The Assessment and Treatment of Pediatric Obesity

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Bethesda, MD
27 April 2023

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Capt. Emerick is a native of Cresson, Pennsylvania. She attended the United States Naval Academy, earning a Bachelor of Science Degree in Chemistry in 1996. She earned her medical degree from the Uniformed Services University of the Health Sciences in 2000.

Captain Emerick is currently an Associate Professor of Pediatrics at the Uniformed Services University of the Health Sciences (USUHS) where she is able to further expand her research in pediatric obesity and teaches extensively in multiple courses for both medical and nurse practitioner students. Continuing her track record as an exemplary multi-faceted Medical Corps Officer, she also serves as the Reproduction and Endocrinology Module Director at USUHS, coordinating and optimizing 8 weeks of curriculum for second year medical students.

Captain Emerick is board certified in Obesity Medicine, Pediatrics and Pediatric Endocrinology and is a Fellow of the American Academy of Pediatrics. Her personal awards include the Defense Meritorious Service Medal, Joint Commendation Medal, Navy and Marine Corps Commendation Medal (two awards), Army Commendation Medal, Joint Achievement Medal, and the Navy and Marine Corps Achievement Medal.

Disclosures:

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Learning Objectives

By the end of this lecture, the participants should be able to:

1. Discuss the effect of childhood obesity on the United States Armed Forces.
2. Diagnose overweight, obesity and severe obesity and discuss the diagnosis with non-stigmatizing language.
3. Screen for appropriate co-morbidities.
4. Develop an appropriate treatment plan for patients with obesity.

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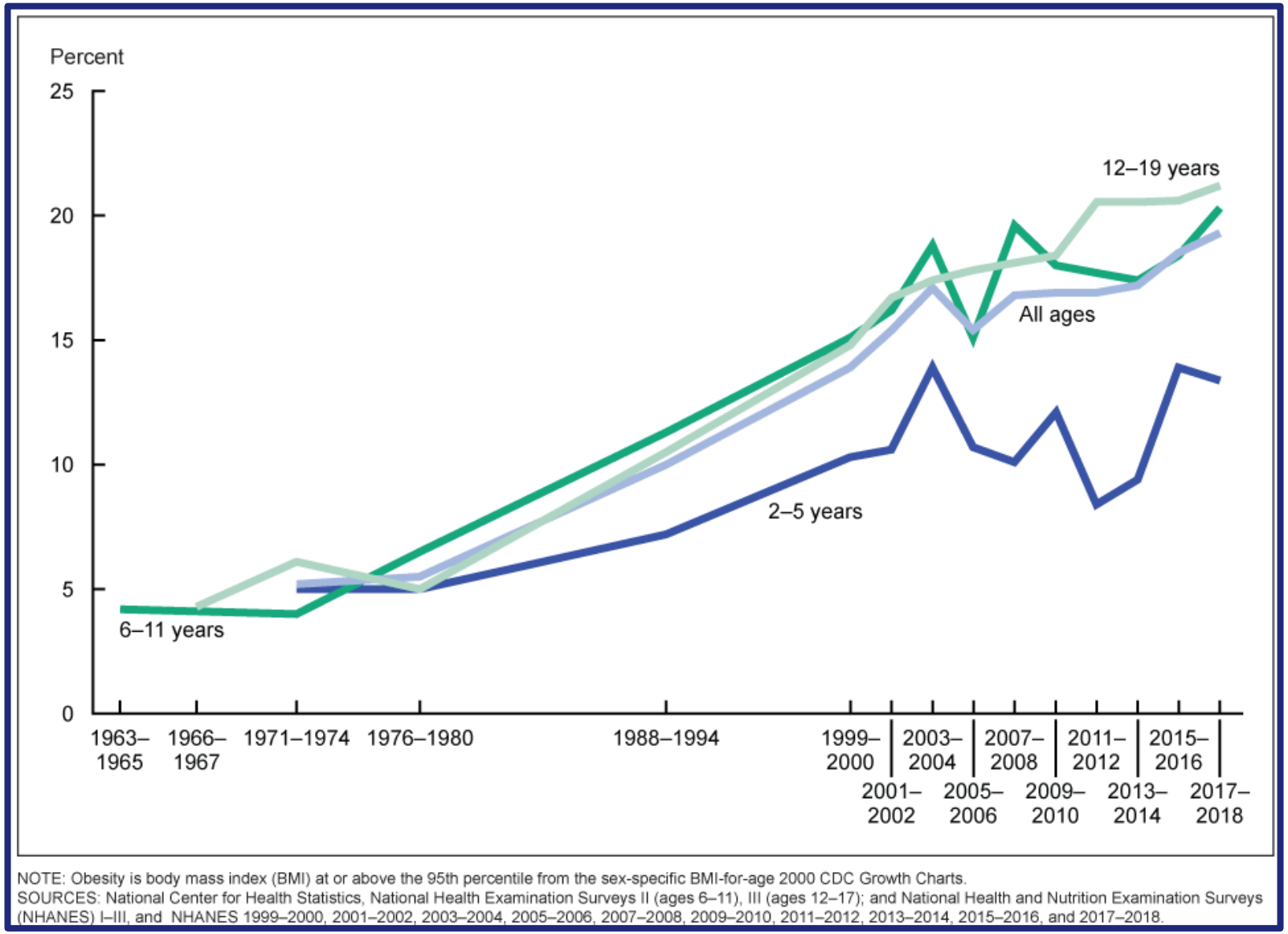
“The Epidemic”

Percentage of US children and adolescents affected by obesity has more than tripled over 4 decades.

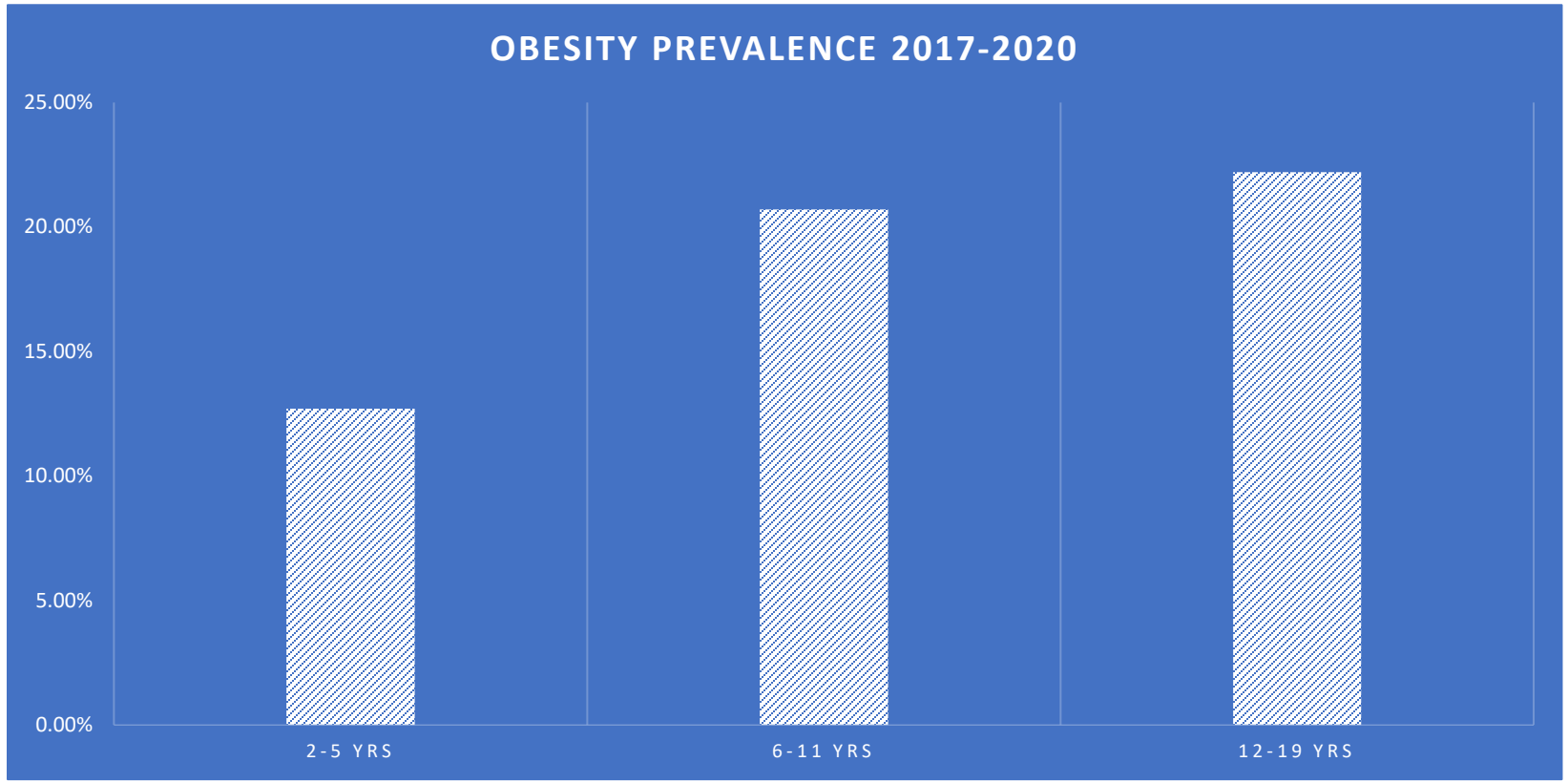
1963-1965 – 5%

2017-2018 – 19%



(Fryer et al., 2020)

Obesity Prevalence Increases with Age



(Stierman et al., 2020)

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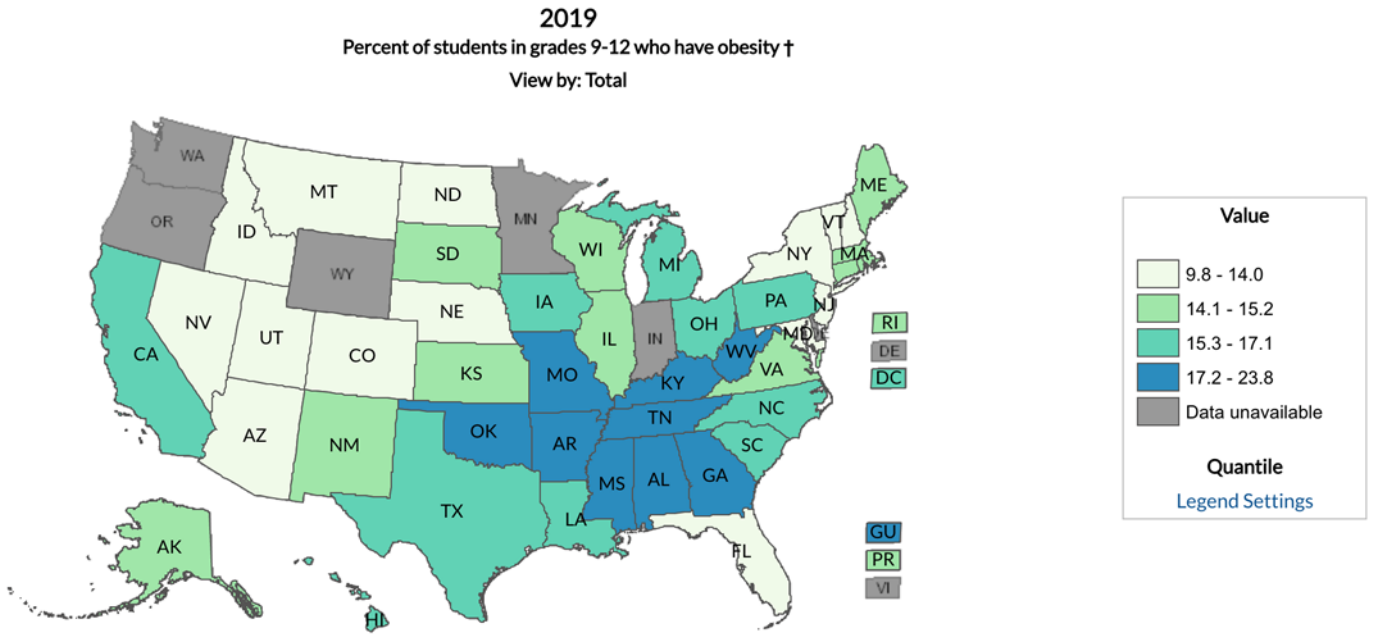
EPIDEMIOLOGY

