



Pediatric Obesity: Application of New Guidelines and Medications

Elizabeth Dabrowski, MD
Assistant Professor, Pediatric
Endocrinology
Medical College of Wisconsin

Children's CME



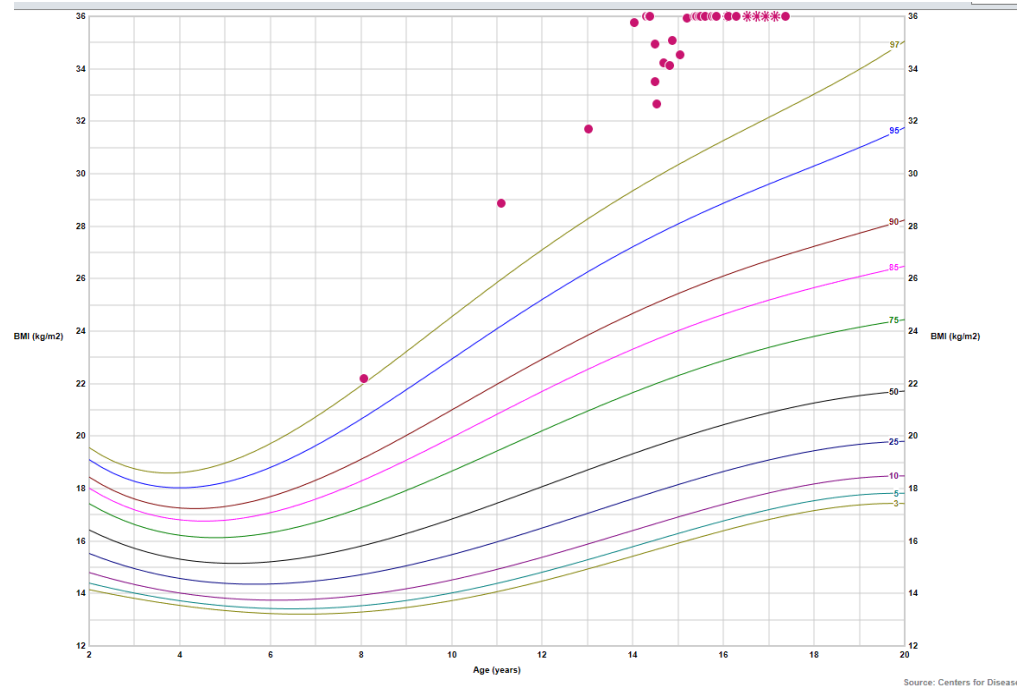
Children's
Wisconsin

Financial Disclosure

- Dr. Dabrowski is a stockholder in Provention Bio. All relevant financial relationships have been mitigated.

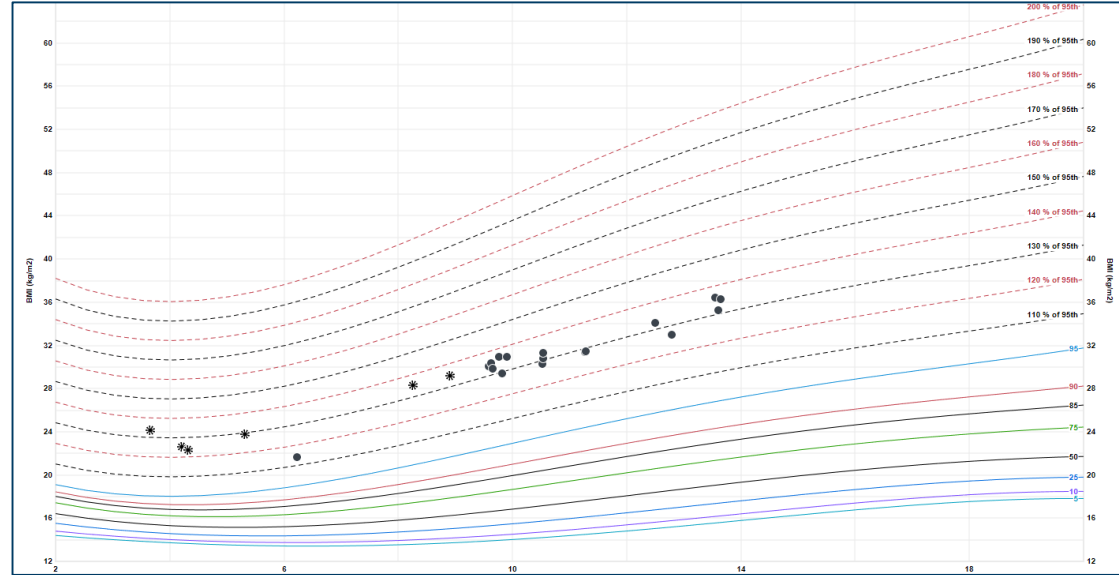
Objectives

- Overview
- Comorbidities
- Lifestyle Intervention
- Pharmacotherapy
- Obesity management at Children's



Definitions

- Overweight: BMI 85-95%
 - BMI is age and sex specific
- Obesity
 - BMI > 95%
 - Class 2: 120% to <140% of the 95th percentile OR BMI 35-39 kg/m²
 - Class 3: 140% of the 95% or BMI >40kg/m²



