



MACON & JOAN BROCK VIRGINIA HEALTH SCIENCES

Nutrition

AT OLD DOMINION UNIVERSITY

Update on Nonsurgical Therapies for Obesity

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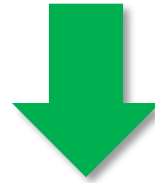


: @totocarbone

Learning objectives

- To review the prevalence of obesity and the energy balance model of obesity.
- To identify effective lifestyle interventions and pharmacotherapy (i.e., anti-obesity medications) in patients with obesity.
- To determine the role of nutrition in patients treated with modern anti-obesity medications to minimize the risk for GI-related side effects.

Obesity Prevalence in the United States

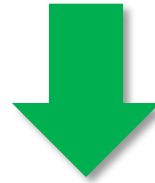


Lifestyle (diet and/or exercise) for Weight Loss



New Pharmacotherapy and Weight Loss

Obesity Prevalence in the United States



Lifestyle (diet and/or exercise) for Weight Loss



New Pharmacotherapy and Weight Loss

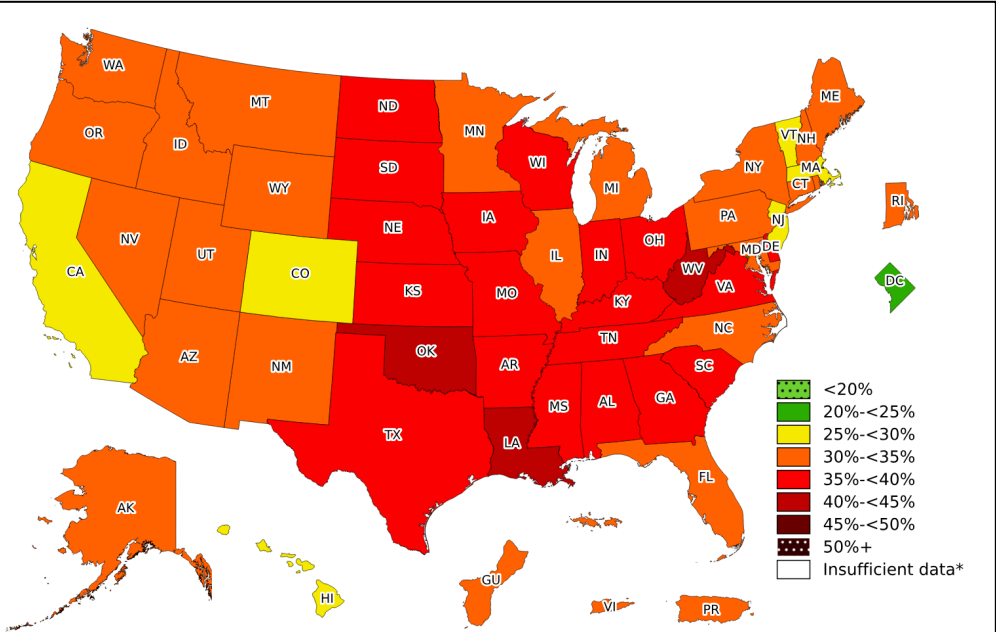
Obesity is an abnormal or excessive *fat* accumulation that impairs health