Disparities include:

- Lower parental education
- Lower income
- Less access to healthy food options
- Low access to physical activity
- Higher incidence of adverse childhood experiences (ACEs)



(cdc.gov/nccdphp/dnpao/data-trends-maps/index.html, 2019)

Rising prevalence:

- Non-Hispanic Black
- Mexican American youth

(Ogden et al., 2020)

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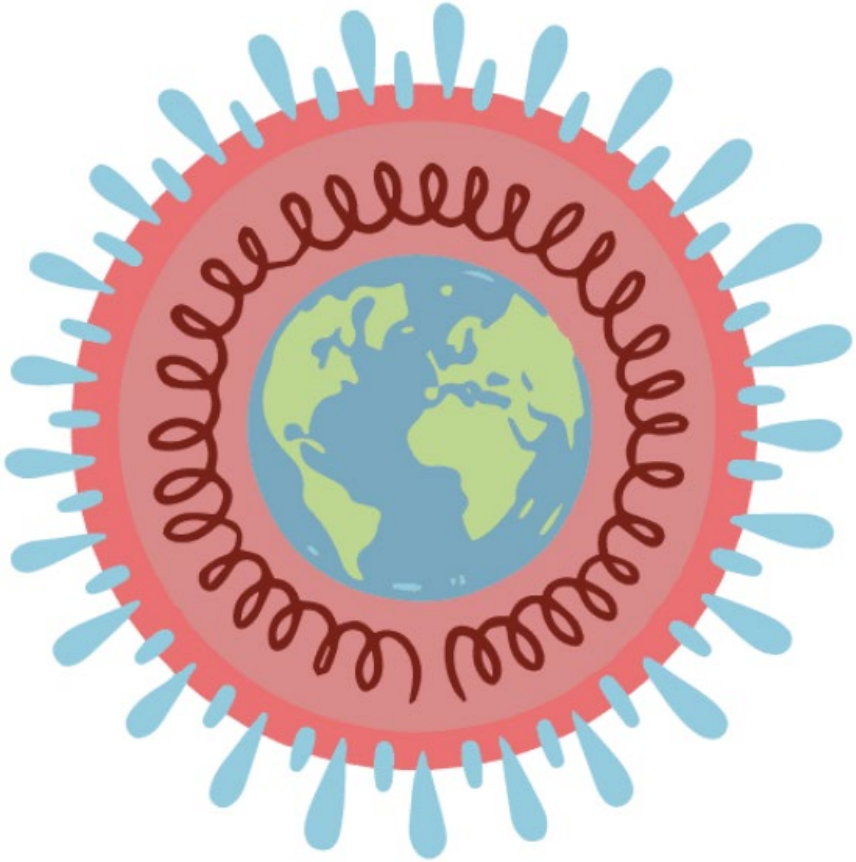
COVID PANDEMIC?

- Cohort of 432,302 persons
- 2–19 years of age
- Rate of body mass index (BMI) increase approximately doubled during the pandemic compared to a prepandemic period
- Largest Increase:
  - Persons with prepandemic overweight or obesity
  - Younger school-aged children

(Lange et al., 2020)



(innovativegenomics.org, n.d.)

UNFIT TO SERVE

OBESITY AND PHYSICAL INACTIVITY ARE IMPACTING NATIONAL SECURITY

THE PROBLEM

Approximately **1 in 5 children** and **2 in 5 adults** in the United States have obesity.

Just over **1 in 3 young adults** aged 17-24 is too heavy to serve in our military.

Among the young adults who meet weight requirements, **only 3 in 4** report physical activity levels that prepare them for challenges in basic training.

Consequently, only 2 in 5 young adults are both weight-eligible and adequately active.

"The military has experienced increasing difficulty in recruiting soldiers as a result of physical inactivity, obesity, and malnutrition among our nation's youth. Not addressing these issues now will impact our future national security."

Mark Hertling, Lieutenant General, U.S. Army (Retired)

(cdc.gov/physicalactivity/resources/unfit-to-serve/index.html, n.d.)

Military Connected Youth

- 1% of the US population serves in the military
- 25% of those who serve have a parent who also served
- 44% of military connected teens intend to enlist in the future
- 18% intend to enlist directly after high school graduation

(Photo courtesy of Capt. Emerick)

(Joint Advertising Market and Research Studies (JAMRS), 2013)
(National Military Family Association (NMFA), 2022)

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Caring for Military Connected Youth

- Pediatric practitioners are champions of preventive medicine
- We aim to optimize the health of our nation's greatest natural resource
- The most common chronic disease of childhood (**AKA obesity**) is challenging to treat

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Making the Diagnosis

- Overweight: BMI > 85% and < 95% for age and sex
- Obesity: BMI > or equal to 95% for age and sex

- Class 1 Obesity: > 95%
- Class 2 > 120% of the 95%
- Class 3 >140% of the 95%

- Severe obesity = Class 2 or 3 → comorbidities more likely

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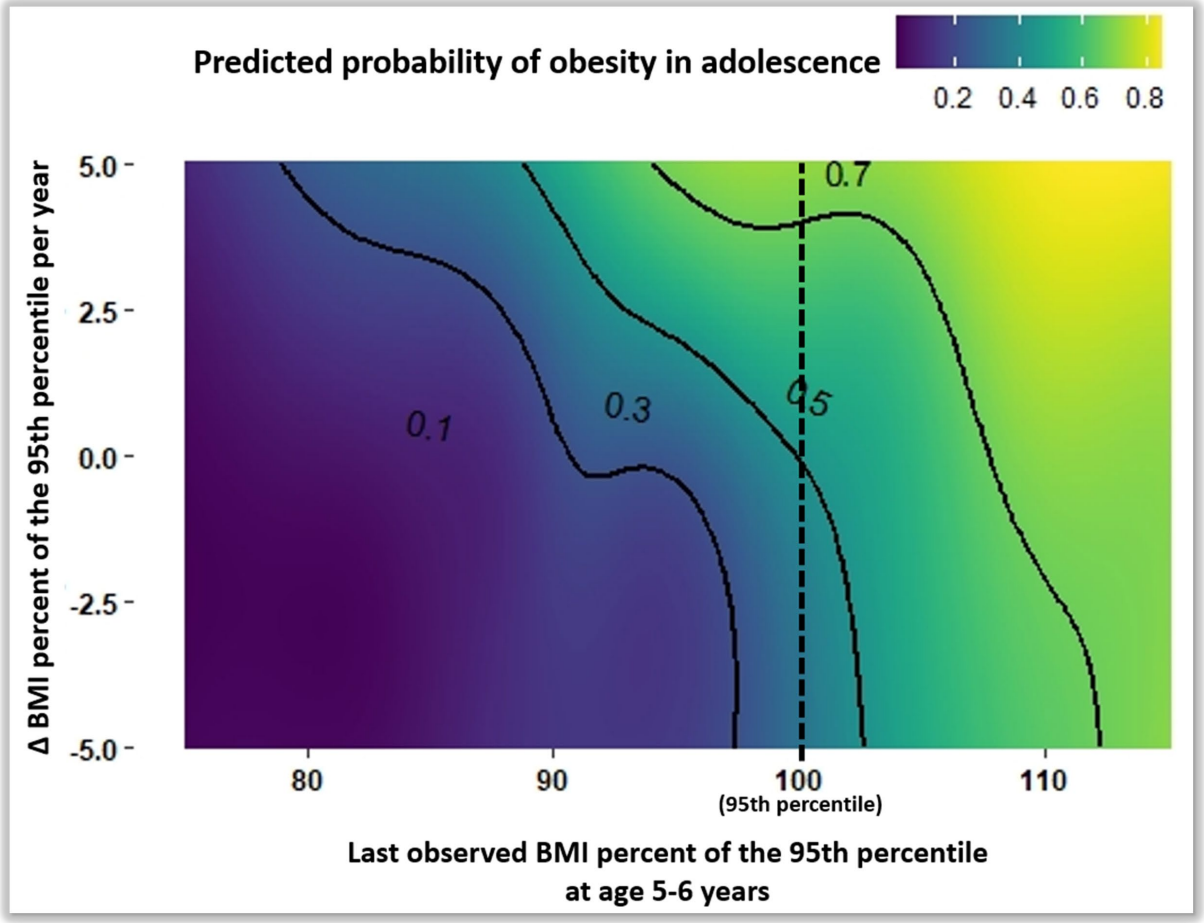
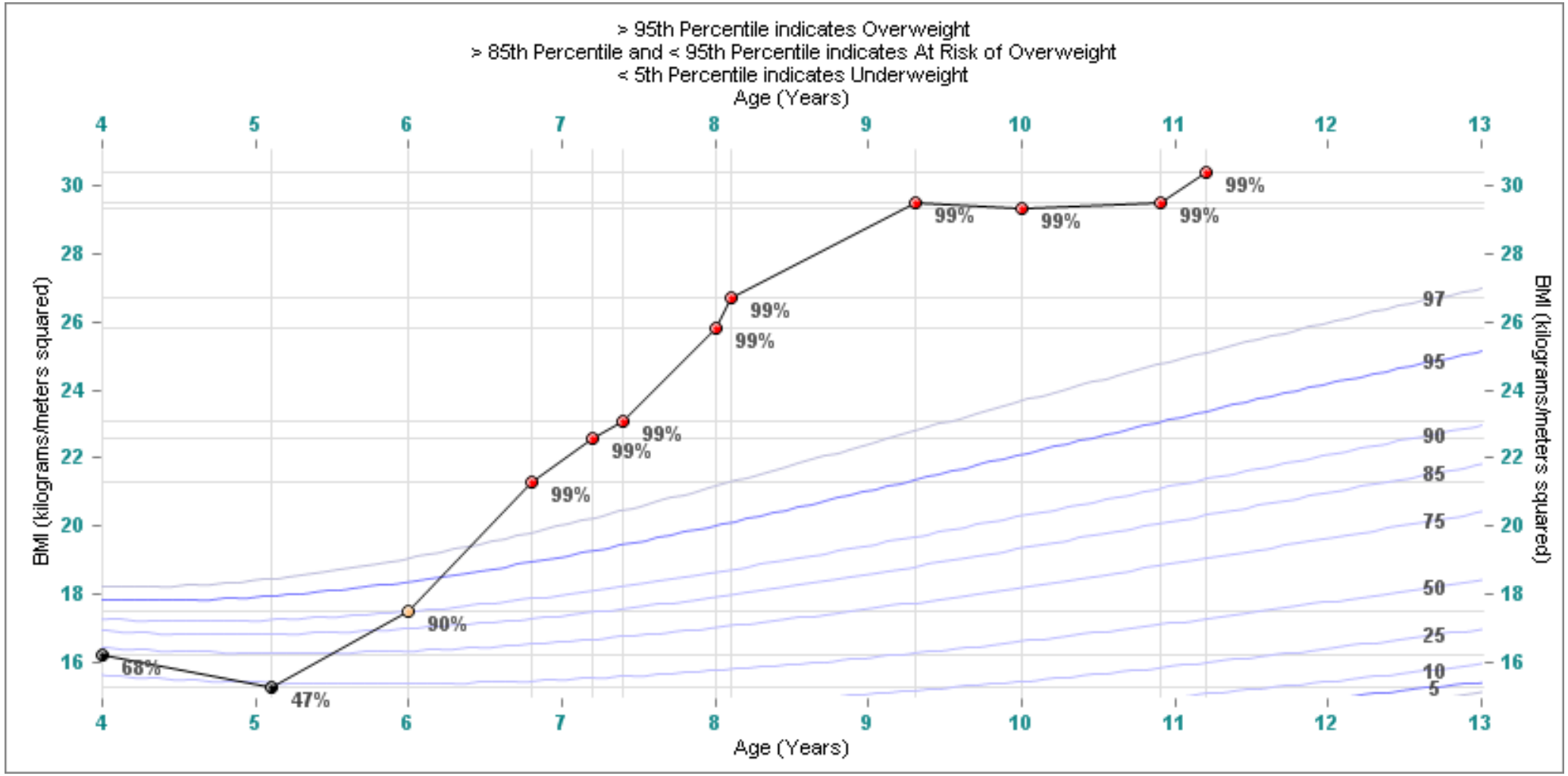
How young is too young?