Obesity is a global health concern

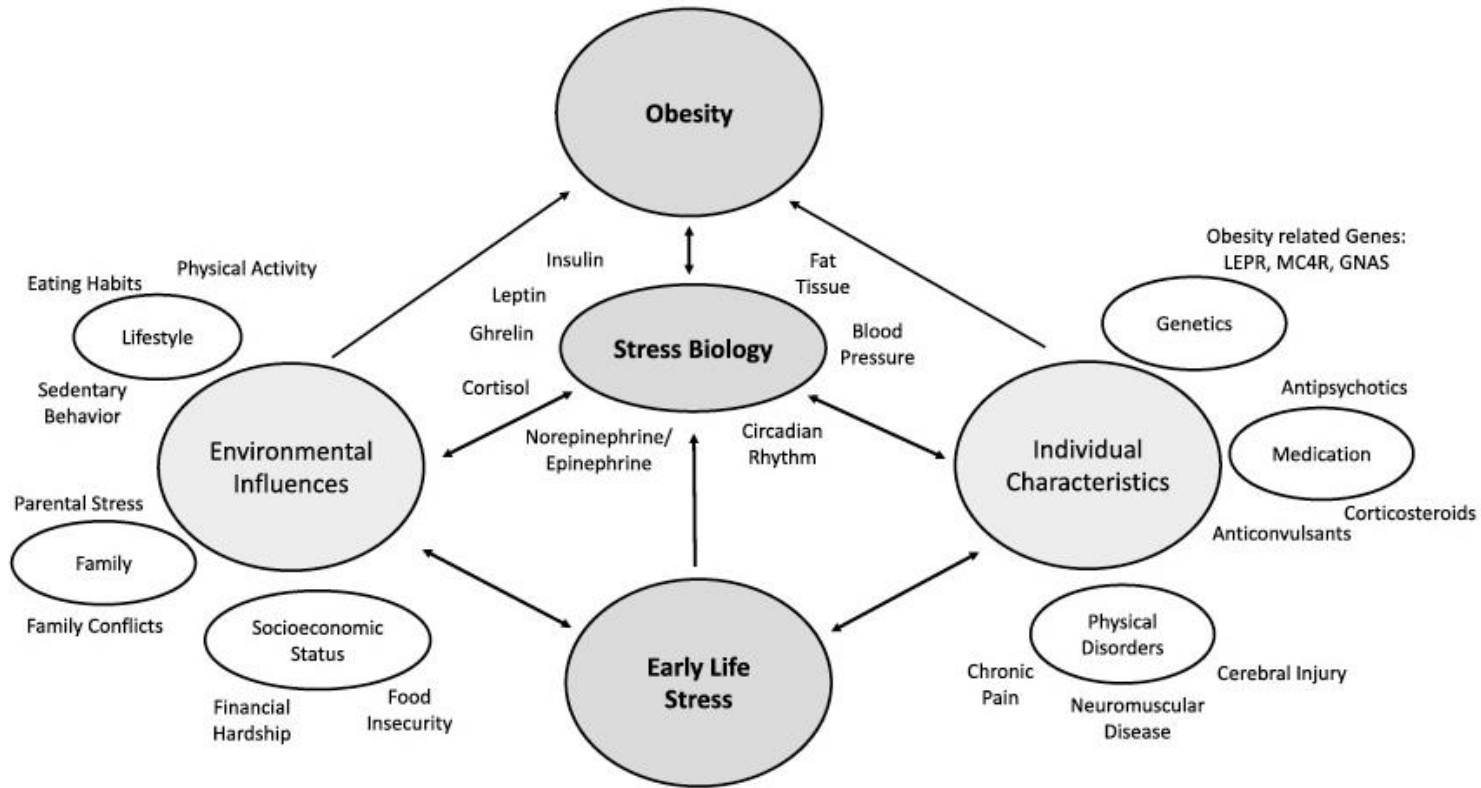
- Prevalence of obesity in children ages 2-19 has tripled over the last 30 years to 18.5% in 2016
 - 2020 data shows 14.6% of children ages 10-17 in WI are obese
 - WIC children ages 2-4 have 15.2% incidence
- A predictive epidemiologic model estimates that if 2017 obesity trends hold, 57% ages 2-19 years will have obesity by 35 years of age, in 2050
- 9.5% of adolescents have severe obesity
- Increased risk of comorbidities- T2DM, NASH, metabolic syndrome, CVD, sleep apnea, bullying, depression



Risk Factors

- Genetics, epigenetics, lifestyle
- Lower parental education
- Lower socio-economic status
 - For every point decrease in SES, prevalence of obesity increases by 11.7%
 - NOT changed by upward mobility later in life
- Children with > 2 ACE have higher odds of obesity
- Stress
- Children with special healthcare needs





Stress, Stress Reduction and Obesity in Childhood and Adolescence. Kiess, et al. Hor Res Ped. Mar 2023, vol

Comorbidities

Metabolic Syndrome

Fatty liver

Type 2 Diabetes

Hypertension

PCOS

Depression

OSA



Children's
Wisconsin



Metabolic Syndrome

- Non obese children: 0-4.7%
- Children with obesity: 14.5-35%
- 10% of children with obesity ages 3-5 have elevated triglycerides and low HDL
- Screening Recommendation
 - Fasting lipid panel in children >10 years old who are overweight
 - Consider fasting lipid panel in children 2-9 years of age who fall in obese range

Non-alcoholic Fatty Liver

- Chronic liver disease marked by steatosis, inflammation, and fibrosis.
- Underlying insulin resistance, which alters the process of fat oxidation in the liver, increasing oxidative stress and inflammation
- More aggressive, destructive
- 1/3 with fatty liver also have type 2 diabetes
- Screening Recommendations
 - ALT in children ages 10 and older with obesity
 - Consider in children ages 2-9 with obesity



