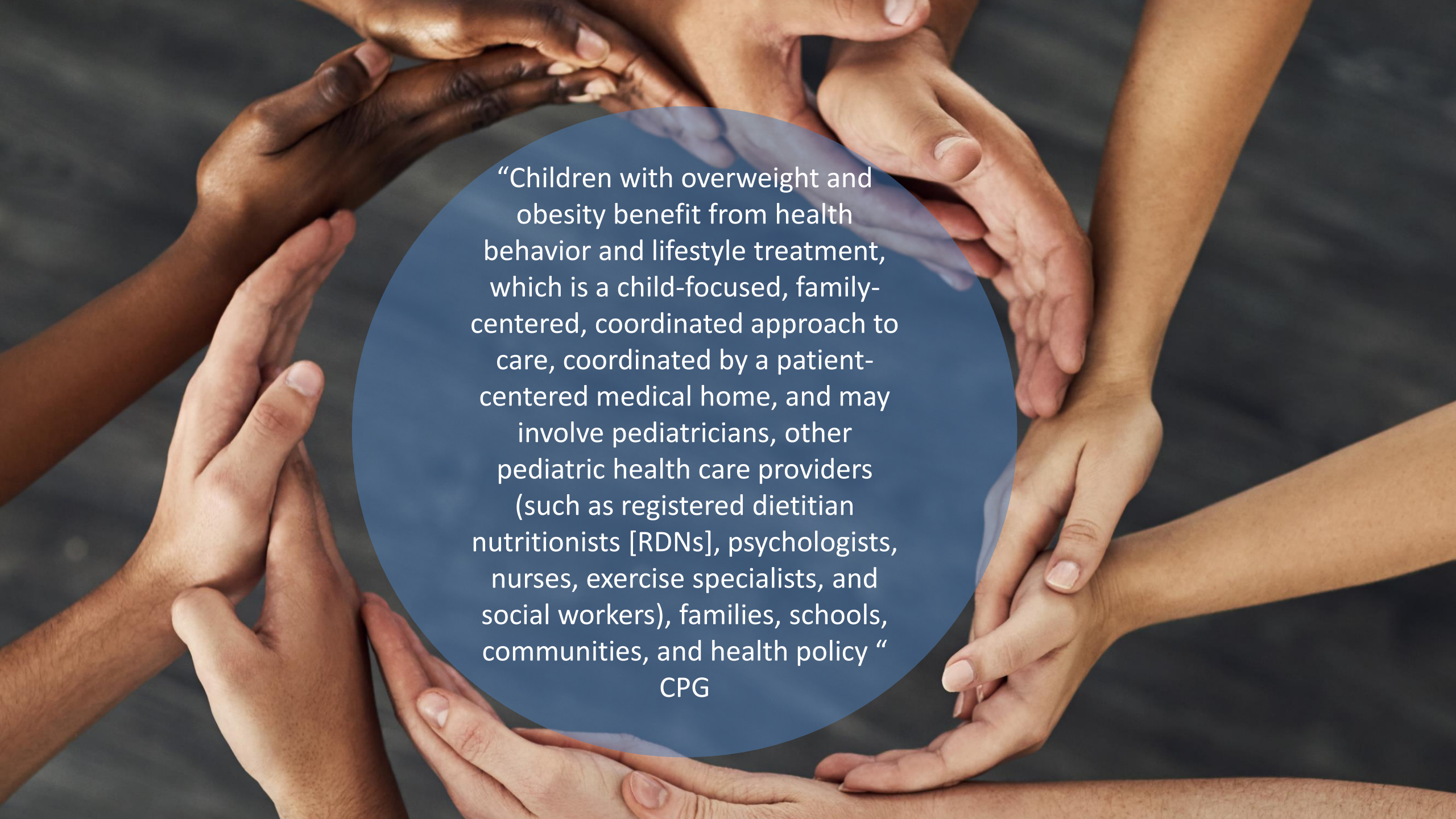
Serve as medical home
What care coordination and/or advocacy does this patient/family need?

PCP & PHCP Evidence-Based Toolbox

- Motivational Interviewing
- Intensive Health Behavior & Lifestyle Treatment
- Pharmacotherapy
- Surgery

Treatment Take-Aways: “As soon as possible, as intensive as available”




“Children with overweight and obesity benefit from health behavior and lifestyle treatment, which is a child-focused, family-centered, coordinated approach to care, coordinated by a patient-centered medical home, and may involve pediatricians, other pediatric health care providers (such as registered dietitian nutritionists [RDNs], psychologists, nurses, exercise specialists, and social workers), families, schools, communities, and health policy “
CPG

Behavioral Strategies

Reduction of sugar-sweetened beverages

60-miunute of daily physical activity

Balance meals and portion sizes MyPlate

Reduction of Screen time

Appropriate sleep

Stoplight diet

Exergaming & screen-based physical activity

Pharmacotherapy

KAS 12. Pediatricians and other PHCPs **should offer adolescents 12 y and older with obesity** (BMI ≥95th percentile) wt loss **pharmacotherapy,** according to medication indications, risks, and benefits, as an **adjunct to health behavior and lifestyle treatment**.

Topiramate

- Approved for epilepsy 2+; Migraines 12+,
  - Combo with Phentermine for Obesity 12+
- Uses
  - Assist with antipsychotic related weight gain, HA suppression
  - Enhance effectiveness Metformin
- MOA
  - Modulation of GABA (gamma aminobutyrate); Carbonic anhydrase inhibitor
- Side Effects
  - Word finding, concentration; teratogenic (cleft lip/palte); kidney stones; tingling
- CI: glaucoma
- Dosing
  - Start at 25 mg once daily; can increase to twice daily after 1 week
  - Typical effective dose 75-100 mg daily

Maayan et al. Neuropsychopharmacology, 2010(35):1520.