- 4,941 MHS children
- 10 BMI points between ages 2 and 6 and one between ages 12-15 years
- Obesity at 2-3 yrs → 41.6% had adolescent obesity
- Obesity at 5-6 yrs → 70% had adolescent obesity



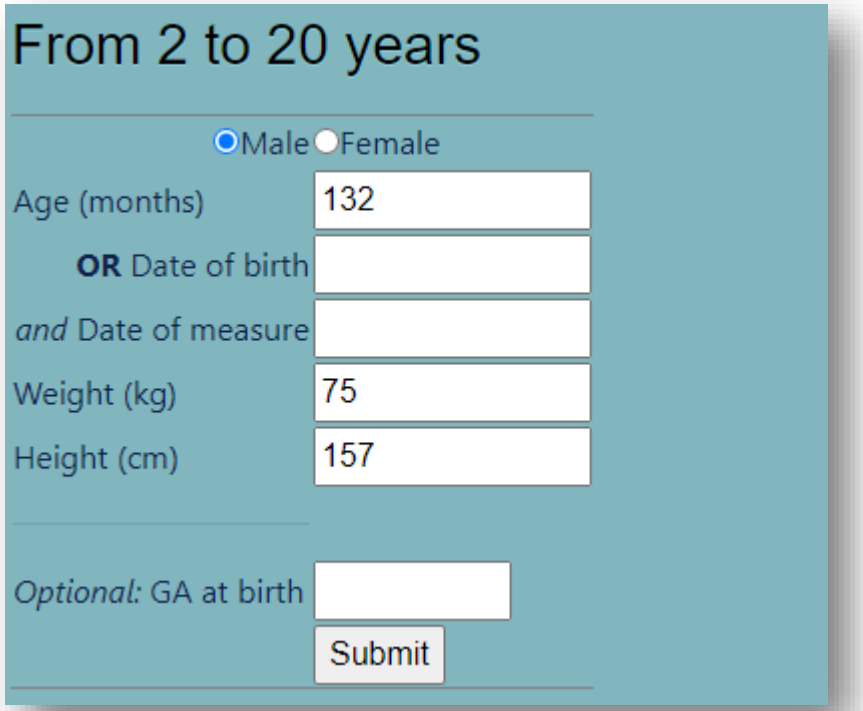
(Jiang et al., 2023)

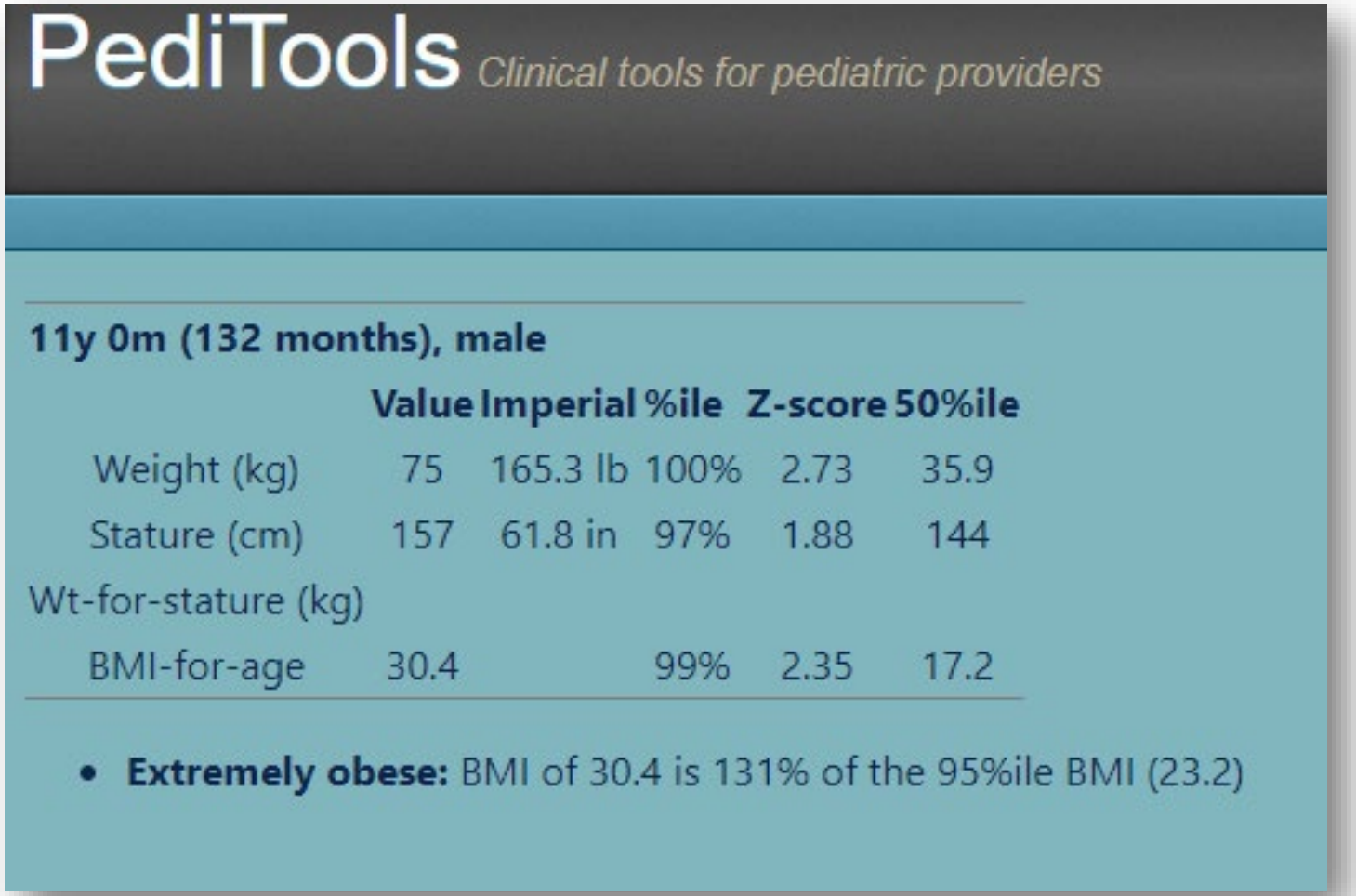
Case: 11 y/o male - well visit



(Jiang et al., 2023)