World Health Organ Tech Rep Ser 2000;894, i-xii, 1-253

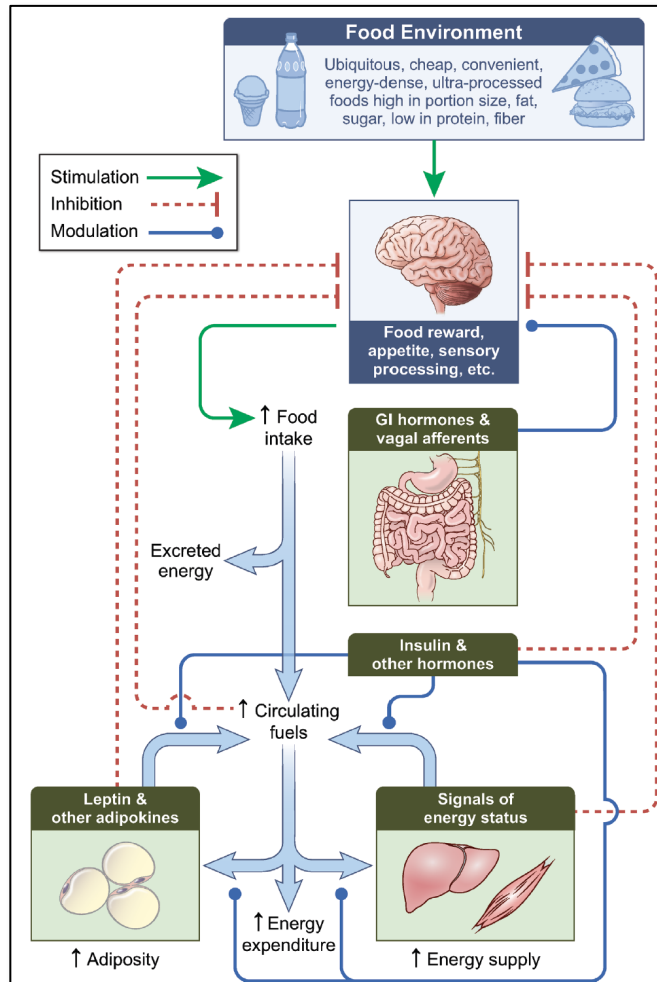
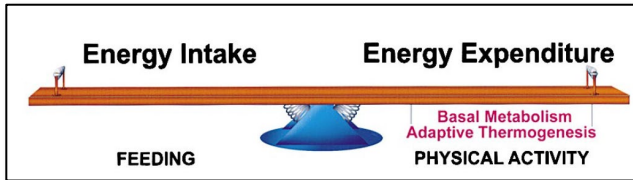
National Health and Nutrition Examination Survey 2017–March 2020 Prepandemic Data Files—Development of Files and Prevalence Estimates for Selected Health Outcomes

Table 5. Prevalence of adults aged 20 and over with obesity, by demographic characteristics: United States, 2017–March 2020

Characteristic	Both sexes		Men		Women	
	Sample size	Prevalence percentage (95% confidence interval)	Sample size	Prevalence percentage (95% confidence interval)	Sample size	Prevalence percentage (95% confidence interval)
Total (age adjusted)	8,295	41.9 (39.4–44.3)	4,051	41.8 (37.7–45.9)	4,244	41.8 (39.3–44.4)
Total (crude)	8,295	41.9 (39.4–44.3)	4,051	41.6 (37.4–45.8)	4,244	42.1 (39.6–44.8)
Age group (years):						
20–39	2,489	39.8 (35.3–44.3)	1,177	39.9 (33.1–47.0)	1,312	39.6 (34.9–44.3)
40–59	2,765	44.3 (41.3–47.4)	1,320	45.9 (41.0–50.9)	1,445	42.8 (38.7–47.1)
60 and over	3,041	41.5 (38.4–44.7)	1,554	38.4 (32.9–44.1)	1,487	44.2 (40.5–47.9)
Race and Hispanic origin:						
Non-Hispanic white	2,866	^{2,3} 41.4 (37.9–44.9)	1,432	³ 43.1 (37.4–48.9)	1,434	^{2–4} 39.6 (36.2–43.0)
Non-Hispanic black	2,213	^{3,4} 49.9 (47.2–52.6)	1,058	³ 40.4 (36.3–44.6)	1,155	^{3–5} 57.9 (54.0–61.7)
Non-Hispanic Asian	1,014	⁴ 16.1 (13.6–18.9)	466	⁴ 17.6 (13.7–22.2)	548	⁴ 14.5 (11.4–18.1)
Hispanic	1,806	45.6 (42.9–48.2)	880	45.2 (41.7–48.8)	926	45.7 (42.4–49.1)
Family income relative to federal poverty level (FPL):						
130% or less FPL	2,019	43.9 (41.7–46.1)	892	38.6 (33.6–43.8)	1,127	^{5,6} 47.9 (44.0–51.7)
More than 130% through 350% FPL	2,815	⁶ 46.5 (43.6–49.4)	1,400	43.9 (40.5–47.3)	1,415	⁶ 48.8 (44.5–53.0)
More than 350% FPL	2,312	39.0 (34.2–43.9)	1,189	42.4 (34.9–50.2)	1,123	35.1 (31.1–39.3)
Education:						
Less than high school diploma	1,538	^{7,8} 40.1 (36.5–43.8)	803	⁷ 35.3 (30.4–40.6)	735	^{5,8} 45.3 (41.0–49.7)
High school diploma or some college	4,709	⁸ 46.4 (44.0–48.9)	2,259	⁸ 45.9 (41.9–50.0)	2,450	⁸ 46.8 (43.9–49.8)
College degree or above	2,037	34.2 (30.1–38.5)	984	36.3 (29.0–44.1)	1,053	32.2 (28.5–36.1)



The Energy Balance Model of Obesity



Hall KD et al. *Am J Clin Nutr* 2022;115(5):1243-1254

Negative Energy Balance for Weight Loss

↑ Energy expenditure

- Physical activity
- Exercise training
- Thyroid hormones
- ...