Metformin

- Approved for T2DM 10+
- Uses
  - Assist with antipsychotic related weight gain; PCOS
- MOA
  - A biguanide oral hypoglycemic agent
  - ↓hepatic glucose production; ↑peripheral insulin sensitivity; ↓leptin
- Side Effects
  - Nausea, flatulence, bloating, diarrhea; return of fertility
- Dosing
  - Start at 500 mg once daily; increase gradually to 1000 mg twice daily
  - Typical effective dose 2000 mg daily

Handen BL, et al. J Am Acad Child Adolesc Psychiatry. 2017;56(10):849-856 e846
Anagnostou, E et al; JAMA Psychiatry. 2016;73(9):928-937.
Wink, L, et al; J Autism Dev Disord (2017) 47:2290-2294.

Liraglutide

- Approved for T2DM 10+, Obesity 12+
- Uses
  - Assist with improved HgA1C, insulin sparing, weight loss
- MOA
  - Glucagon-like peptide 1 analogue
  - Stimulate POMC/CART neurons; inhibit neuropeptide Y and agouti-related peptide via GABA-dependent signaling
- Side effects: nausea, vomiting, constipation, diarrhea
  - Some increase in GB events, but not over that expected from rapid weight loss or baseline events in those with obesity
  - Hypoglycemia and pancreatitis: seems to be in those on other agents increasing risk (ie insulin, sulfonylurea and HCTZ respectively)
  - Unclear if increase in medullary thyroid C-cell carcinoma (MEN 1)
- Dosing
  - Start at 0.6 mg SQ once daily; can increase weekly by 0.6 mg to 3 mg SQ daily
  - Typical effective dose 3 mg SQ daily

Tamborlane WV, et al; Ellipse Trial Investigators. Liraglutide in Children and Adolescents with Type 2 Diabetes. N Engl J Med. 2019 Aug 15;381(7):637-646. Patel D, et al; Postgrad Med. March 2018