Type 2 Diabetes

- More rapid beta cell destruction
 - Rapid progression to complications
- Annual percentage increase in children of 4.8%
- 1 in 5 adolescents have prediabetes
- Screening Hemoglobin A1c
 - >10 years of age with obesity
 - >10 years of age and overweight with risk factors
 - If normal, repeat q2-3 years (sooner if rapid weight gain)

TABLE 10 Criteria for Diagnosing Prediabetes and T2DM⁹⁰

	Prediabetes or Impaired Glucose Tolerance	Diabetes Mellitus ^a
Fasting plasma glucose (FBG) ^b	100–125 mg/dL	≥126 mg/dL
2-h plasma glucose (OGTT) ^c	140–199 mg/dL	≥200 mg/dL
Random plasma glucose (RBG) ^d	Not applicable	≥200 mg/dL
HbA1c ^e	5.7% to 6.4%	≥6.5%

^a In the absence of unequivocal hyperglycemia, diagnosis is confirmed if 2 different tests are above threshold or a single test is above threshold on 2 separate occasions.

^b Fasting for at least 8 h with no calorie intake.

^c Oral glucose tolerance test (OGTT) using a load 1.75 g/kg of body weight of glucose with a maximum of 75 g.

^d In patients with hyperglycemic crises or classic symptoms of hyperglycemia (eg, polyuria, polydipsia).

^e Glycosylated hemoglobin (HbA1c) is the preferred test for monitoring prediabetes.⁴⁷⁸

Other

- Hypertension
 - Screening BP every visit starting at age 3
 - 8% of children with obesity ages 3-5 have HTN
 - 20% in children ages 11-15
- Obstructive Sleep Apnea
- Polycystic Ovarian Syndrome
- Depression
 - 35 increased odds (44% in females with obesity)
- Orthopedic complications
- Idiopathic Intracranial Hypertension

Screening Labs

Ages 2-9 consider

- Fasting lipid panel
- ALT
- Hemoglobin A1c***
- Fasting blood sugar***

>10 years old

- Fasting lipid panel
- ALT
- Hemoglobin A1c
- Fasting blood sugar

Interventions

1. Lifestyle Modifications
2. Medical
3. Surgical



USPTF Guidelines

- Screen those over 6 for obesity and offer or refer to a comprehensive, family-based behavioral treatment
- Interventions that are more successful are 26 hours or more over 2-12 months***
- Guidelines for ALL comorbidities also recommend lifestyle changes as first line
- Generally, intervention groups showed absolute reductions in BMI z score of 0.20 or more and maintained their baseline weight within 5 lb; control groups showed small increases or no change in BMI z score, typically gaining a mean of 5 to 17 lb

Earlier is better!

- Referral- based weight management in ages 2-6 years
- Focus on nutrition and physical activity
 - Limit screen time
 - Non-responsive feeding practices
 - Structured mealtimes
- 56% of children were obese and 44% were severely obese
- 13% went from obese to overweight
- Similar results in other studies
- Counseling when kids are overweight can prevent obesity



AAP: Comprehensive Obesity Treatment

- Longitudinal treatment in medical home
- Monitoring for comorbidities and depression
- Non-stigmatizing; unique to each FAMILY
 - Tailoring needs to individuals
- Motivational Interviewing
- Nutrition, physical activity, health behavior
- Collaborative treatment goals
- Integrated care



Nonstigmatizing conversation

- Ask permission to discuss weight
- Avoid labeling
 - Ie say child with obesity not obese child
 - My patient is affected by obesity not my patient is obese
- Use neutral words
 - Preferred words: unhealthy weight, gaining too much weight for age, height or health
 - Offensive: obese, morbidly obese, large, fat, overweight, chubby



Motivational Interviewing

- More successful when the family makes the goal
- 4 processes
 - Engaging- assess readiness to change
 - Focusing-patient and family make the decision to change; identify behaviors together
 - Evoking- advanced patient/family autonomy
 - IE a teen more focused on athletic performance than healthy
 - Planning- eval patient/family knowledge about what is necessary for a strategy to be successful and necessary resources

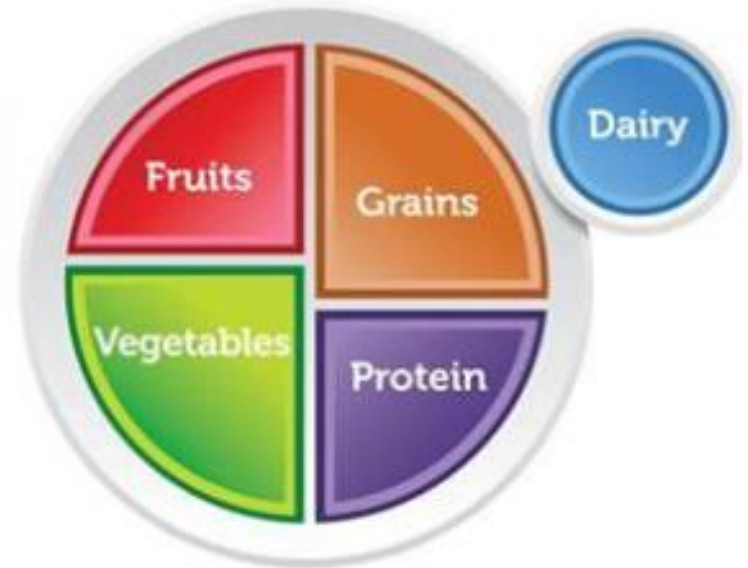
Lifestyle Intervention

- Intensive behavioral and lifestyle treatments
 - Involve community health workers, RD or nutritionist, exercise physiologist, physical therapist and social workers
 - Milwaukee recreation department guide
- 26 contact hours
- Clinic-community partnerships
- Family based
- Nutrition skill building versus nutrition education
- Mental health focus