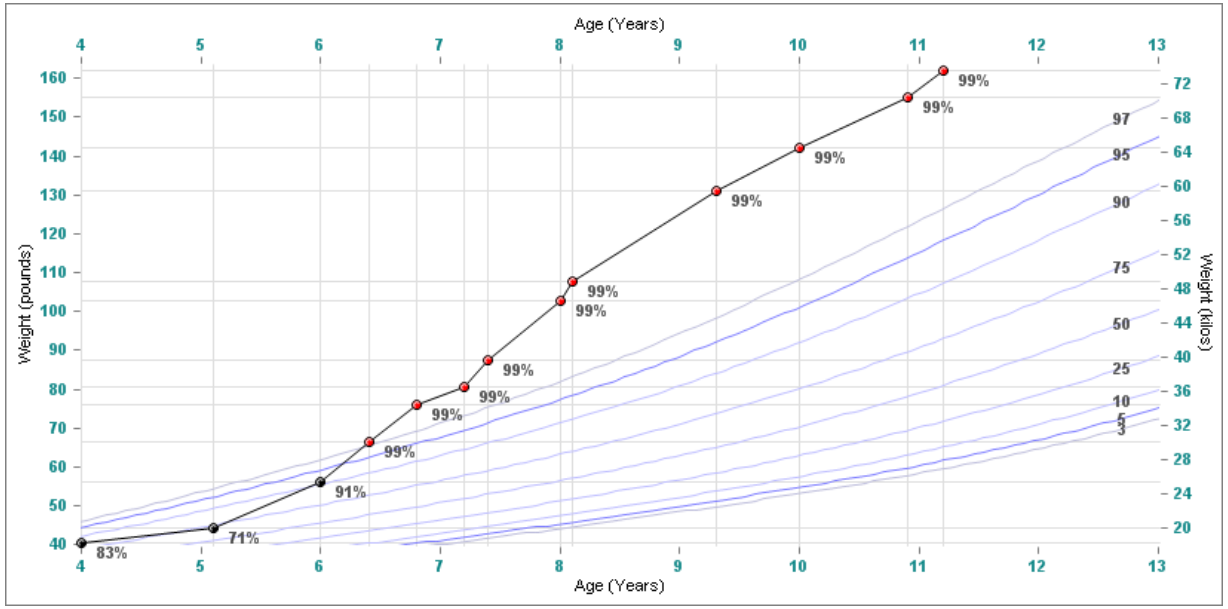
PediTools



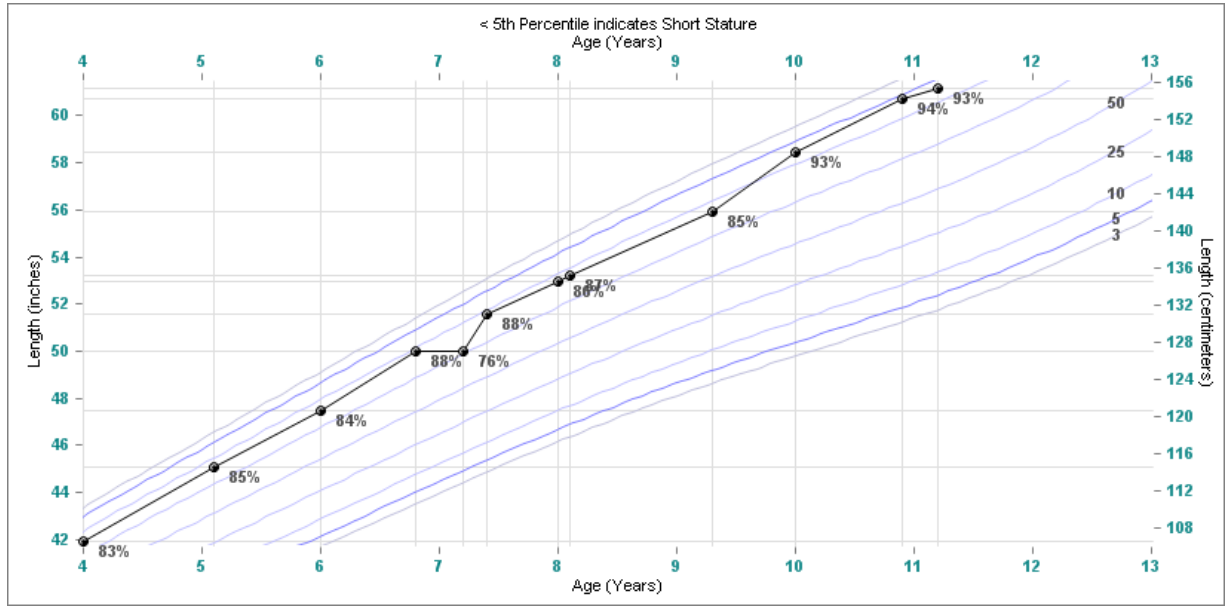


(PediTools.org, n.d.)

Obesity Etiology?



Weight for Age



Height for Age

Endocrine Etiology?

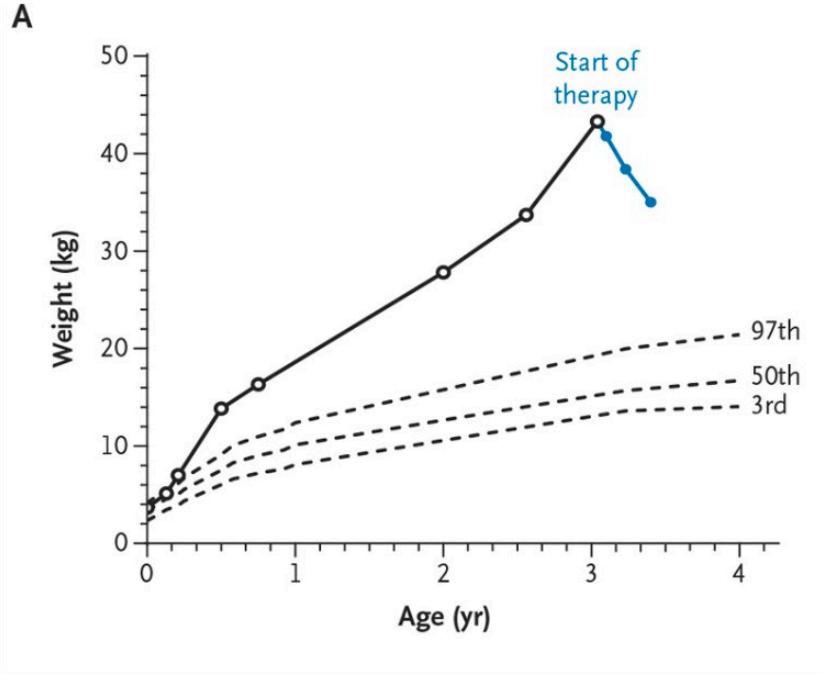
Monogenetic/Syndromic Obesity?

(Jiang et al., 2023)

Rare Genetic forms of Obesity

- Monogenetic Obesity
  - Rare
  - Severe/Early onset (prior to age 5)
  - Abnormal feeding behaviors
  - Enocrine disorders

- Syndromic Obesity
  - Cognitive impairment
  - Dysmorphic features
  - Organ- specific developmental abnormalities



(Wabitsch et al., 2015)

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TABLE 2 Genetic Syndromes Associated With Obesity

Genetic Syndrome	
Monogenetic disorders	
MC4R deficiency	Increased lean body mass, accelerated linear growth. Hyperinsulinemia. May have lower blood pressure.
Leptin deficiency	Normal linear growth with reduced adult height. Rapid-onset obesity with hypothalamic dysfunction (hypogonadotropic hypogonadism, hypothyroidism). Alterations in immune function. Responsive to leptin treatment.
Leptin receptor deficiency	Normal linear growth with reduced adult height. Rapid-onset obesity with Hypothalamic dysfunction (hypogonadotropic hypogonadism, hypothyroidism). Alterations in immune function. Not responsive to leptin therapy.
POMC deficiency	Accelerated childhood growth. Adrenocorticotropic hormone deficiency, mild hypothyroidism. Red hair, light skin (in non-Hispanic white individuals).
Proprotein subtilisin or kexin type 1 deficiency	Failure to thrive in early infancy. Hypoglycemia, adrenocorticotropic hormone deficiency. Intestinal malabsorption, diarrhea.
SRC1 deficiency	Impaired leptin-induced POMC expression.
Syndromic forms of obesity	
Prader-Willi syndrome	In neonatal period poor feeding, failure to thrive, and hypotonia. By 4–8 y, hyperphagia with food impulsiveness. Short stature. Growth hormone deficiency, hypogonadism. Dysmorphia, intellectual disability, behavioral difficulties.
Alstrom syndrome	Short stature. Insulin resistance, T2DM, hypogonadism, hyperandrogenism in females, hypothyroidism. Visual impairment, hearing loss, cardiomyopathy, hepatic dysfunction, renal failure.
Bardet-Biedl syndrome	Normal stature. Hypogonadism, polydactyly, retinal dystrophy, renal malformation, cognitive disabilities, polyuria, and polydipsia.
Smith-Magenis syndrome	Short stature. Disrupted melatonin signaling. Craniofacial anomalies, intellectual disability, self-injurious behaviors, sleep disturbance.
SH2B1 deficiency	Hyperinsulinemia, delayed speech and language development, aggressive behavior.
Sim1 deficiency	Short stature. Hypopituitarism. Neonatal hypotonia, facial dysmorphism, developmental delay.
16p11.2 microdeletion syndrome	Developmental delay, intellectual disability, autism spectrum disorder, impaired communication, and socialization skills.
Brain derived neurotrophic factor deficiency	Hyperphagia, impaired short-term memory, hyperactivity, learning disability. Patients with Wilms tumor-aniridia (WAGR syndrome) have subset of deletions on chromosome 11p.12 including brain derived neurotrophic factor locus.
Albright's hereditary osteodystrophy	Short stature, round face, brachydactyly, subcutaneous ossifications. Some patients may have mild developmental delay. If inherited from the mother, may be associated with pseudohypoparathyroidism type 1a.
Cohen syndrome	Hypotonia, intellectual disability, distinctive facial features with prominent upper central teeth, broad nasal tip, smooth or shortened philtrum, thick hair and eyebrows, long eyelashes, retinal dystrophy, acquired microcephaly, joint hyperextensibility.
Beckwith-Wiedemann syndrome	Macrosomia, macroglossia, hemihyperplasia, anterior abdominal wall defects, visceromegaly, neonatal hypoglycemia, embryonal tumors, renal anomalies. Genetic alteration in chromosome 11p15.5.

Adapted from Pediatric Obesity-Assessment, Treatment, and Prevention: An Endocrine Society Clinical Practice Guideline.[268]

MC4R

MC4R – most common monogenic form of obesity

Effective therapy for many forms

History

- Meds: Zyrtec as needed
- Allergies: No known drug allergies
- Past Medical History (Hx): Seasonal allergies
- Past Surgical Hx: None
- Family Hx:
  - Mom: Obesity, Type 2 Diabetes Mellitus (T2 DM) and Hypertension (HTN)
  - Dad: Hyperlipidemia – on a statin since age 35 years
- Social Hx: L/w Mom and Dad
- Dev Hx: A student in 6th grade

0700: Wake up

0730: Breakfast - Pop tarts and 100% orange juice

0800: Bus to school

1100: Lunch - usually buys school lunch - likes the spicy chicken sandwich, tater tots and chocolate milk

1500: Home from school

Snack: Ramen noodles and a piece of fruit

Before dinner: Homework – 45 minutes, plays video games until dinner

1800: Dinner - mom cooks 5 nights a week, varied meals, fast food 2-3 times a week, likes ice cream for dessert

1845: Takes dog for 15 minute walk around neighborhood, then watches favorite shows until bed time

2130: Bed time - no problems, falling or staying asleep, no snoring

Physical Exam

- Weight 75 kg, Height 157 cm, BMI: 131% of the 95%, BP 134/83
- General: alert and interactive
- Head, ears, eyes, nose, throat (HEENT): normal
- Lungs: normal
- Cardiovascular (CV): normal
- Abdomen (ABD): normal
- Genitourinary (GU): NEMG, testes 3cc bilaterally with Tanner 1 PH (pre-pubertal)
- Skin: light, thin striae on flanks, mild acanthosis nigricans post. neck
- Back: no scoliosis
- Extremities: normal
- Neuro: no focal deficits, deep tendon reflexes (DTRs) 2 + bilaterally

Physical Exam

- Weight 75 kg, Height 157 cm, **BMI: 131% of the 95%, BP 130/86**
- General: alert and interactive
- HEENT: normal
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- EXT: normal
- Neuro: no focal deficits, DTRs 2 + bilaterally

Problem List

(pixaby.com, n.d.)

- Stage 2 Obesity
- Concern for hypertension
- Acanthosis Nigricans

- Other possible co-morbidities?
  - Nonalcoholic fatty liver disease (NAFLD)
  - Diabetes
  - Hypercholesterolemia
  - Depression/Anxiety/Disordered Eating

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Talking About Obesity

(creazilla.com, n.d)

- How do you start the conversation?