↓ Energy absorption
↑ Energy excretion

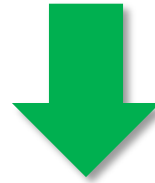
- Orlistat
- SGLT1/SGLT2 inhibitors

↓ Energy intake

- Energy restriction (diet)
- Energy restriction (pharmacology)

Lifestyle: ↓ Energy intake + ↑ Energy expenditure

Obesity Prevalence in the United States



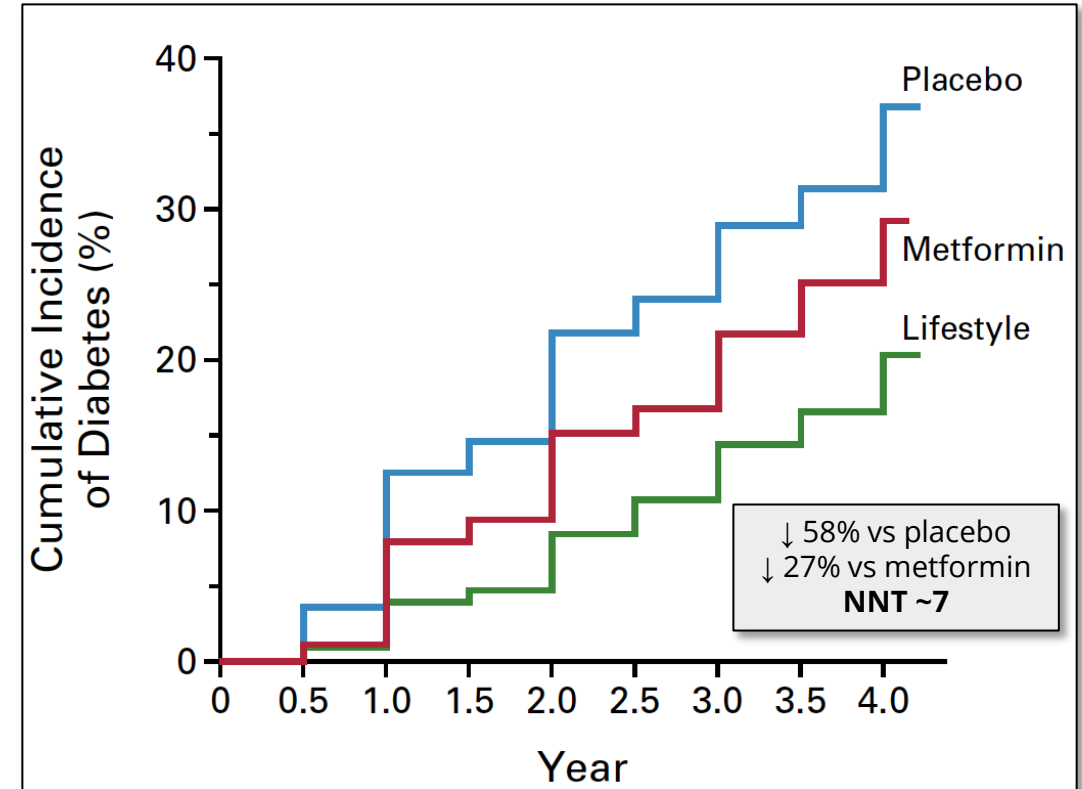
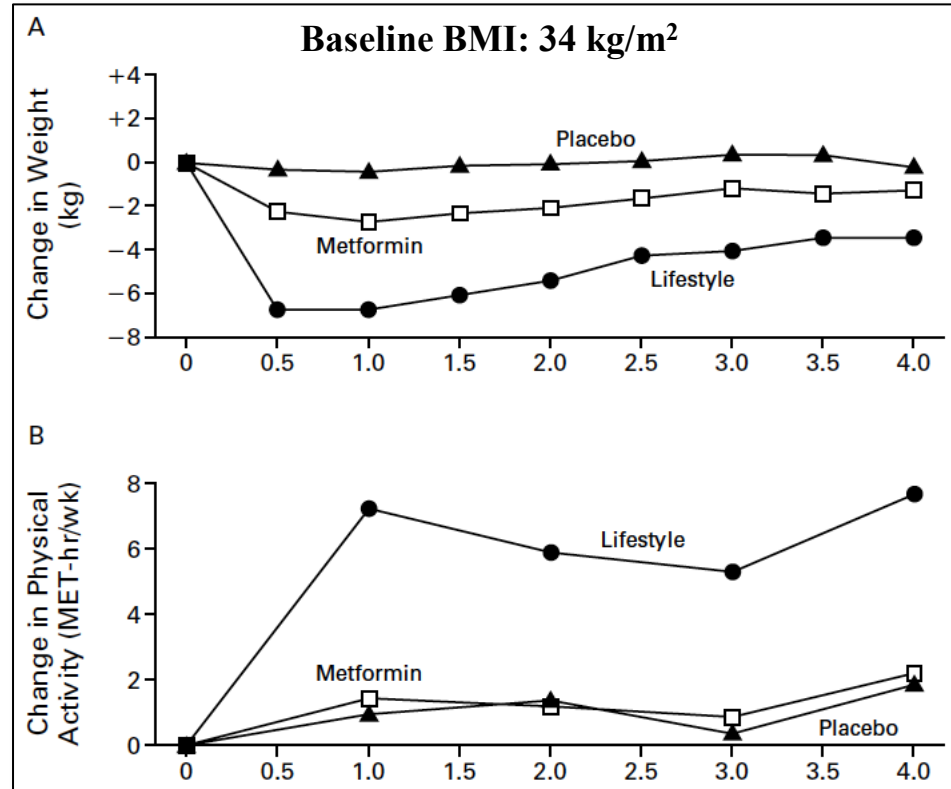
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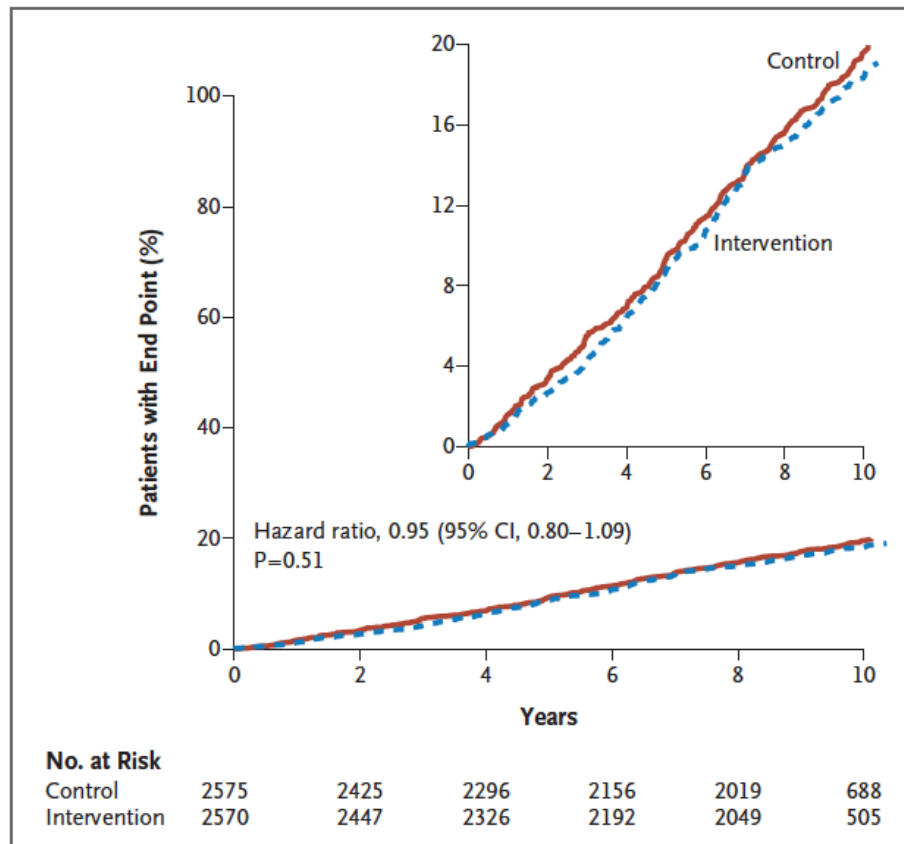
New Pharmacotherapy and Weight Loss