4-3-2-1 Program and variations

- 4 Family meals a week without screens
- 3 meals per day
- 2 hours screen time or less
- 1 hour physical activity
- 0 sugar sweetened beverages
- MyPlate
 - 50% fruit and vegetables
- Get at least 8 hours of sleep (depending on age)
- Limit simple carbohydrates and increase fiber – for cereals, granola bars, pasta, breads (At least 3 grams of fiber or more and less than 9 grams of sugar per serving)



Modifiable Risk Factors

- Frequency of dining out and fast food
- Activity level
- Feeding style
 - Authoritative
 - Authoritarian
 - Permissive
 - Negligent

Parental Influence

- Parental modeling is more effective than verbal pressuring toward eating behavior or physical activity
- A longitudinal, self-reporting study, overweight or obese adolescents ($n = 100$) whose parents engaged in healthier behavior also showed healthier behavior and BMI reduction

Zarychta K, Mullan B, Luszczynska A. It doesn't matter what they say, it matters how they behave: parental influences and changes in body mass among overweight and obese adolescents. *Appetite*. 2016 Jan 1;96:47-55.

© Children's Wisconsin



McDonalds

-big mac, large fries, large coke

- 1,340 calories
- 52gm fat
- 192 carbs



-cheeseburger, side salad, large diet coke

- 315 calories
- 12gm fat
- 36 carbs





Chili's

-Smokehouse combo- corn, texas toast, bbq ribs, jalapeno-cheddar sausage, fries

- 4,080 calories
- 366gm fat
- 212gm carbs



-Mango chile-chicken

- 490 calories
- 19gm fat
- 49gm carbs



Screen Time

- Screen time with elevated heart rate does not count 😊
- Use of screen based physical activity
 - Systematic reviews show kids can lose weight or maintain weight when playing over a sustained period of time
 - Studies generally short term (<3 months), no more than 12 months
 - More effective than no intervention
 - Modest reduction in weight, adiposity or BMI z-score in one obesity intervention
 - Did not result in increased physical activity

Oliveira CB, Pinto RZ, Saraiva BTC, et al. Effects of active video games on children and adolescents: a systematic review with meta-analysis. *Scand J Med Sci Sports*. 2020;30 (1):4-12

Pharmacotherapy

1. Orlistat
2. Metformin
3. Phentermine/Topiramate
4. GLP-1 Receptor Agonists



May offer children ages 8 through 11 years of age with obesity weight loss pharmacotherapy, according to medication indications, risks, and benefits, as an adjunct to health behavior and lifestyle treatment

Hampel SE, Hassink SG, Skinner AC, Armstrong SC, Barlow SE, Bolling CF, Avila Edwards KC, Eneli I, Hamre R, Joseph MM, Lunsford D, Mendonca E, Michalsky MP, Mirza N, Ochoa ER, Sharifi M, Staiano AE, Weedn AE, Flinn SK, Lindros J, Okechukwu K. Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. *Pediatrics*. 2023 Feb 1;151(2):e2022060640. doi: 10.1542/peds.2022-060640. PMID: 36622115.

Orlistat

*****FDA APPROVED FOR
OBESITY*****

- Intestinal lipase inhibitor
- Approved ages 12 and up
- Only 3 pediatric trials
 - Mean changes ranged from 1lb weight gain to 12lb weight loss compared to 7lb gain up to 4lb weight loss in placebo
- Use limited by steatorrhea, fecal urgency and flatulence



Metformin

- Biguanide drug that reduces blood sugar by decreasing liver production, intestinal absorption and increasing insulin sensitivity
- NOT approved for weight loss
- FDA approved ages 10 and up for T2DM
- The trial with the most intensive concomitant lifestyle therapy, with an estimated 86 contact hours, showed a statistically nonsignificant net difference in BMI z score between the intervention and placebo groups at 12 months
 - 1 patient with a decrease in BMI
 - Mean weight reduction of 3.1lbs with metformin versus 1.4lbs with placebo

Phentermine

***FDA APPROVED FOR
OBESITY***

- Stimulates hypothalamus- release of norepinephrine as well as reuptake inhibitor to reduce appetite
- FDA approved for short-course therapy (3 months) for adolescents 16 years or older
- 7.5 mg, 15 mg, 30 mg, or 37.5 mg
- Adverse effects include elevated BP, irritability, dizziness, headache, tremor, dry mouth, and stomachache
- Contraindicated if cardiovascular disease, glaucoma, MAOI use
- Monitor: HR, BP, creatinine