- 3 steps to non-stigmatizing communication about weight

1. **Ask permission** to discuss weight/BMI

2. **Use** words perceived as neutral: unhealthy weight, gaining too much weight for age, height or health.
   Avoid: obese, morbidly obese, large, fat, overweight, chubby

3. **Use** person first language
   Example: Patient with obesity **NOT** obese patient

(Hampl et al., 2023)

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What Parents Want: Talking About Obesity

349 children (ages 3-17 years) seen at WRNMMC for well visits

71.6% of parents accurately described their child's weight

Of children with overweight or obesity **84%** of parents underestimated the child's weight

76.4% of children with overweight and **39.0% of children with obesity** were perceived as having a **healthy weight** or being underweight

57.5% of children with obesity were perceived as overweight rather than obese

Only 3.5% of children with obesity were accurately described by their parents

(Faircloth et al., 2019)

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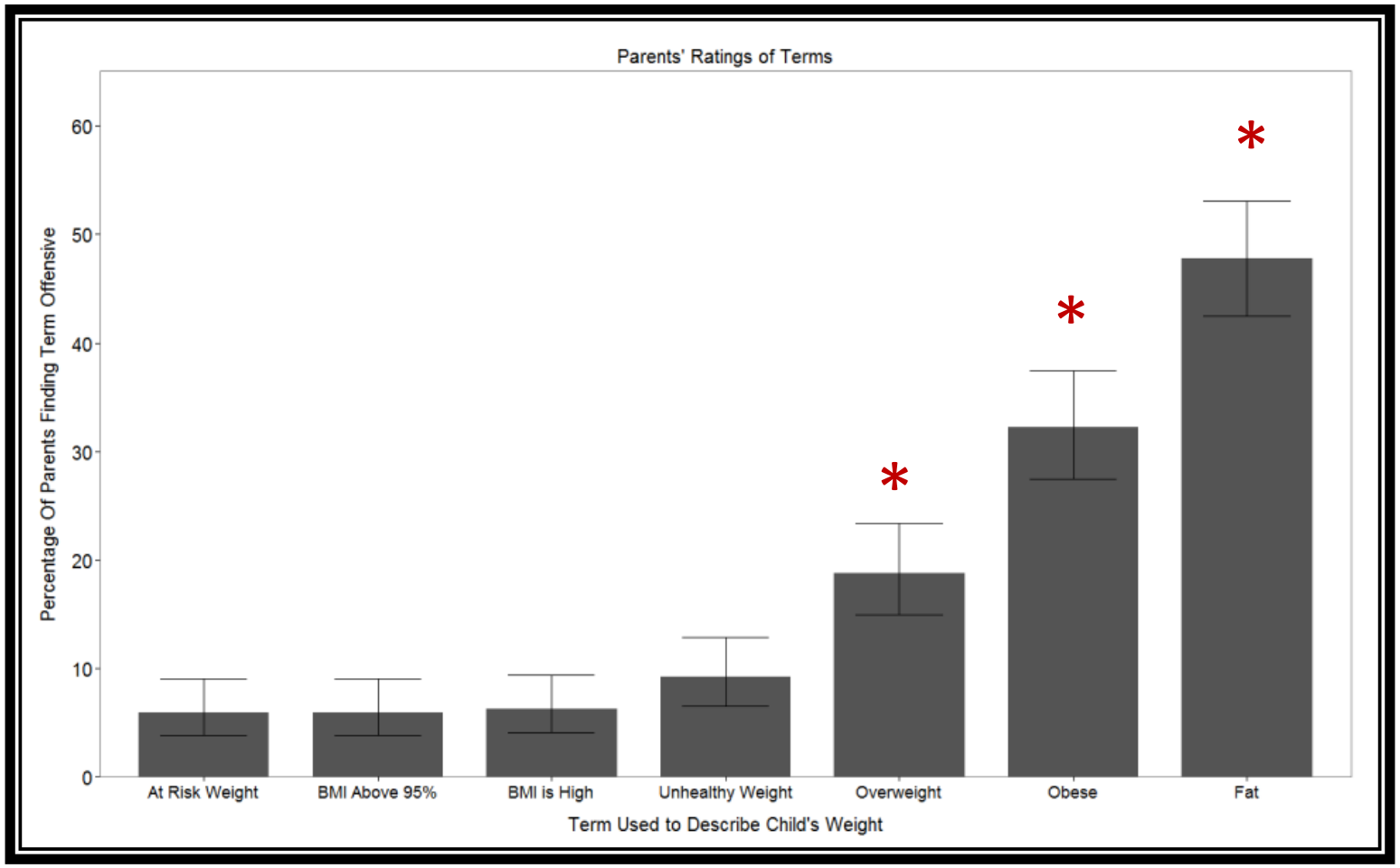
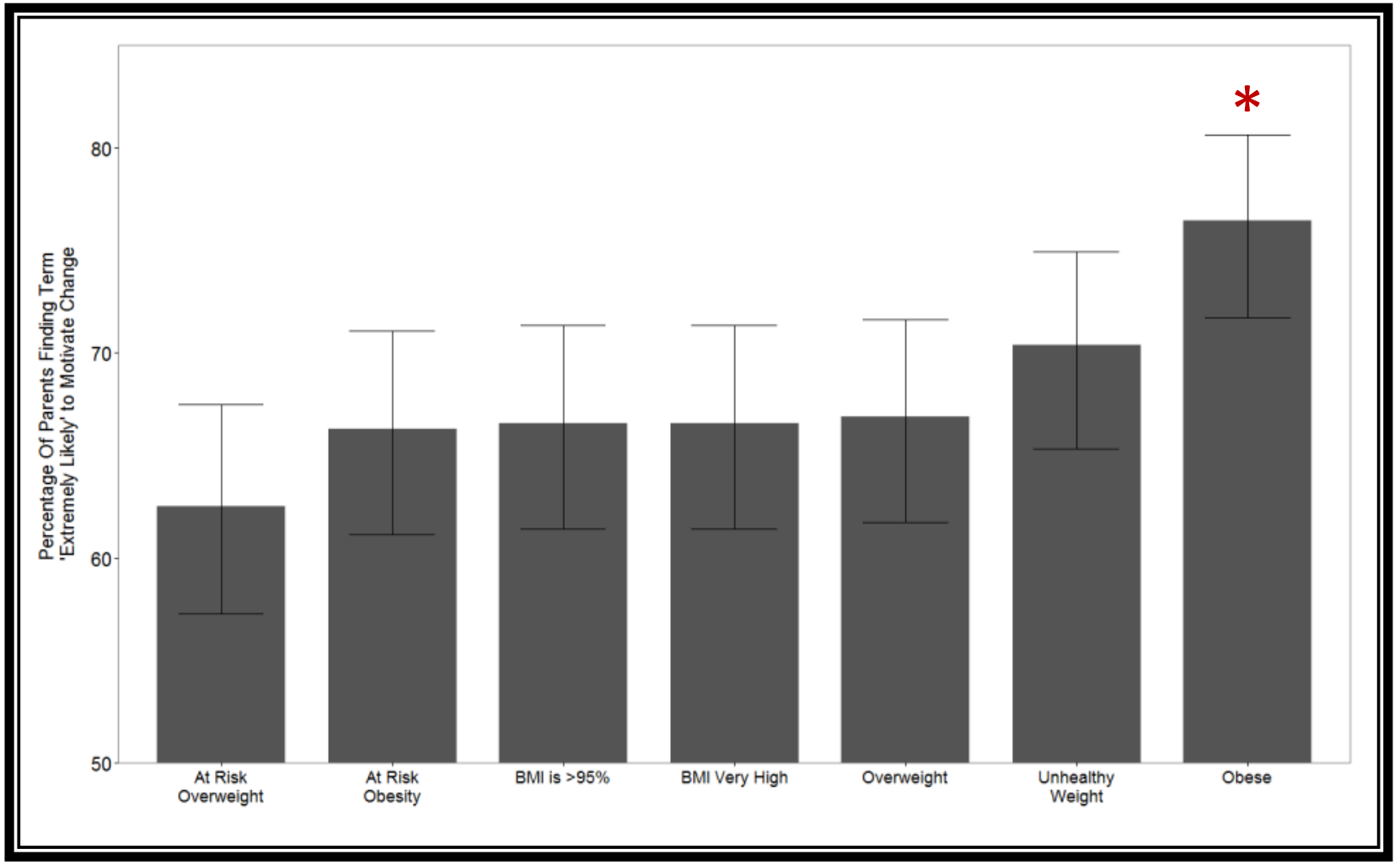
Parent Offensiveness Rating



(Faircloth et al., 2019)

* $P < 0.001$

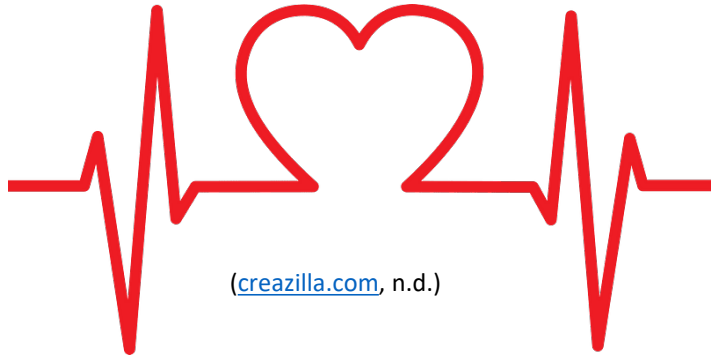
Motivating Terminology



(Faircloth et al., 2019)

* $p < 0.001$

Comorbidity Screening - Hypertension



(creazilla.com, n.d.)

- Frequency: every visit after age 3 for children with overweight and obesity

TABLE 12 BP Categories by Age and Number of Visits Needed for Diagnosis

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] NA, not applicable.

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Blood Pressure

Blood Pressure Levels for Boys by Age and Height Percentile (Continued)

Age (Year)	BP Percentile ↓	Systolic BP (mmHg) ← Percentile of Height →							Diastolic BP (mmHg) ← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
11	50th	99	100	102	104	105	107	107	59	59	60	61	62	63	63
	90th	113	114	115	117	119	120	121	74	74	75	76	77	78	78
	95th	117	118	119	121	123	124	125	78	78	79	80	81	82	82
	99th	124	125	127	129	130	132	132	86	86	87	88	89	90	90
12	50th	101	102	104	106	108	109	110	59	60	61	62	63	63	64
	90th	115	116	118	120	121	123	123	74	75	75	76	77	78	79
	95th	119	120	122	123	125	127	127	78	79	80	81	82	82	83
	99th	126	127	129	131	133	134	135	86	87	88	89	90	90	91
13	50th	104	105	106	108	110	111	112	60	60	61	62	63	64	64
	90th	117	118	120	122	124	125	126	75	75	76	77	78	79	79
	95th	121	122	124	126	128	129	130	79	79	80	81	82	83	83
	99th	128	130	131	133	135	136	137	87	87	88	89	90	91	91

(nih.gov, n.d.)

Our Patient: 134/83 = concern for Stage 1 Hypertension – needs confirmed at 2 other checks

Comorbidity Screening: Obstructive Sleep Apnea (OSA)

- Sleep History
  - Snoring
  - Daytime somnolence
  - Nocturnal enuresis
  - Morning headaches
  - Inattention

- Polysomnogram for children and adolescents with obesity and one or more symptoms of disordered breathing

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Comorbidity Screening: Polycystic Ovary Syndrome (PCOS)

- Evaluate for:
  - Menstrual irregularities
  - Signs of hyperandrogenism
    - Hirsutism
    - Acne

Comorbidity Screening: Depression

- Monitor for symptoms of depression
- **Conduct an annual evaluation for depression for adolescents 12 years and older with a formal self report tool**
- Example: PHQ-9

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Comorbidity Screening: Orthopedic Conditions

- Blount's Disease:
  - Asymmetric tibia vara, tibial torsion, and precurvatum
  - Leg pain, abnormal gait with bowing of lower legs, leg length discrepancy
  - Monitor with serial radiographs every 6 months, ortho eval for surgery

- Slipped Capital Femoral Epiphysis (SCFE)
  - Hip or knee pain
  - External rotation with passive hip flexion, limitation of internal rotation, antalgic gait
  - Treatment: No weight bearing, get to a surgeon!