Lifestyle: ↓ Energy intake + ↑ Energy expenditure

REDUCTION IN THE INCIDENCE OF TYPE 2 DIABETES WITH LIFESTYLE INTERVENTION OR METFORMIN



Lifestyle: ↓ Energy intake + ↑ Energy expenditure



Weight-change categories (percentage weight loss in first year; n=4834)					
	Gain or stable (<2% loss)	Small loss (≥2–<5%)	Medium loss (≥5–<10%)	Large loss (≥10%)	p value
Primary outcome					
Events per person-years	289/17 075	141/7870	154/8570	128/8942	..
Crude rate per 100 person-years	1.69	1.79	1.80	1.43	..
Unadjusted hazard ratio (95% CI)	1.00	1.07 (0.88–1.31)	1.07 (0.88–1.31)	0.83 (0.67–1.02)	0.21
Adjusted hazard ratio†(95% CI)	1.00	1.08 (0.88–1.33)	1.16 (0.95–1.42)	0.79 (0.64–0.98), p=0.034*	0.17
Secondary outcome					
Events per person-years	422/16 699	206/7657	203/8411	186/8792	..
Crude rate per 100 person-years	2.53	2.69	2.41	2.12	..
Unadjusted hazard ratio (95% CI)	1.00	1.08 (0.91–1.27)	0.96 (0.81–1.13)	0.83 (0.70–0.99), p=0.035*	0.04
Adjusted hazard ratio† (95% CI)	1.00	1.05 (0.88–1.25)	0.97 (0.82–1.16)	0.76 (0.63–0.91), p=0.003*	0.006

↓ 10% Weight Loss in the first year was associated with a lower risk for hard cardiovascular events.

Energy Restriction + Physical Activity/Exercise Training

Table 1. Recommended Components of a High-Intensity Comprehensive Lifestyle Intervention to Achieve and Maintain a 5-to-10% Reduction in Body Weight.*

Component	Weight Loss	Weight-Loss Maintenance
Counseling	≥14 in-person counseling sessions (individual or group) with a trained interventionist during a 6-mo period; recommendations for similarly structured, comprehensive Web-based interventions, as well as evidence-based commercial programs	Monthly or more frequent in-person or telephone sessions for ≥1 yr with a trained interventionist
Diet	Low-calorie diet (typically 1200–1500 kcal per day for women and 1500–1800 kcal per day for men), with macronutrient composition based on patient's preferences and health status	Reduced-calorie diet, consistent with reduced body weight, with macronutrient composition based on patient's preferences and health status
Physical activity	≥150 min per week of aerobic activity (e.g., brisk walking)	200–300 min per week of aerobic activity (e.g., brisk walking)
Behavioral therapy	Daily monitoring of food intake and physical activity, facilitated by paper diaries or smart-phone applications; weekly monitoring of weight; structured curriculum of behavioral change (e.g., DPP), including goal setting, problem solving, and stimulus control; regular feedback and support from a trained interventionist	Occasional or frequent monitoring of food intake and physical activity, as needed; weekly-to-daily monitoring of weight; curriculum of behavioral change, including problem solving, cognitive restructuring, and relapse prevention; regular feedback from a trained interventionist

Target comorbidities with Diet Quality!

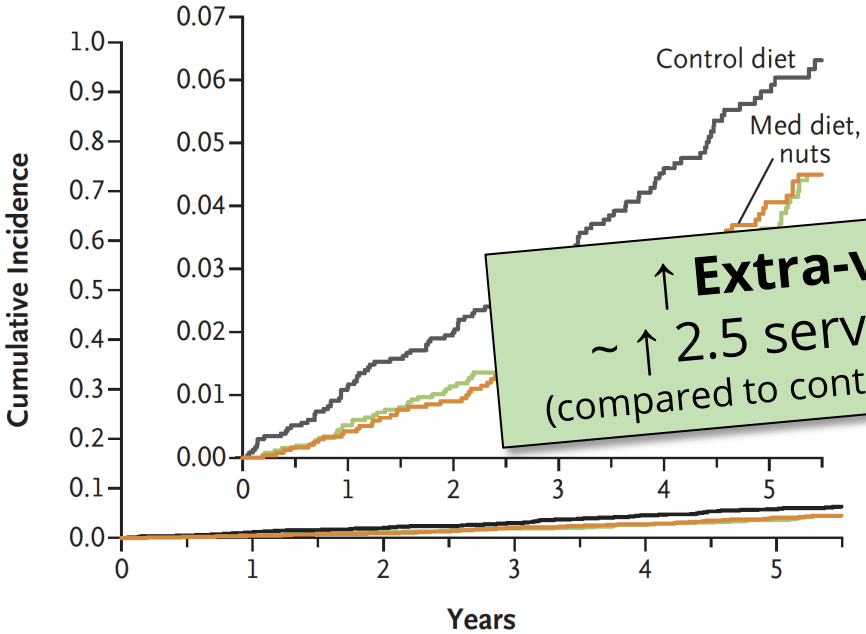
PREDIMED¹

Total fat: ~41% of total energy
saturated fatty acids ~9%

↑ 150 kcal compared to
control (low-fat diet)