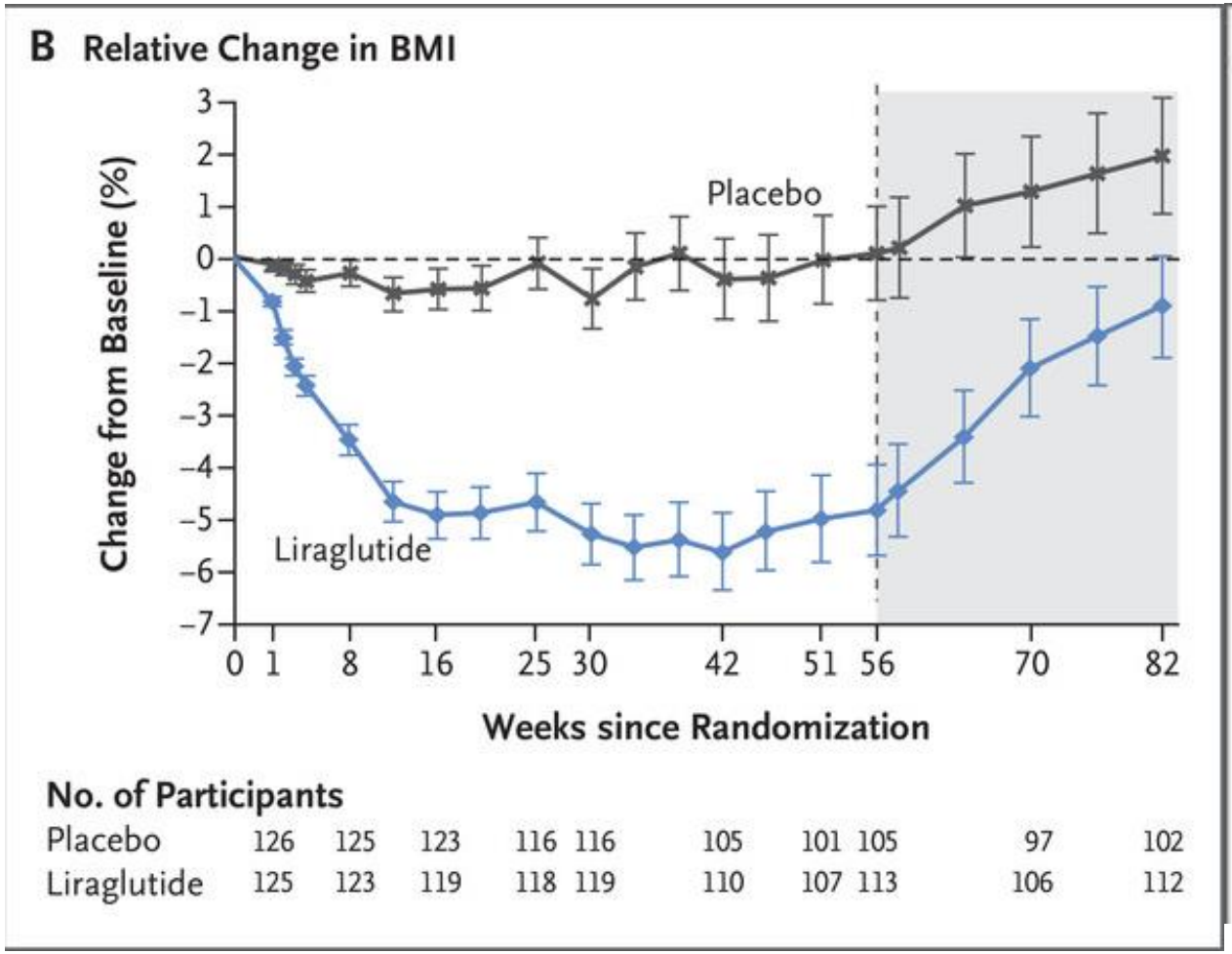
Semaglutide

- Approved for Obesity 12+
- Uses
  - Assist with improved HgA1C, insulin sparing, weight loss
- MOA
  - Glucagon-like peptide 1 analogue
  - Stimulate POMC/CART neurons; inhibit neuropeptide Y and agouti-related peptide via GABA-dependent signaling
- Side effects: nausea, vomiting, constipation, diarrhea
  - Some increase in GB events, but not over that expected from rapid weight loss or baseline events in those with obesity
  - Hypoglycemia and pancreatitis: seems to be in those on other agents increasing risk (ie insulin, sulfonylurea and HCTZ respectively)
  - Unclear if increase in medullary thyroid C-cell carcinoma (MEN 1)
- Dosing
  - Start at 0.25 mg SQ once weekly; can increase monthly (0.5 mg, 1 mg, 1.7 mg, 2 or 2.4 mg)
  - Typical effective dose 2 to 2.4 mg SQ weekly

Tamborlane WV, et al; Ellipse Trial Investigators. Liraglutide in Children and Adolescents with Type 2 Diabetes. N Engl J Med. 2019 Aug 15;381(7):637-646. Patel D, et al; Postgrad Med. March 2018

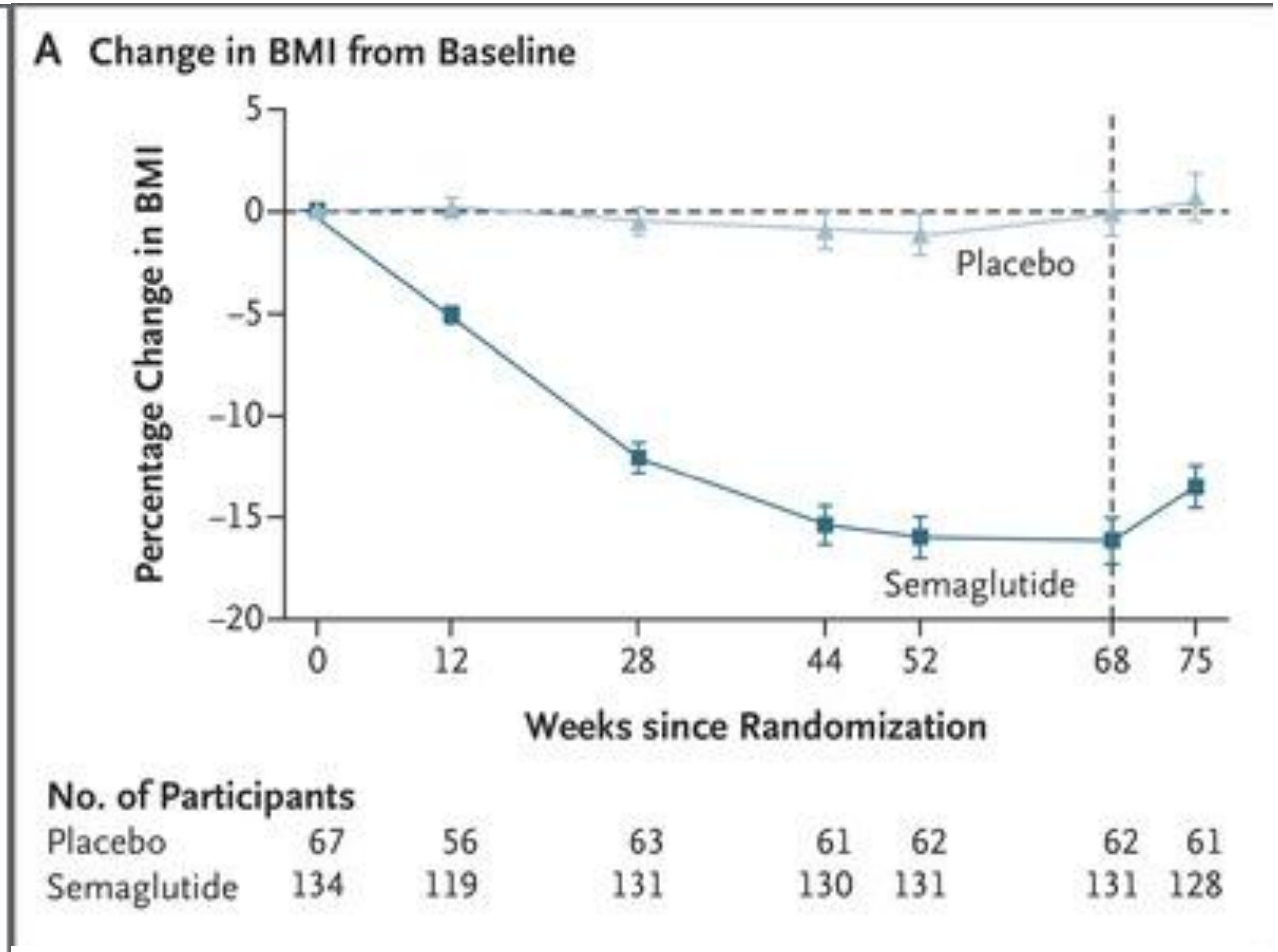
Liraglutide: Efficacy and Weight-Related End Points.

AS Kelly et al. N Engl J Med 2020;382:2117-2128.



Once-Weekly Semaglutide in Adolescents with Obesity.