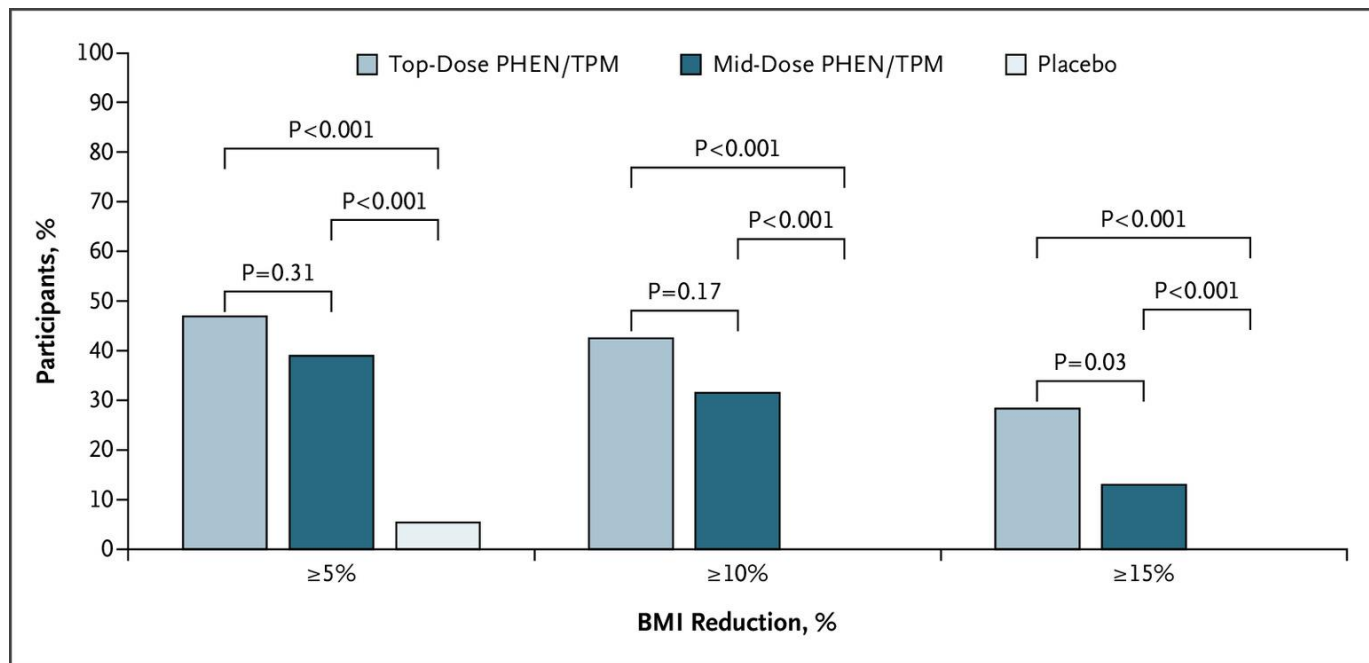
Topiramate

- Carbonic anhydrase inhibitor that suppresses appetite
- Major adverse effect is cognitive slowing
 - Metabolic acidosis, nephrocalcinosis and parasthesias
- Potential teratogen and requires counseling and reliable birth control
- 1 study has evaluated the use of topiramate in children, and it did not differ from placebo
- FDA approved for children 2 years and older with epilepsy and for headache prevention in children 12 years and older

Qsymia

FDA APPROVED FOR OBESITY

- Appetite suppressant
- FDA approved ages 12 and up with BMI > 95%
- Improved HDL and TG cholesterol profiles



Kelly AS, Bensignor MO, Hsia DS, Shoemaker AH, Shih W, Peterson C, Varghese ST. Phentermine/Topiramate for the Treatment of Adolescent Obesity. NEJM Evid. 2022 Jun;1(6):10.1056/evidoa2200014. doi: 10.1056/evidoa2200014. Epub 2022 Apr 30. PMID: 36968652; PMCID: PMC1003558547

GLP-1 Receptor Agonists

*****FDA APPROVED FOR
OBESITY*****

- Incretin- stimulates insulin secretion
- Increases satiety- slows gastric emptying, inhibits glucagon release, works on arcuate nucleus of the hypothalamus, limbic/reward system in amygdala
- Reduces gut lipoprotein secretion
- Independent of weight change can reduce hepatic inflammation, steatosis and fibrosis
- Contraindication- FH of MEN, pancreatitis
- Side effects: nausea, emesis