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Comorbidity Screening: Idiopathic Intracranial Hypertension (IIH)

- Maintain high index of suspicion for IIH
  - New onset or progressive headaches
  - With significant weight gain
  - More common in females
- PE - papilledema
- Urgent referral to neurology and ophthalmology

(wikipedia.org, n.d.)

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Laboratory Screening to Consider

- **Age 10 or older and obesity**
  - Lipid panel (ideally fasting)
  - T2 DM screening (fasting plasma glucose, Hgb A1c or oral glucose tolerance test [OGTT])
  - Liver dysfunction (alanine transaminase [ALT])
  - Frequency: every 2 years

- **Age 2-9 years with obesity**
  - Consider screening for lipid abnormalities
  - Other screening based on clinical findings or risk factors

(Hampl et al., 2023)

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Laboratory Screening to Consider

- Age 10 or older and overweight
  - Lipid panel (ideally fasting)

  - Consider if risk factors present
    - T2 DM screening (fasting plasma glucose, Hgb A1c or OGTT)
    - Liver dysfunction (ALT)

(Hampl et al., 2023)

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Risk Factors

- T2 DM
  - Family history T2DM in 1st /2nd degree relative
  - Maternal gestational diabetes
  - Signs of insulin resistance or conditions associated with insulin resistance
    - acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small-for-gestational-age birth weight
  - Obesogenic psychotropic medication.
- NAFLD
  - Male sex
  - Prediabetes/diabetes
  - Obstructive sleep apnea
  - Dyslipidemia
  - Sibling with NAFLD

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Back to our patient….

- 11 y/o male with stage 2 obesity, acanthosis nigricans and hypertension:

- ALT: 22 IU/L (normal 0-30 IU/L)
- Fasting serum glucose **112 mg/ dL** (normal 70 – 100 mg/dL)
- HbA_{1C} **6.3%** (normal <5.7%)
- Total cholesterol **191 mg/dL** (normal <180 mg/dL)
- High-density lipoprotein (HDL) **32 mg/dL** (normal for males ≥40 mg/dL)
- Low-density lipoprotein (LDL) 109 mg/dL (normal <110 gm/dL)
- Triglycerides **250 mg/dL** (normal <150 mg/dL)

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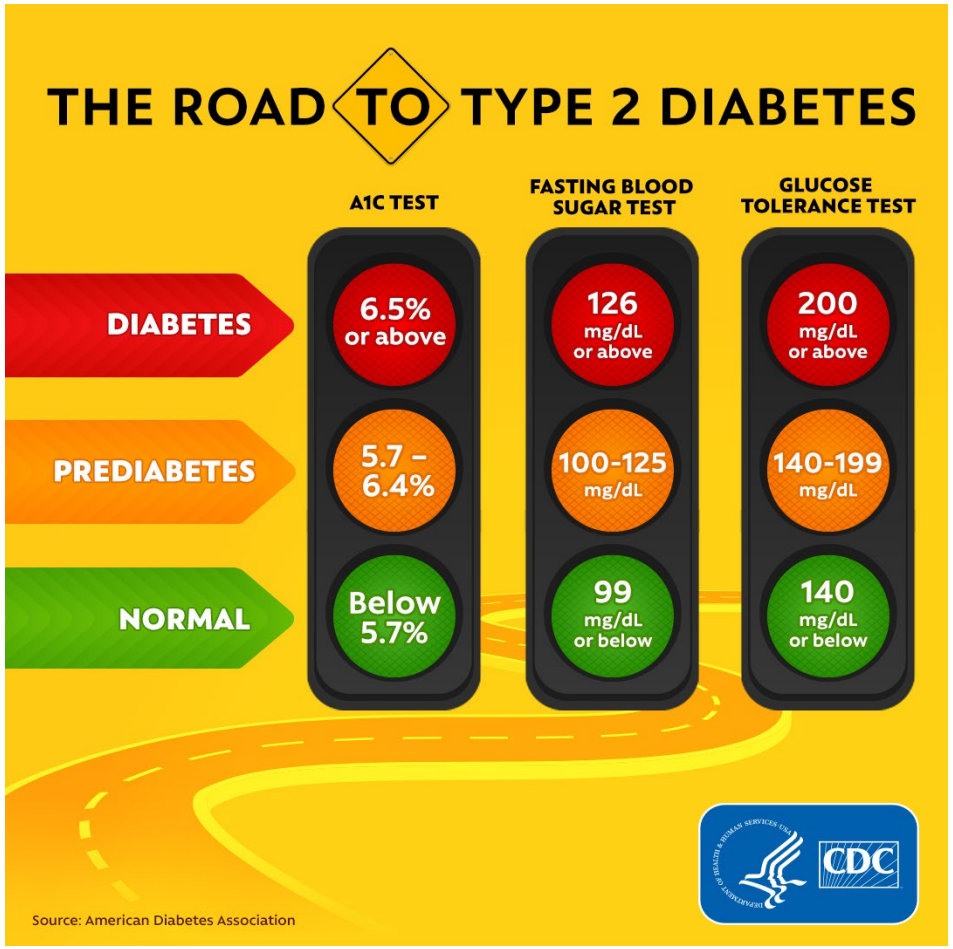
Interpreting Results

- 11 y/o male with
  - Obesity
  - Risk for hypertension
  - Dyslipidemia (low HDL and high triglycerides)
  - Impaired fasting glucose/pre-diabetes

So now what?

- Schedule follow up
- Recheck blood pressure
- Discuss plan to address obesity and co-morbidities



Patient Follow Up

- Review lab results with the patient/family
- Initial therapy for all diagnoses →behavioral interventions
- Using non-stigmatizing concepts previously discussed:
  - Assess readiness for change
  - Assess patient/parental concern
  - Assess current/prior changes to achieve healthier habits

- Use Motivational Interviewing to help formulate initial plan
- Offer Nutrition Consult

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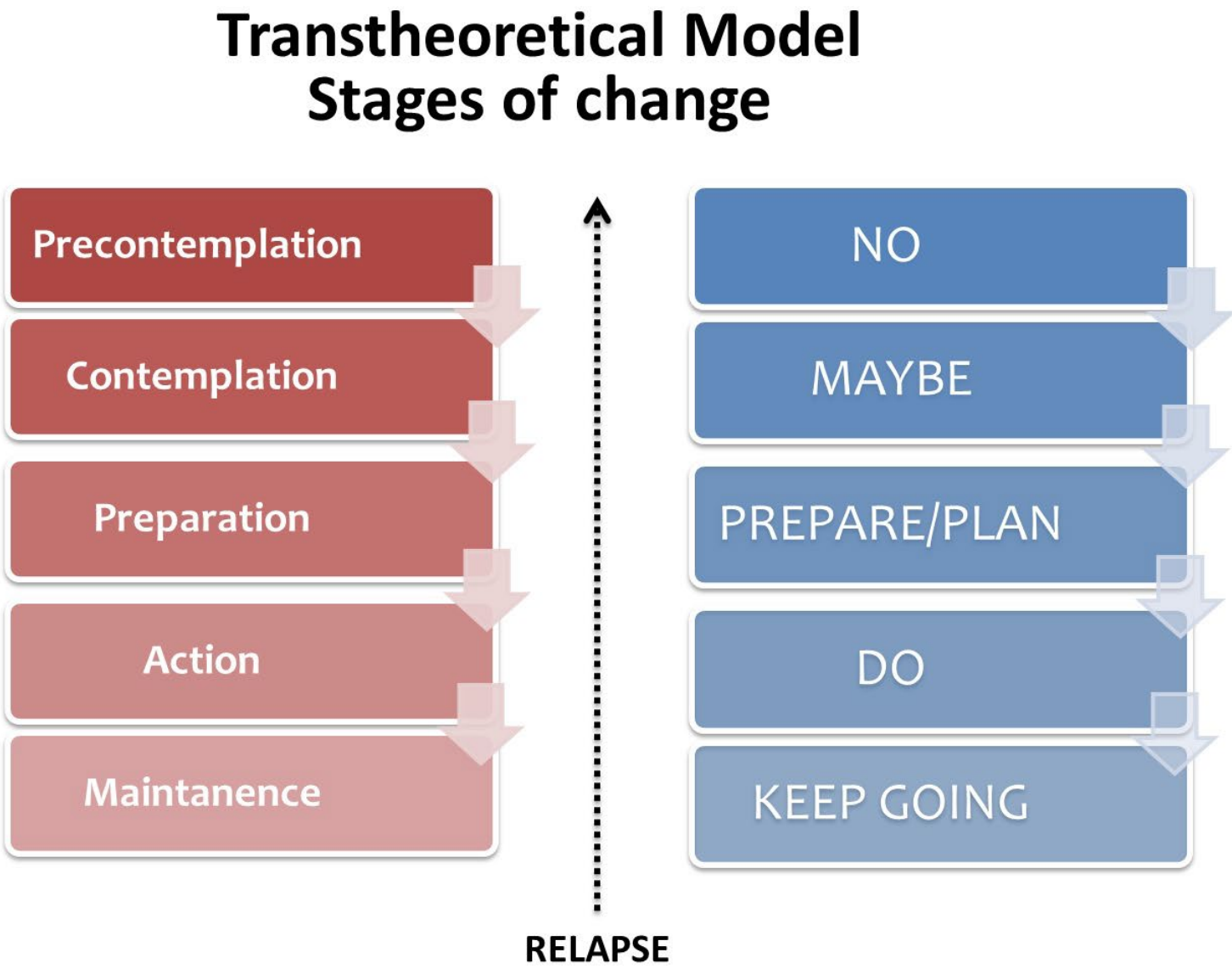
Transtheoretical Model Stages of Change



(commons.wikimedia.org, n.d.)

Motivational Interviewing (MI)

- Patient-centered counseling style that identifies and reinforces the patient's own motivation for change

- MI **guides** families to identify a behavior to change based on what they feel is important and can be accomplished

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OARS

(peakpx.com, n.d.)

O - Open Ended Questions

- Allow patient to reflect and elaborate
- Patient does most of the talking

A – Affirmations

- Recognize/reinforce success
- Show empathy

R - Reflections

- Rephrase what the patient expresses in your own words

S – Summary Statements

- Apply reflective listening at closure/transitions
- Paraphrase and pull out key points

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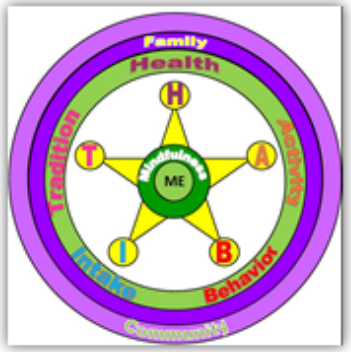
Motivational Interviewing - Tools

Name: _____ Circle One: Parent / Child or Teen Date: _____

HEALTHY HABITS Whole Health Assessment

Use this circle to help you think about all of the things that contribute to your health.

- YOU are in the center of the circle as a unique and important person!
- Mindfulness means being aware of your daily routines and how they affect your health.
- The points of the star are the keys to forming Healthy HABITS in your family, and include:
  - Health
  - Activity
  - Behavior
  - Intake
  - Tradition
- The first purple ring is your best support network – your family!
- The outer ring is your community support network. Some examples might include: your school, your faith community, and your Health Care Team



Please write a few words that describe you.