Weghuber D, Barrett T, Barrientos-Pérez M, Gies I, Hesse D, Jeppesen OK, Kelly AS, Mastrandrea LD, Sørrig R, Arslanian S; STEP TEENS Investigators. N Engl J Med. 2022 Nov 2.



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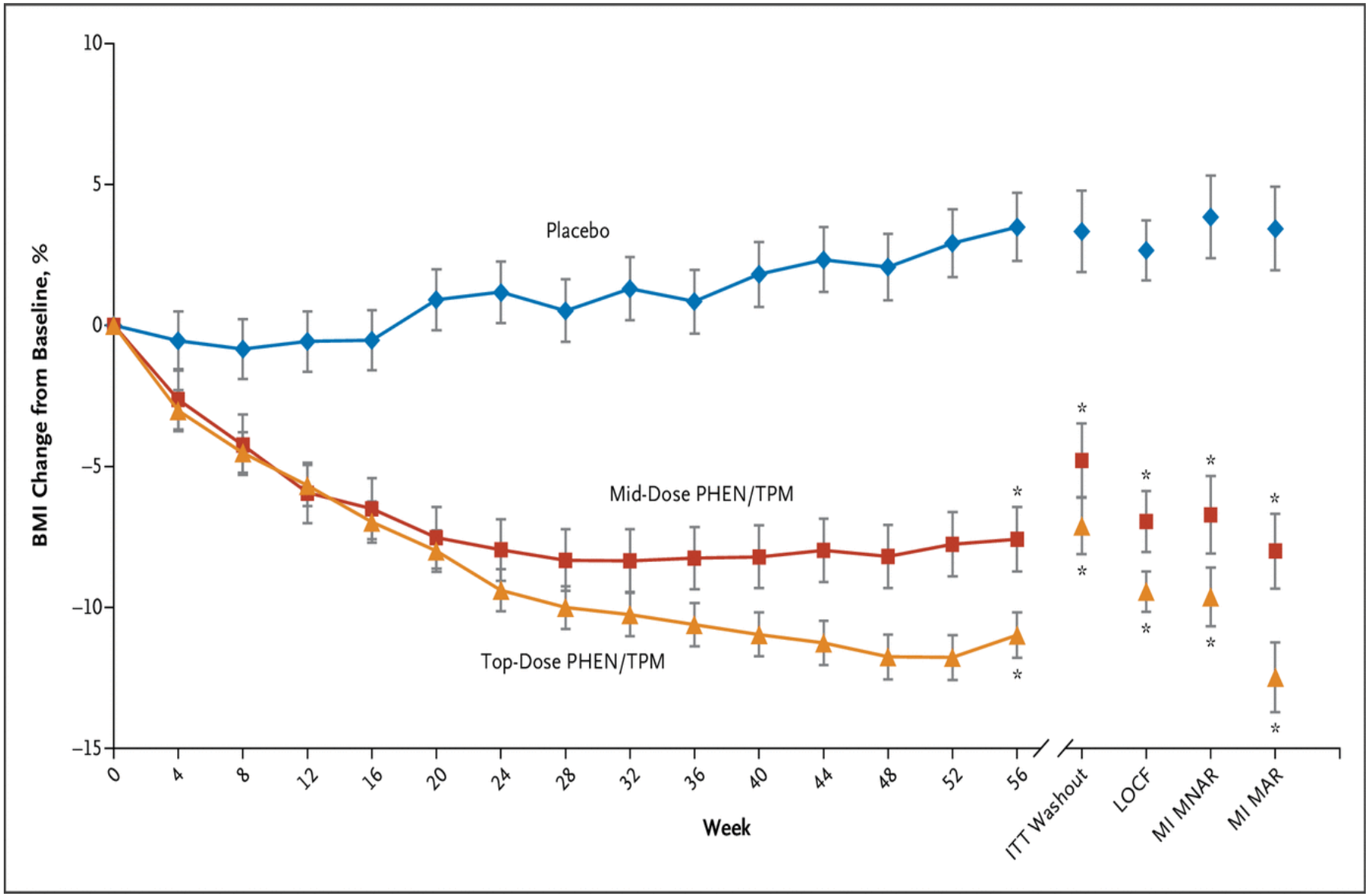
Phentermine/Topiramate (Qsymia)

- Approved for obesity 12+
- Uses
  - Decrease hunger, cravings, headaches, increase metabolism
- MOA
  - Norepi-releasing agent (Phentermine)
  - GABA-modulator: decreased appetite (Topiramate)
- Side effects
  - Insomnia, dry mouth, paresthesia, dizziness, dysgeusia, congenital cleft lip/palate, somnolence, word-finding, constipation
- Dosing
  - Starting dose 3.75mg/23mg x 2 weeks
  - Max dose: 15mg/92mg
- Contraindications
  - Pregnancy, hyperthyroid, glaucoma, MAOI's
  - Monthly pregnancy tests recommended



AS Kelly et al. NEJM Evidence 2022;1:.

Phentermine/Topiramate for the Treatment of Adolescent Obesity, Volume: 1, Issue: 6, DOI: (10.1056/EVIDoa2200014)

NEJM Evidence

Setmelanotide

- Approved for Bardet Biedl, POMC, PCSK1, and LEPR
  - Rare genetic disorders of obesity, early onset hyperphagia
- Side effects:
  - Hyperpigmentation 69%, Depression 26%, SI 11%, spontaneous erections 26% (arousal 7% females).
- Dosing
  - Start at 1 mg SQ once daily (6-12 yo) or 2 mg SQ daily 12+; can increase after 2 weeks
  - Typical effective dose 3 mg SQ daily

Lisdexamphetamine

- Approved for Binge 18+; ADHD 6+
- Uses
  - ADHD treatment; choose for children with hunger, rebound sx
- MOA
  - Amphetamine stimulant
- Side Effects: dry mouth, sleeplessness, ↑HR, Anxiety, constipation, jittery
- Dosing
  - Start at 20 mg once daily; can increase monthly to effect
  - Typical effective dose 50-70 mg daily

McElroy JAMA Psychiatry 2015; McElroy Curr Psychiatry Rep 2015.