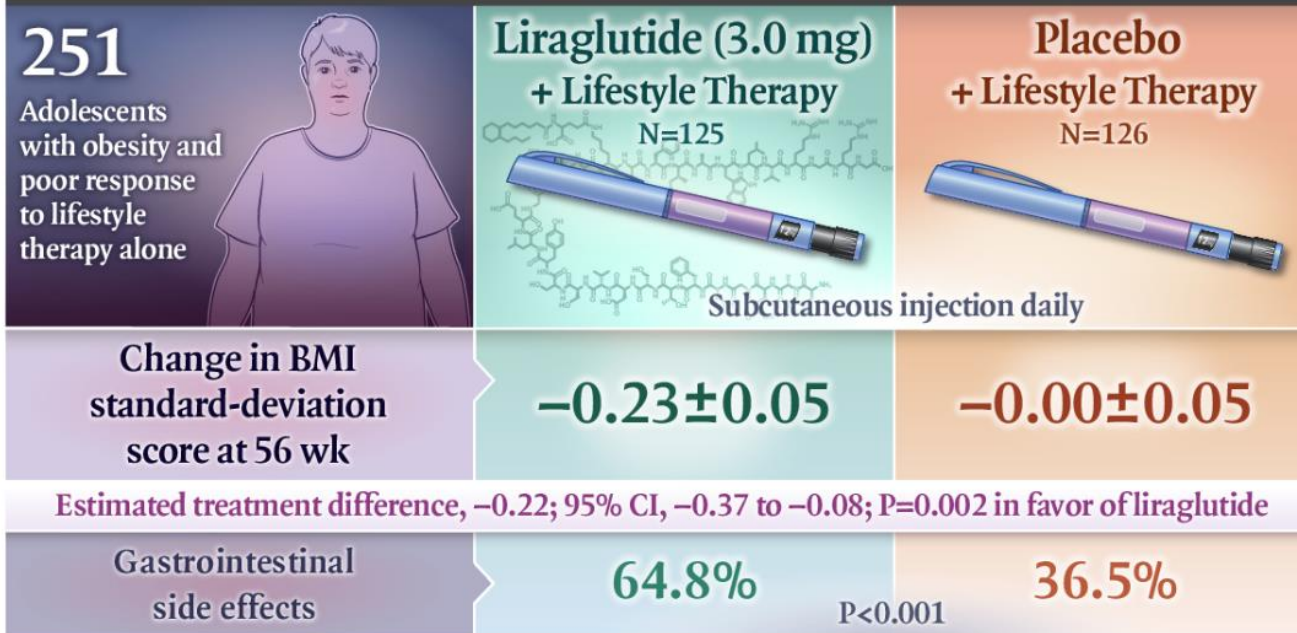
Liraglutide

- Commonly marketed as Victoza or Saxenda
- Most common adverse events were GI in nature
 - Asymptomatic hypoglycemic events that self resolved
- Victoza is approved ages 10 + for patients with T2DM
- Saxenda is approved 12+ for obesity management
 - Max dose 3mg daily
 - In studies, 82% of patients tolerated maximum dose



Liraglutide for Adolescents with Obesity

MULTICENTER, RANDOMIZED, DOUBLE-BLIND TRIAL

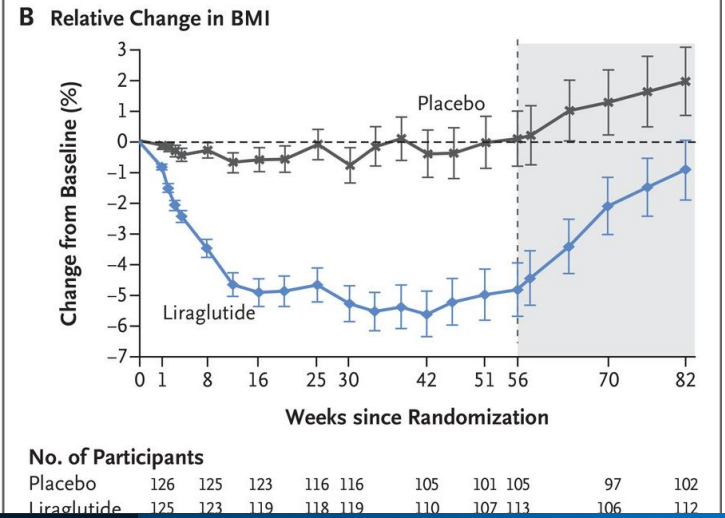
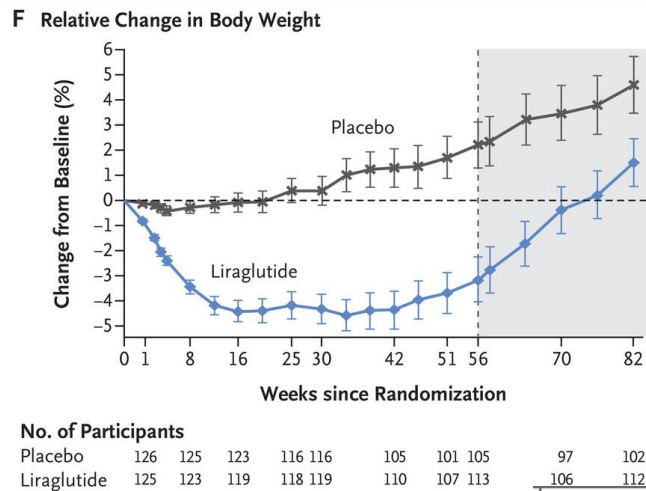