What does being healthy mean to you? _____

_____

What have you tried in the past to improve your health? _____

_____

Is there anything that has stopped you from making healthy changes? _____

_____

Who makes up your support team? _____

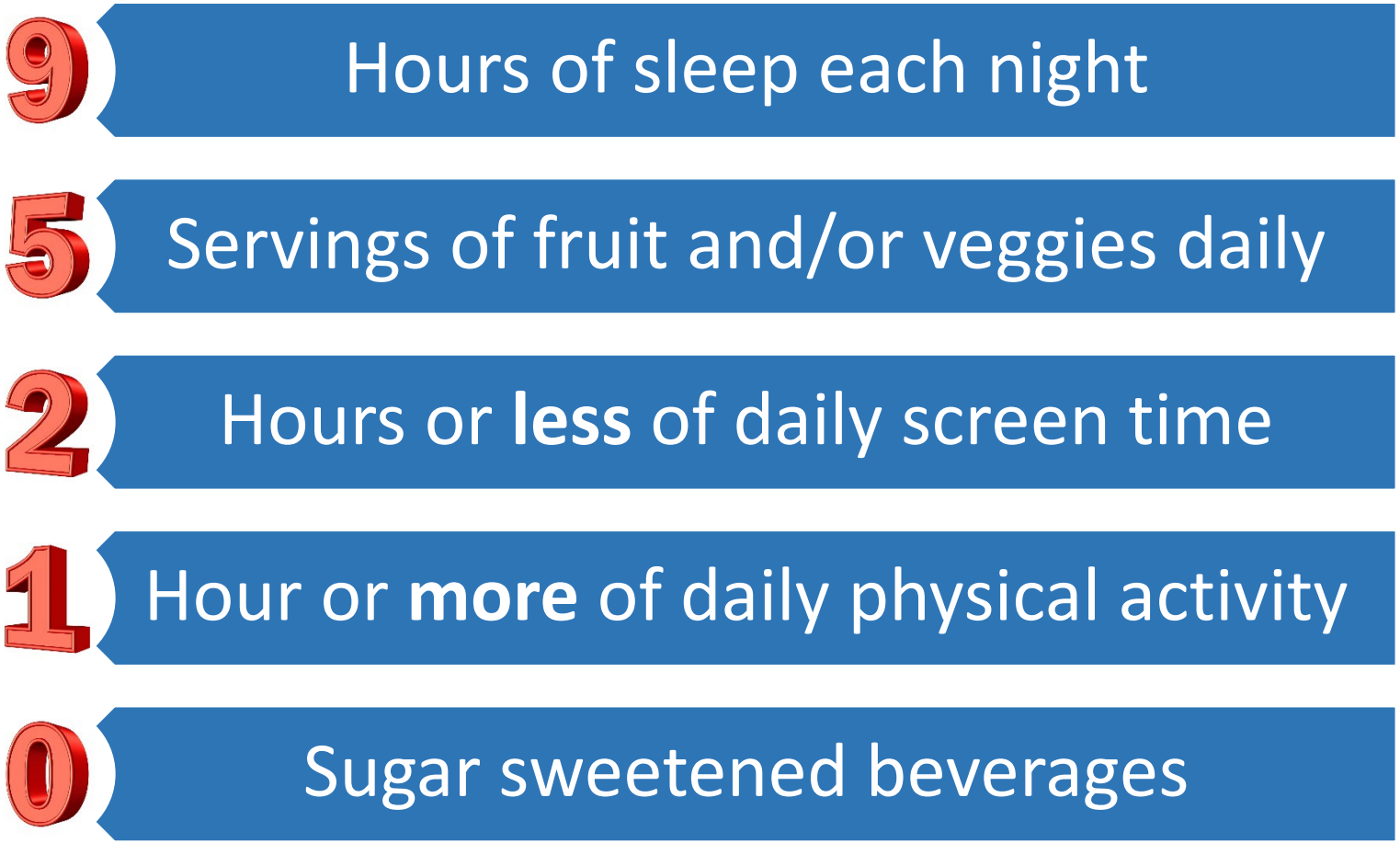
Where Are You, and Where Would You Like to Be?

For each area, consider where you are, and where you would like to be.

In each box, place a number 1 – 5: 1 means you struggle with this area or behavior, 5 means you are very successful in this area already.

Area of Whole Health	Where I am Now (1 – 5)	Where I Want to Be (1 – 5)
Health: Your physical health Your mental health		
Activity: Moving and doing physical activities		
Behaviors:		
1. Stress Management: How do you handle stress?		
2. Self-esteem: How do you feel about yourself?		
3. Organizational skills: Planning your day		
4. Screen time: Time spent on screens each day		
5. Sleep: Time spent in good quality sleep		
Intake: Food and Drinks		
1. Fruits and vegetables		
2. Sugary beverages: Includes juice, soda, sports drinks, sweet tea, energy drinks, etc.		
3. Water intake		
4. Portion sizes		
5. Snack choices		
6. Eating out		
Tradition:		
1. Spending time together as a family		
2. Eating together as a family		
3. Supporting your family or having your family support you		

95210 – Prescription for Healthy Living



SMART Goals

- S – Specific
- M- Measurable
- A – Attainable
- R – Relevant
- T – Time Bound

Goal: I would like to exercise more often

SMART GOAL: I will walk for 30 minutes around my neighborhood, 4 days a week for the next month.

SMART Goals for our patient:

1. **I will eat at least 3 servings of fruits and or veggies every day for the next month**
2. **I will use my fit bit and get 10,000 steps daily, 6 days a week for the next month**

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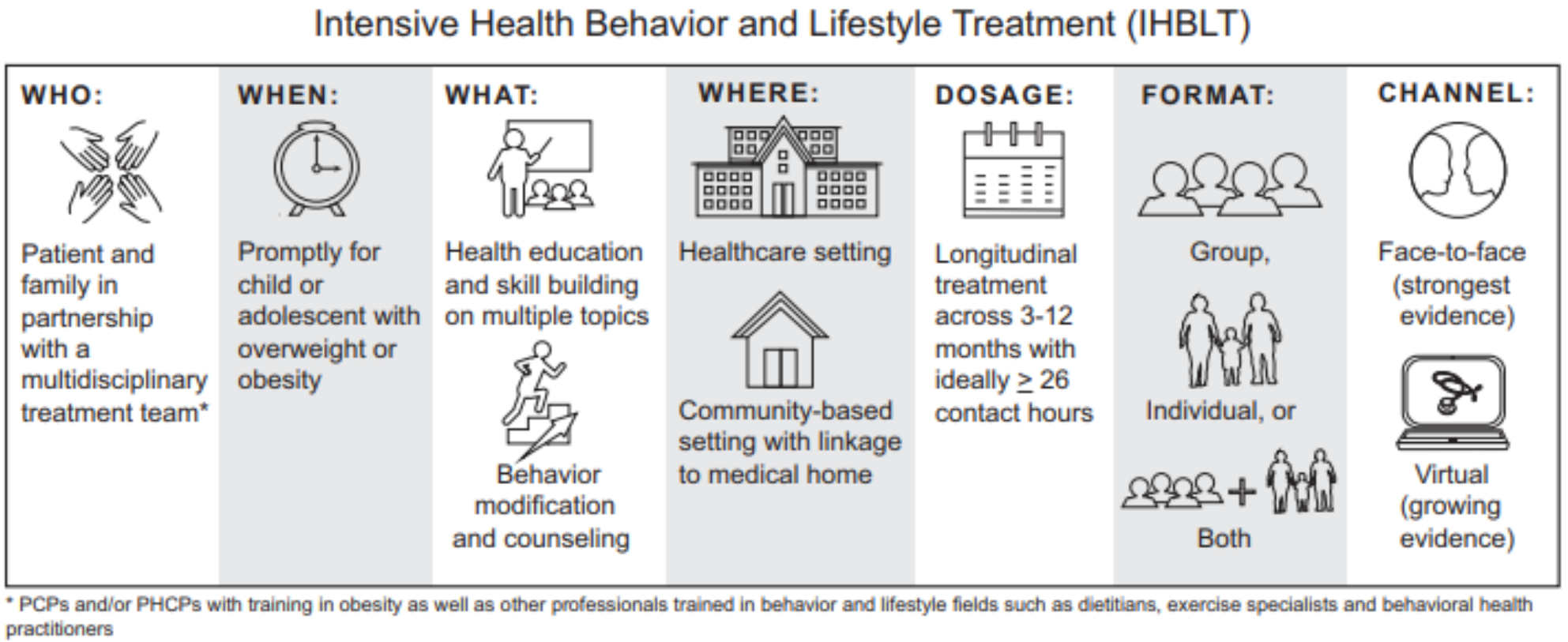
Intensive Health Behavior and Lifestyle Treatment (IHBLT)

- Foundational treatment approach



(Hampl et al., 2023)

WRNMMC Healthy Habits Clinic

- **Screen** children with overweight and obesity for comorbidities and **provide treatment**
- Educate families on **Healthy Habits** in multiple life domains, providing a tool box for **Changes for Life**
- Utilize **motivational interviewing techniques** to help promote **lasting behavior change** in our families
- Partner with patients and families to create a **SMART goal** behavior modification plan
- Provide a **safe location** for peer and coach support along the journey to healthier habits

WRNMMC Healthy Habits Clinic

Our Team

- Pediatric Endocrinology
- Adolescent Medicine
- Pediatric NP
- Peds Nutrition
- LPN
- RN
- Pediatric Endocrinology Fellows
- Pediatric Residents

Logistics

- Intake
  - One morning per month
  - Individual appointment with provider
  - Location: clinic
- Follow up
  - One afternoon per month (increasing to 2)
  - 90 min group visit
  - 45 min physical activity/45 min health education- goal setting
  - Location: virtual classroom

A Year of Healthy Habits

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Month	Exercise	Topic
January	Yoga and Meditation	Healthy Weight : Risks and Benefits
February	Heart Healthy HIIT	Making Healthy Choices
March	Retreat	Retreat
April	Barre/Pilates	Hunger vs Craving/Emotional Eating
May	Strength Training at Home	Environmental Influences
June	Summer Vibes Cardio Agility	Meal Planning
July	Cardio Intervals	Shopping Together
August	Dance Fitness	Cooking Together
September	Cardio Kickboxing	Media Influences
October	Yoga and mindful meditation	Bullying
November	Dance Fitness	Exercise/Energy Balance
December	12 Days of Fitness	Behavioral Change and Maintenance

Back to our Patient…. A year later

- Our patient has followed up quarterly for the past year
- BMI initially stabilized and in the past 6 months has had a modest downward trend
- SMART Goals have been re-evaluated and adjusted at each visit

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Patient Update….

- BMI now 110% of the 95%
- Blood pressure: 110/74 (normal for age, sex and height)
- Hgb A1c: down to 5.9% from 6.3%
- Lipids: HDL up to 52 from 32, triglycerides: 120 down from 250, LDL now 105
- The patient continues to work on IHBLT

- Asks about pharmacotherapy?

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Is this patient a candidate for weight loss medications?