Bupropion/Naltrexone (Contrave)

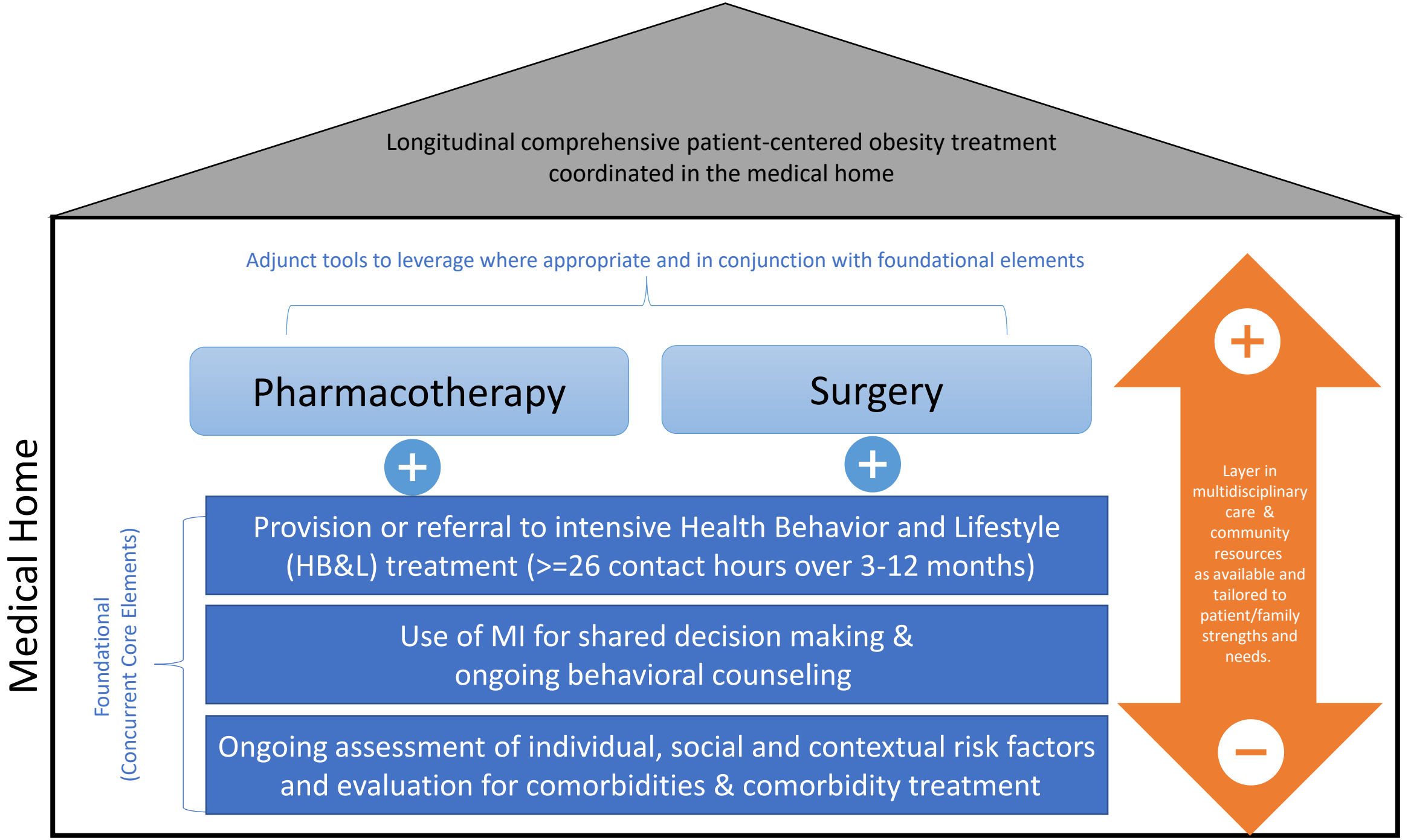
- Approved for weight loss 18+
- MOA
  - Norepinephrine, Mu opioid receptor antagonism
  - Controls cravings and addictive behaviors to food
- Side effects
  - Nausea, constipation, headache, vomiting, insomnia, dry mouth, diarrhea, suicidality, dizziness, dry mouth
- CI
  - Uncontrolled HTN, epilepsy, anorexia or bulimia, drug/alcohol withdrawal, MAOIs, long-term opioid use, pregnancy
- Dosing
  - Starting dose: 8mg/90mg daily x1 week
  - Maintenance dose: 32mg/360mg
  - Not useful if on a high fat diet (bioavailability)

Buproprion

- Approved for Depression 16+, smoking cessation 18+
- Uses
  - ADHD, smoking cessation, obesity, and sexual disorders
- MOA
  - Dopamine and norepinephrine reuptake inhibition
  - Antagonist of nicotinic acetylcholine receptors
- Side Effects
  - Seizures, bulimia, exacerbation of anxiety
- Dosing
  - Start at 75-100 mg once daily; can increase to effect
  - Typical effective dose 150-300 mg daily

Naltrexone

- Approved for Alcohol and Opioid Use Disorder 18+
- Uses
  - Pruritis, Binge Symptomatology
- MOA
  - Mu opioid receptor antagonism
- Side Effects
  - Cannot use if on narcotics as is a partial agonist and will go into withdrawal/decrease effectiveness
- Dosing
  - 50mg tablets (may start with ½ tab 25mg)
  - Can go up to 300 mg daily