A.S. Kelly et al. 10.1056/NEJMoa1916038

Copyright © 2020 Massachusetts Medical Society



Liraglutide

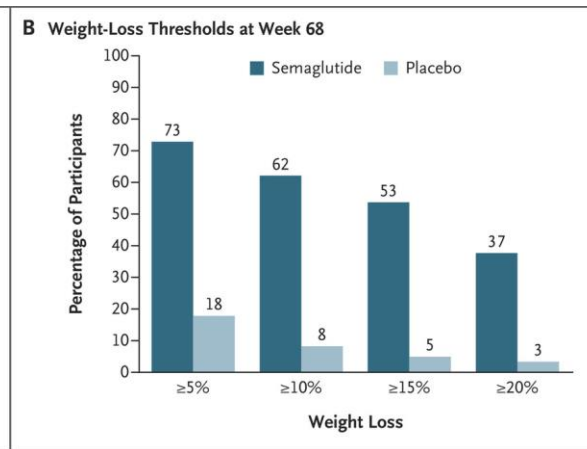
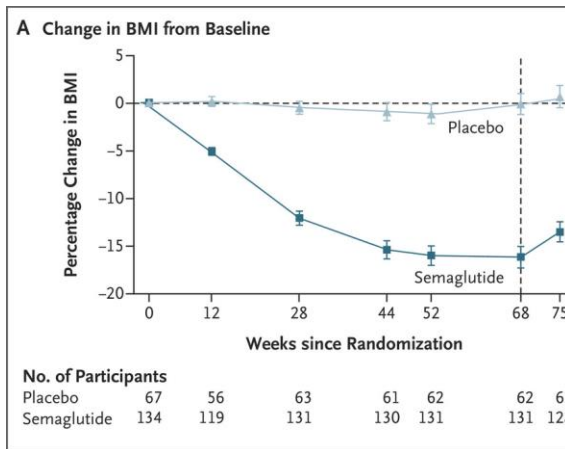
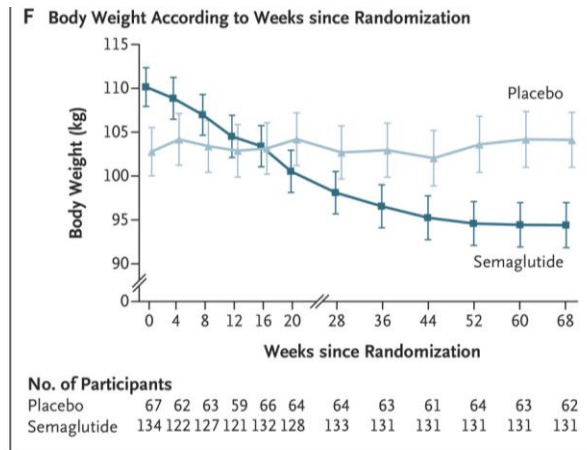
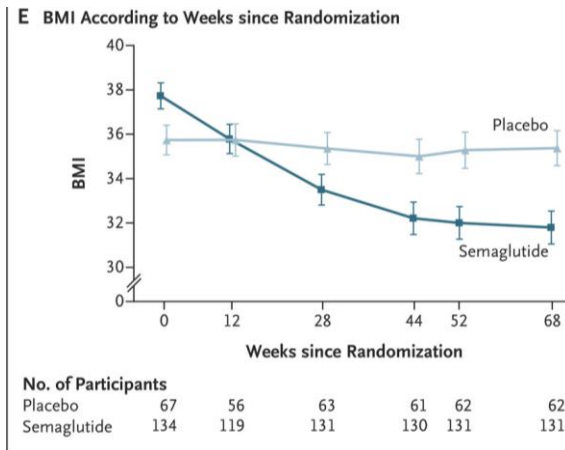


Kelly AS, Auerbach P, Barrientos-Perez M, Gies I, Hale PM, Marcus C, Mastrandrea LD, Prabhu N, Arslanian S; NN8022-4180 Trial Investigators. A Randomized, Controlled Trial of Liraglutide for Adolescents with Obesity. *N Engl J Med.* 2020 May 28;382(22):2117-2128. doi: 10.1056/NEJMoa1916028.

FDA approved 12 and older

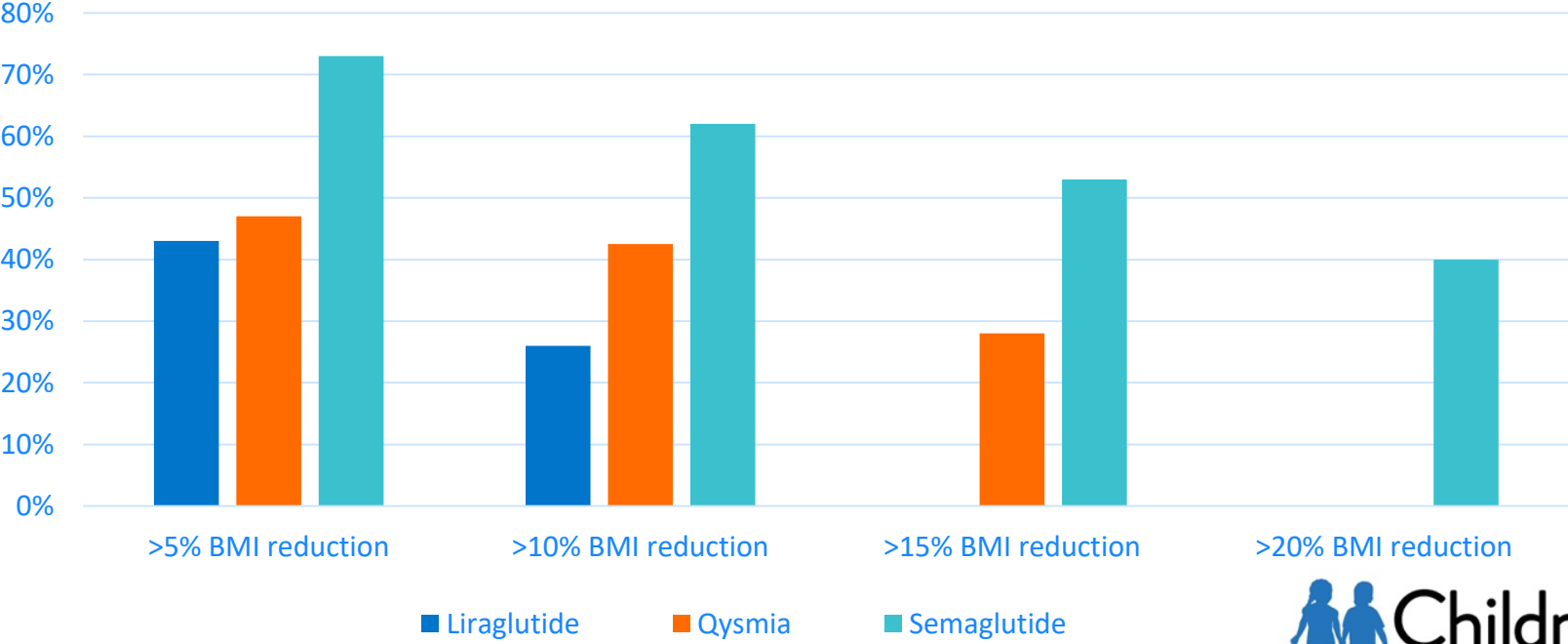
Semaglutide

- STEP 4 Trial for Teens
 - Superior to adult studies
- Mean change in BMI from baseline after 68 weeks was 16.1%
- 62% of patients lost at least 10% body weight
- 37% of patients lost >20% body weight