- YES!
- Age > 12
- BMI > 95% for age and sex
- Engaged in IHBLT

- What now?
  - Step 1 - optimize chronic medications
  - Step 2 – consider weight loss pharmacotherapy options

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Medication	Obesogenic	Nonobesogenic
Allergy and Asthma management	Antihistamines Oral steroids	Inhaled nasal steroids Monteleukast
Antidepressants	Amitryptiline, Nortryptiline, Paroxetine, Setraline	Buproprion Imipramine HCL Buspirone and more
Antiepileptics	Carbamazepine, Gabapentin, Pregabalin, Valproate, Vigabatrin	Felbamate, Lamotrigine, Levitriacetam, Phenytoin, Topiramate, Zonisamide
Antipsychotics	MOST	Molindone, Pimozide
Migraine Management	Atenolol, Propanolol, Divalproex Sodium, Flunarizine, Imipramine, Pizotifen	Portryptiline, Timolol, Topiramate, Zonisamide
Mood Stabilizers	Lithium	
Psychostimulants		MOST

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Medication

First - optimize chronic meds if possible!

Weight Loss Pharmacotherapy

- **Approved for age 12 and older**
  - Orlistat (intestinal lipase inhibitor)
  - Liraglutide (glucagon like peptide (GLP) -1-receptor agonist)
  - Semaglutide (GLP-1 receptor agonist)
  - Phentermine/Topiramate (Simpathomimetic Amine/GABA agonist)

- **Approved for age 16 and older**
  - All of the above + Phentermine (sympathomimetic amine)

- **Approved for age 18 and older**
  - All of the above + Bupropion/Naltrexone (Dopamine and NE Reuptake inhibitor and Opioid Receptor Agonist)

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Orlistat

(commons.wikimedia.org, n.d.)

- MOA: Gastric and Pancreatic Lipase Inhibitor
- Dose: 120 mg TID before or up to one hour after meals
- Inhibits about 30% of dietary fat absorption
- Side Effects: steatorrhea, fecal incontinence, frequent/urgent BMs
- Side effect can be limited by keeping meal fat content < 15g
- Contraindications: cholestasis, chronic malabsorption
- Take with MVI

- **How well does it work**?
- **BMI decrease of about 0.8 kg/m2**

(Raman et al., 2022)

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Liraglutide

- **MOA**: GLP-1 receptor agonist
- Stimulates glucose dependent insulin release from beta cells, delayed gastric emptying, inhibition of post meal glucagon secretion, central decrease of appetite
- **Dose:** Start at 0.6 mg SQ daily and increase weekly to a max dose of 3 mg SQ daily
- **Side Effects:**
  - Nausea, hypoglycemia, diarrhea, constipation, headache
  - Decreased appetite, dyspepsia, fatigue, dizziness, abd pain
  - Increased lipase
  - Tachycardia
  - Renal impairment in the setting of dehydration

Liraglutide

- **Contraindications:**
  - Personal or family history of medullary thyroid cancer
  - Or MEN 2
  - Pregnancy
  - Active gallbladder disease or pancreatitis
  - Monitor for depression/suicidal thoughts

(Raman et al., 2022)

- **How well does it work?**
  - Randomized, double blinded, placebo controlled trial in adolescents
  - 56 weeks
  - **BMI reduction of 5%**
    - **43.3% liraglutide**
    - 18.5% placebo
  - **BMI reduction of 10%**
    - **33% liraglutide**
    - 9% placebo

Semaglutide

- **MOA:** GLP-1 receptor agonist
- Stimulates glucose dependent insulin release from beta cells, delayed gastric emptying, inhibition of post meal glucagon secretion, central decrease of appetite
- **Dose:** Start at 0.25 mg SQ once weekly and increase monthly to a max dose of 2.4 mg SQ once weekly
- **Side Effects:**
  - Nausea, hypoglycemia, diarrhea, constipation, headache
  - Decreased appetite, dyspepsia, fatigue, dizziness, abd pain
  - Increased lipase
  - Tachycardia
  - Renal impairment in the setting of dehydration

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Semaglutide

- Contraindications:
  - Personal or family history of medullary thyroid cancer
  - Or MEN 2
  - Pregnancy
  - Active gallbladder disease or pancreatitis
  - Monitor for depression/suicidal thoughts

How well does it work?

68 week trial in adolescents

Average decrease in BMI = 16.1%

Weight reduction of 5%:	73% semaglutide, 18% placebo
Weight reduction of 10%:	62% semaglutide, 8% placebo
Weight reduction of 15%:	53% semaglutide, 5% placebo
Weight reduction of 20%:	37% semaglutide, 3% placebo

(Weghuber et al., 2022)

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Topiramate and Phentermine

- **MOA:** GABA agonist and sypathomimetic amine
  - **Topiramate**: GABA augmented decreased food intake
  - **Phentermine**: increased catecholamine release in the hypothalamus, decreased norepinephrine reuptake, increased POMC stimulation

- **Dose:** Start at lowest dose (3.75/23 mg) PO once daily x 2 wk
  Increase to 7.5/46 mg PO once daily

  If < 3% wt loss at 12 wks, increase to 11.25/69mg x 2 wks

  Increase to 15/92 mg PO once daily

  If < 5% wt loss after 12 wks at max dose →discontinue

Topiramate and Phentermine

- **Side Effects**: parasthesias, dizziness, dysgeusia, insomnia, constipation, dry mouth
- **Contraindications:** pregnancy, glaucoma, hyperthyroidism, during/within 14 days of taking MOA inhibitors
- Discontinue if suicidal behavior/ideation

- **How well does it work?**
  - Adolescent study ages 12-17
  - 3 arms, 56 week duration
    - Lifestyle + placebo
    - Lifestyle + 7.5/46mg PHEN/TPM
    - Lifestyle + 15/92 mg PHEN/TPM
  - Mid dose: **8.1% BMI reduction** compared to placebo
  - High dose: **10.4% BMI reduction** compared to placebo

(Weghuber et al., 2022)

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Phentermine

- MOA: Sypathomimetic amine
- Increased catecholamine release in the hypothalamus, decreased norepinephrine reuptake, increased POMC stimulation
- Approved for ages 16 and up, short term use – up to 12 weeks
- Dose: 15 to 37.5 mg PO once daily
- Side effects: dry mouth, constipation, diarrhea, insomnia, palpitations, tachycardia, elevated BP, overstimulation, restlessness, dizziness, euphoria, dysphoria, tremor, headache, psychosis and changes in lidbido.
- Contraindications: pregnancy, nursing, agitated state, patients with CV disease, hyperthyroidism, glaucoma, h/o drug abuse, during/within 14 days of MOA inhibitor use

- **How well does it work?**
  - Retrospective chart review
  - Adolescents with severe obesity
  - Phentermine + lifestyle therapy compared to lifestyle only at 6 months
  - **Mean BMI reduction of 4%**

(Weghuber et al., 2022)

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Naltrexone-Buproprion

- **MOA:** Opioid Receptor Antagonist/Dopamine and NE reuptake inhibitor
- **Only approved for age 18 and up**
- **Dosing:** extended release tablets 8mg Naltrexone/90mg Buproprion
  - Start with one tablet PO once daily
  - Increase weekly over 4 weeks to 2 tablets twice daily
- **Side Effects:** headache, nausea, vomiting, constipation
  Dry mouth, insomnia, and agitation

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Naltrexone-Buproprion

- **Black Box warning**: increased risk of suicidal thinking and behavior in children, adolescents and young adults

- **Contraindications**: uncontrolled hypertension, seizure disorders, anorexia nervosa, bulimia, abrupt discontinuation of alcohol, benzodiazepines, chronic opioid use, during or within 14 days of moa inhibitor

How well does it work?

- Adult study
- 12 months
- **4.6% mean weight loss**

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Patient Follow Up

- Start the patient on Semaglutide
- Close follow up with monthly dose increase over 5 months
- 6 month follow up: Wt - 67 kg, Ht – 164cm, BMI – 24.9/95%
- Initial BMI = 30.4, delta: 5.5 = 18% BMI reduction
- Continue Semaglutide 2.4 mg SQ weekly and lifestyle therapy
- Follow up q 3-6 months

When to consider Bariatric Surgery?

TABLE 20 Criteria for Pediatric Metabolic and Bariatric Surgery[733]

Weight Criteria	Criteria for Comorbid Conditions
Class 2 obesity, BMI $\geq$ 35 kg/m^2 or 120% of the 95th percentile for age and sex, whichever is lower	Clinically significant disease; examples include but are not limited to T2DM, IIH, NASH, Blount disease, SCFE, GERD, obstructive sleep apnea (AHI >5), cardiovascular disease risks (HTN, hyperlipidemia, insulin resistance), depressed health-related quality of life.
Class 3 obesity, BMI $\geq$ 40 kg/m^2 or 140% of the 95th percentile for age and sex, whichever is lower	Not required but commonly present.

AHI, apnea-hypopnea index.

- No specific age limit
- **Not much data in those 12 years and younger**

(Hampl et al., 2023)

Bariatric Surgery – Key Points

- Weight loss surgery is safe and effective for pediatric patients in comprehensive metabolic and bariatric surgery settings
- Laparoscopic Roux-en-Y gastric bypass and vertical sleeve gastrectomy commonly performed in pediatric patients
- Results: significant sustained weight loss & comorbidity improvement
  - HTN, T2 DM, dyslipidemia
  - CVD risk factors
  - Weight related quality of life

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Bariatric Surgery – Complications

- 15% minor complications
  - Post operative nausea/dehydration
- 8% major perioperative complications in first 30 days
- 5 years post-op: 13-25% require subsequent related procedures
- At risk for micronutrient deficiencies – need long term f/u
  - Most Common - Iron and Vitamin D

Key Takeaways

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- Pediatric obesity impacts military readiness, with potentially greater impact in military connected youth.
- Discussing obesity should be done utilizing non-stigmatizing communication.
- Effective treatment starts with asking permission to discuss weight, assessing the family's prior attempts to make healthy changes, evaluating readiness for change, and working with the family to target actionable areas for change.
- IHBLT is the foundation of child and adolescent obesity treatment. Pharmacotherapy and bariatric surgery are effective adjuncts in patients that meet criteria.

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Questions?

How to Obtain CE/CME Credits

To receive CE/CME credit, you must register by 0730 ET on 28 April 2023 to qualify for the receipt of CE/CME credit or certificate of attendance. You must complete the program posttest and evaluation before collecting your certificate. The posttest and evaluation will be available through 11 May 2023 at 2359 ET. Please complete the following steps to obtain CE/CME credit:

1. Go to URL: https://www.dhaj7-cepo.com/apr2023ccss
2. Search for your course using the **Catalog**, **Calendar**, or **Find a course** search tool.
3. Click on the REGISTER/TAKE COURSE tab.
   a. If you have previously used the CEPO CMS, click login.
   b. If you have not previously used the CEPO CMS click register to create a new account.
4. Follow the onscreen prompts to complete the post-activity assessments:
   a. Read the Accreditation Statement
   b. Complete the Evaluation
   c. Take the Posttest
5. After completing the posttest at 80% or above, your certificate will be available for print or download.
6. You can return to the site at any time in the future to print your certificate and transcripts at: https://www.dhaj7-cepo.com/
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