Longitudinal comprehensive patient-centered obesity treatment coordinated in the medical home
Medical Home
Adjunct tools to leverage where appropriate and in conjunction with foundational elements
Pharmacotherapy
Surgery
+
+
Foundational (Concurrent Core Elements)
Provision or referral to intensive Health Behavior and Lifestyle (HB&L) treatment (>=26 contact hours over 3-12 months)
Use of MI for shared decision making & ongoing behavioral counseling
Ongoing assessment of individual, social and contextual risk factors and evaluation for comorbidities & comorbidity treatment
+
Layer in multidisciplinary care & community resources as available and tailored to patient/family strengths and needs.
−

Surgical Management

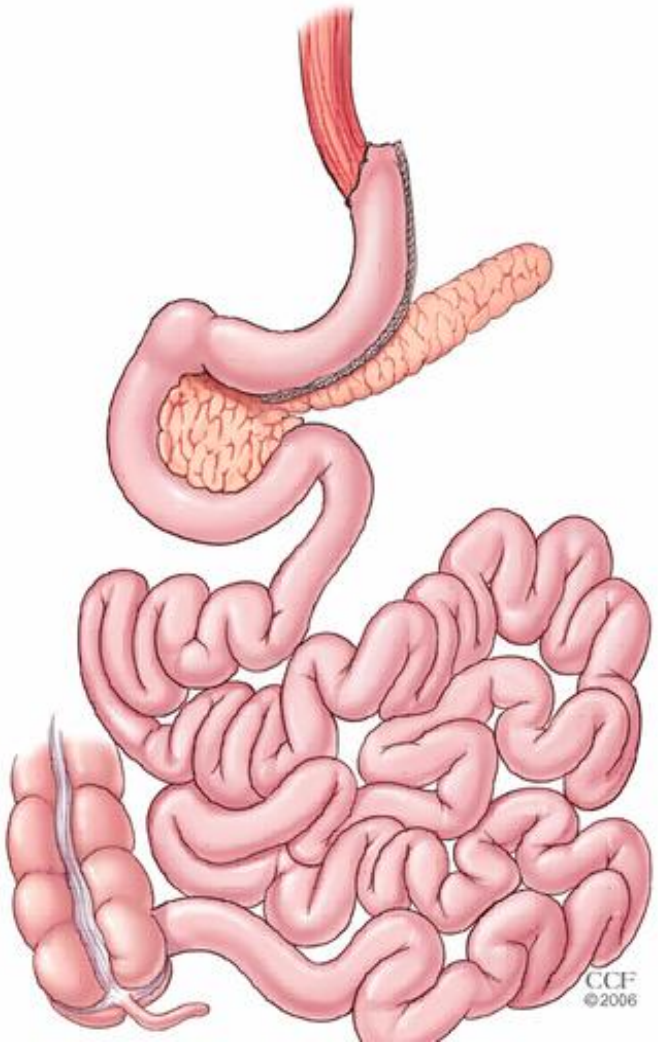
- 10+ years of age
- BMI ≥120% p95 or a BMI 35+ with an additional complication
  - Hyperlipidemia, HTN, insulin resistance, T2DM, decreased HRQoL (Health related Quality of Life), OSA, GERD, NAFLD, orthopedic complications, or IIH (Idiopathic Intracranial Hypertension)
- BMI ≥140% p95 or a BMI of 40+ without additional comorbidity

Pratt JSA, et al. 7, Jul 2018, Surg Obes Relat Dis, Vol. 14, pp. 882-901
Armstrong SC, et al; Pediatric Metabolic and Bariatric Surgery: Evidence, Barriers, and Best Practices. Pediatrics. 2019 Dec;144(6)

Presurgical Preparations

- 6-12 months of weight management (“Surgery School”)
  - •Variable process for families
  - •Adjusted to their needs
- Informed consent
  - •Postop requirements, water, vitamins, diet, visits, CPAP
  - •Experience and complication rate of surgeon
- Psychological, exercise and dietary evaluation
- Dietary treatment and preparations
- Stable support system

Sleeve Gastrectomy



- Restrictive
- Similar weight loss to RNYGB
- No anastomoses
  - Can get staple line bleeding (most common) or leaks
- Not reversible
- Can have vitamin deficiencies
- Higher early complication rate than Band