Weghuber D, Barrett T, Barrientos-Pérez M, Gies I, Hesse D, Jeppesen OK, Kelly AS, Mastrandrea LD, Sørrig R, Arslanian S; STEP TEENS Investigators. Once-Weekly Semaglutide in Adolescents with Obesity. *N Engl J Med.* 2022 Dec 15;387(24):2245-2257. doi: 10.1056/NEJMoa2208601. Epub 2022 Nov 2. PMID: 36322838; PMCID: PMC9997064.

Percent BMI Reduction by Medication



Where/when to refer

NewKids
Healthy Heart
Endocrine



Children's
Wisconsin



NewKids Referral

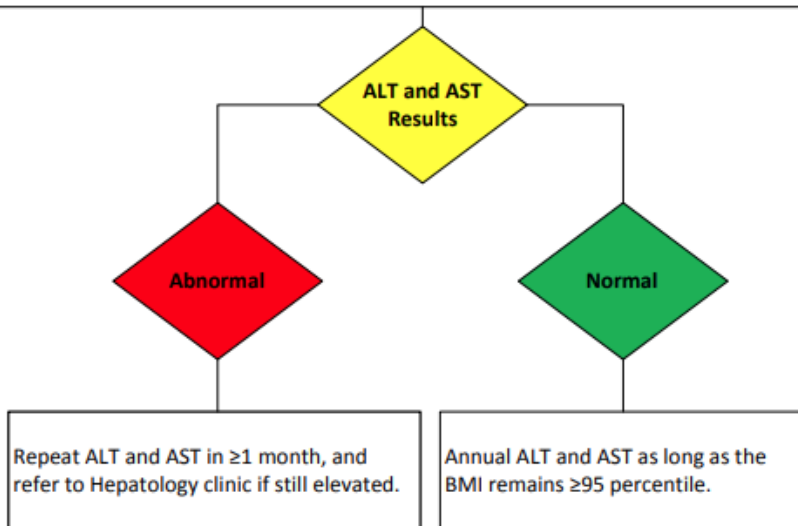
- BMI > 85% for age and gender and have a co-morbid health issue
- Abnormal fasting labs – Lipid panel, Glucose, Hemoglobin A1c, Insulin level, ALT, AST
- Comorbidities: PCOS, Sleep apnea, SCFE, Pseudo Tumor Cerebri, NAFLD/NASH

Hepatology Referral

Fatty Liver Screening

(see reverse for lipids and A1c)

Age \geq 6yo and BMI \geq 95th percentile: obtain ALT and AST



Healthy Heart

- For children with dyslipidemia, hypertension or family history of early heart disease- fasting labs
 - LDL>250, TG >500
 - LDL>190 or TG 200-500- lifestyle intervention, repeat in 6 months and if still elevated, refer
 - LDL 130-190- lifestyle intervention, repeat in 12 months if low risk
 - TG 100-200- lifestyle intervention, repeat in 6 months
- Patients seen by MD, RN, RD
- Have exercise physiologists and psychology support



Endocrine Referral

- For patients who do not meet criteria for diabetes, they are seen in endocrine clinic by MD or NP only
- If patient meets diagnostic criteria for diabetes or you are unsure, please contact us!
 - A1c > 6.5%- contact our office for diabetes appointment
 - A1c 6-6.4%, fasting glucose less than 126 and asymptomatic-lifestyle changes and repeat in 3 months
 - A1c 5.7-5.9%- lifestyle intervention and repeat in 6 months



Bariatric Surgery

- “The lack of therapeutic options to treat children with obesity has resulted in most large outcome studies reporting only small decreases in BMI with lifestyle management. The lack of significant outcomes has contributed to the guidance from the AAP and ASMBS for bariatric surgery for those 10 and above”
- Criteria for surgery
 - a BMI \geq 120% of the 95th percentile with a major comorbidity or $>$ 140% of the 95th percentile.
 - Not supported by evidence but clinical decision making should govern
 - Laparoscopic gastric sleeve
 - 5 year Teen Labs Study, there was 96% follow-up at 5 years with a mean percentage weight loss of 26%. In regards to comorbidities, 68% normalized blood pressure, and 81% normalized triglycerides, with 86% of patients with T2DM in remission



Bariatric Surgery

- Dr. Tammy Kindel, Dr. Karen Zorek, Denise Kilway, APNP, Marissa Seyfert, RD, Danielle Schneider, RN
- Collaborative assessment between Froedtert Bariatric and NEW Kids
- MSWL visits – once a month for 6 months
- Evaluated on a case-by-case basis
 - Sleeve gastrectomy – Restrictive makes a small stomach – some nutrient deficiencies
 - Roux in Y – Restrictive and malabsorption small pouch and moves small intestine - more nutrient deficiencies



Thank you

Feel free to contact me with questions/comments/concerns
edabrowski@mcw.edu



Children's
Wisconsin



Kids deserve the best.