Body weight change after gastric bypass in Adults and Teens

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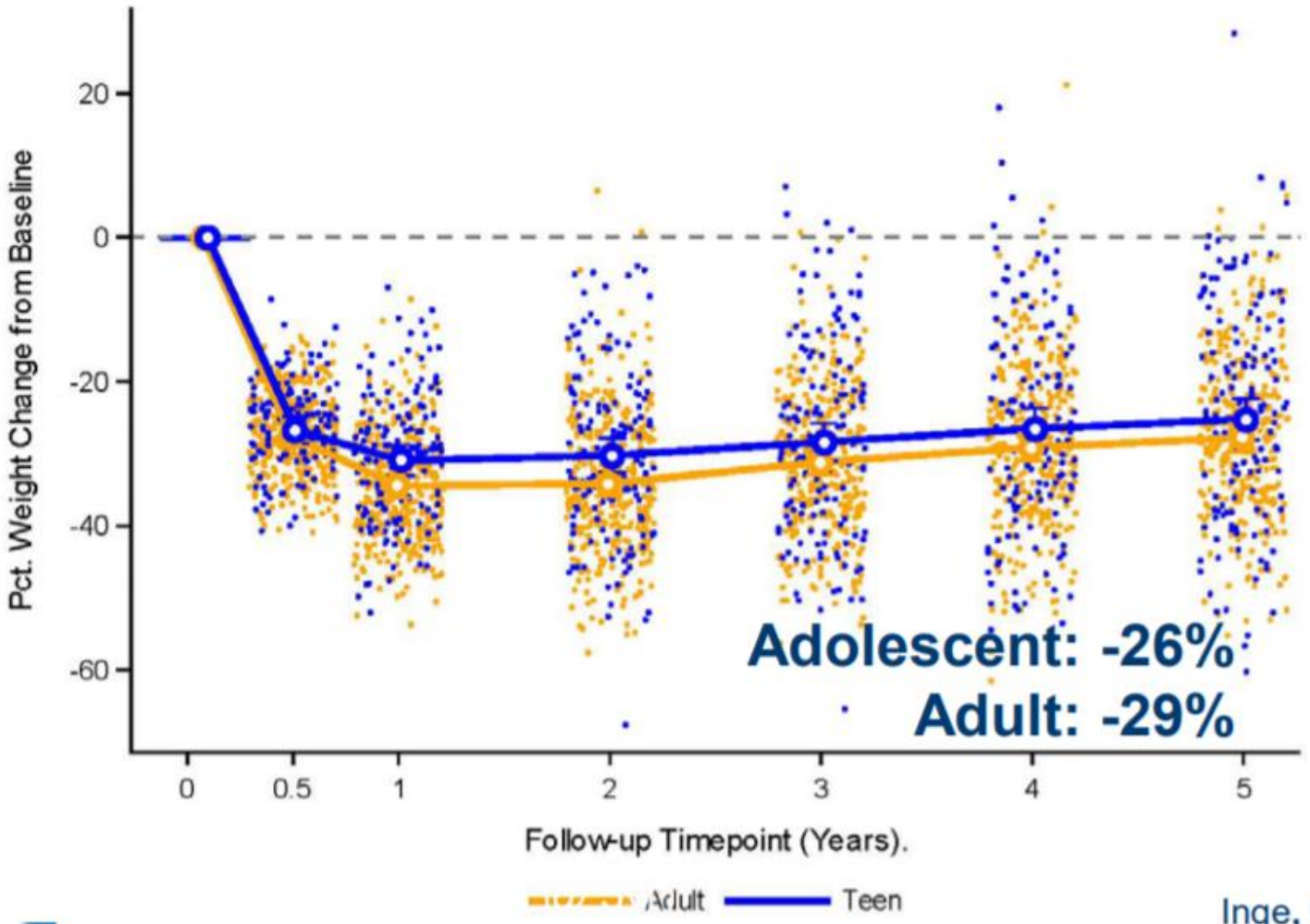


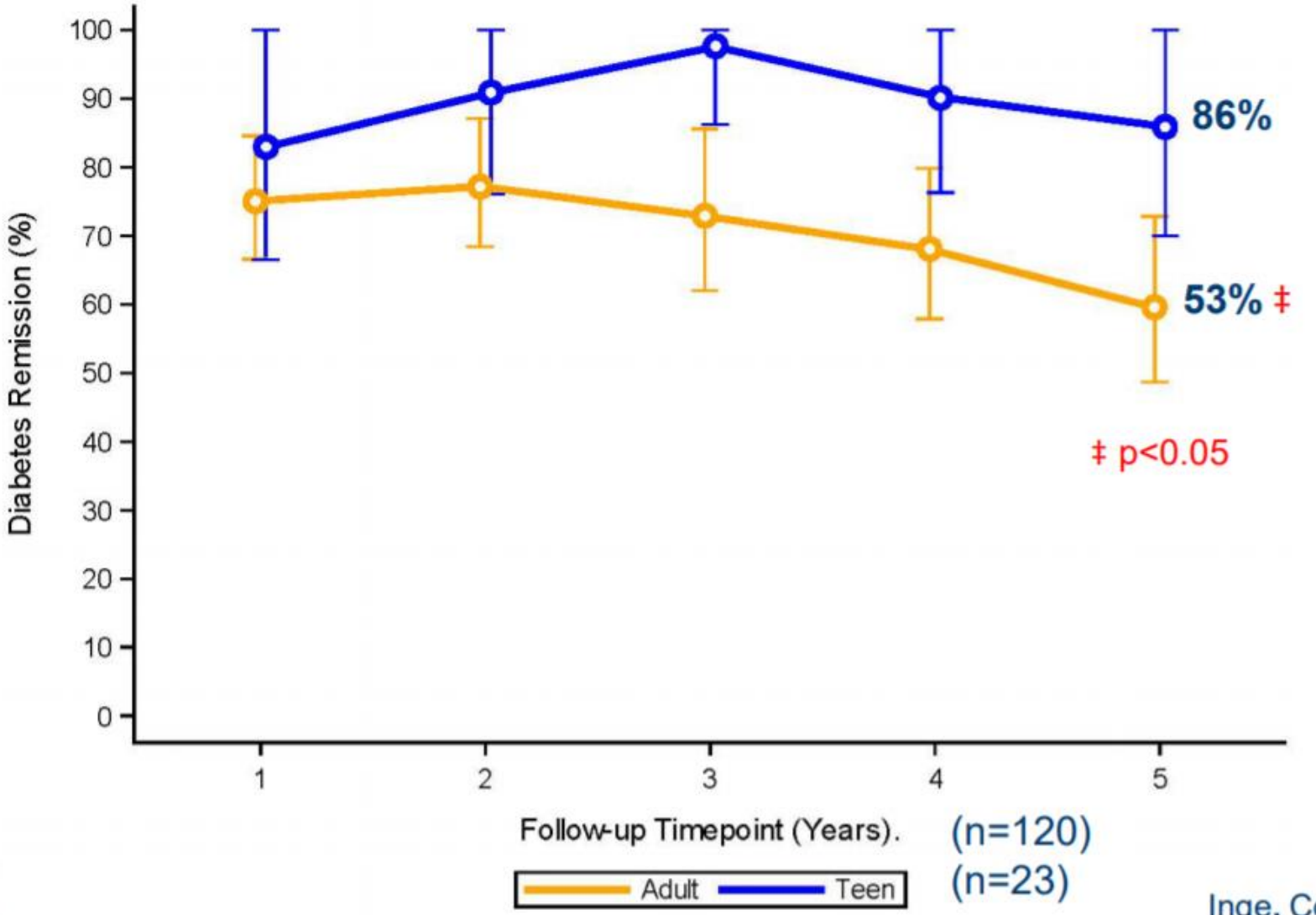
Adolescent:
n=165, age 13-19yrs

Adult:
n=396, ages ≥ 25-60yrs

All gastric bypass

Inge, Courcoulas, Jenkins, Michalsky, et.al. *NEJM* 2019; 374:113-123

Diabetes remission



Greater Benefit for Teens!

Inge, Courcoulas, Jenkins, Michalsky, et.al. *NEJM* 2019; 374:113-123

Post-Operative Care

- Close contact and monitoring
  - Water intake
    - 100-150 oz daily
  - Protein intake
    - Work up to 3 shakes daily over the 2 weeks (90 g)
  - Diet advancement at 2 weeks, 1 month, and 2 months
  - Medical care
    - CPAP, Sleep, Pain, Activity, Heartburn
    - Symptoms of fullness, vomiting, fear of drinking and eating
    - Taking medicines and vitamins
    - Keeping appointments

Complications

- Anastomotic leak
- Small bowel obstruction
- Stricture
- Incisional Hernia
- Vitamin/Mineral Deficiencies
- DVT/PE
- Bleeding
- Marginal Ulcer
- Gallstones
- Hypoglycemia

"This CPG supports early treatment at the highest level of intensity appropriate for and available to the child. It is hoped that pediatricians and other PHCPs, health systems, community partners, payers, and policy makers will recognize the significance and urgency outlined by this CPG to advance the equitable and universal provision of treatment of the chronic disease of obesity in children and adolescents. – CPG"

Questions?

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Center for Children's Healthy Lifestyles & Nutrition

5 KEY PROGRAMMATIC AREAS

41
FACULTY

5
CLINICAL PROGRAMS

$50,250,243
2019 TOTAL GRANT AWARDS

KU MEDICAL CENTER The University of Kansas | Children's Mercy KANSAS CITY

How to explain setpoint/physiology to family

- It is common for people coming to the weight management clinic to have experienced little improvement in weight status despite trying to lose weight.
- This is because each person has a body weight set point, where the body maintains and defends this weight status.
  - In obesity, the set point is too high.
  - So, when a child tries to make changes in eating or activity to lose weight, the body tries to resist the weight loss to defend the set point and this leads to increases in hunger.
- Many factors play a role in the setpoint including genetics, age, metabolism and even stress. You can see that carrying extra weight is a complex condition and it's not anybody's fault.

Phenotyping

- Homeostatic Eating
  - Hunger (desire to eat)
  - Satiation (calories needed to reach fullness)
  - Satiety (duration of fullness)
- Hedonic Eating
  - Desire to eat to cope with emotions (negative or positive)
- Energy Expenditure
  - REE
  - NEAT
  - Thermogenic effect of food and exercise

Hyperphagia	Overeating/Feasting	Binge eating
Stealing food	Sneaking	Eating alone
Waking at night to eat	Eating large meals, seconds	Large portions, specific foods
Constant uncontrolled hunger/eating	No true loss of control	Unable to stop/bottomless pit
No feelings of guilt	+/- guilt	Guilt after eating
Eating food from trash	Lack of satiety, satiation	Eat past fullness
Breaking cabinets/locks	Increased hunger signals	Average 1 episode/wk x 3 mo
Beh dysregulation with limits		Body Dysmorphism
Constant food focus		

Eating Disorders and Obesity

- Screening and monitoring is necessary in the context of treatment
- Increased risk of eating disorder in children with obesity
  - 9.3% vs 2.1% in males
  - 20.2% vs 8.4% in females
- Decreased risk of eating disorder after formal weight management
  - Metanalysis of 30 studies

Jebeile H, et al. Obes Rev 2021; 1-10.

Obesity and ED treatment (AAP)

Motivational interviewing

Focus on family-based lifestyle modification

- MY PLATE
- Screen time
- Family meals
- Discourage dieting and talk about weight at home
- Promote healthy body image
- Inquire about bullying and mistreatment episodes

If suspected:

- Refer to multidisciplinary team
- Look for high risk activity and physical findings, monitor weight

Horberger LL, et al. Pediatrics 2021; 147 (1).

Assessment tools

- Eating Behavior Assessments
- Binge Eating Screening
- Mental Health Assessments
  - PHQ-9A
  - GAD-7
  - Vanderbilt
- Psychosocial Assessments
  - Food insecurity
- Family History
- Review of Systems
- Physical Examination
- Laboratory Evaluation

Food insecurity: Hunger Vital Sign™

- An easy two question screening tool developed by Children's Healthwatch:
  - Within the past 12 months, we worried whether our food would run out before we had money to buy more.
  - Within the past 12 months, the food we bought just didn't last and we didn't have money to get more.
- Is this often true, sometimes true, or never true?
  - Often true or sometimes true, identifies as food insecure.