A Primary End Point (acute myocardial infarction, stroke, or death from cardiovascular causes)

Med diet, EVOO: hazard ratio, 0.69 (95% CI, 0.53–0.91)
Med diet, nuts: hazard ratio, 0.72 (95% CI, 0.54–0.95)



↑ **Extra-virgin Olive Oil**
~ ↑ 2.5 servings (10 g/serving)
(compared to control. Baseline ~2-2.5 servings)

No. at Risk						
Control diet	2450	2268	2020	1583	1268	946
Med diet, EVOO	2543	2486	2320	1987	1687	1310
Med diet, nuts	2454	2343	2093	1657	1389	1031

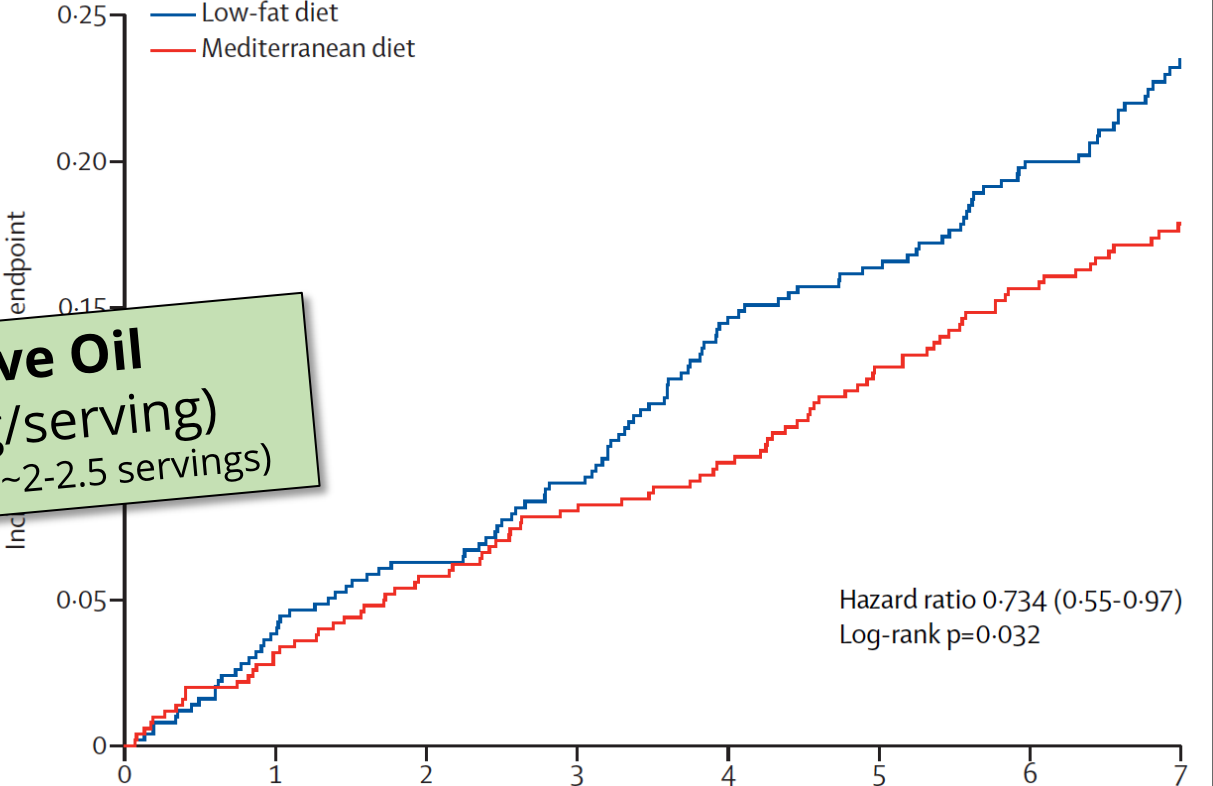
↓ 29%

CORDIOPREV²

Total fat: ~41% of total energy
saturated fatty acids ~9%

↑ 330 kcal compared to
control (low-fat diet)

A



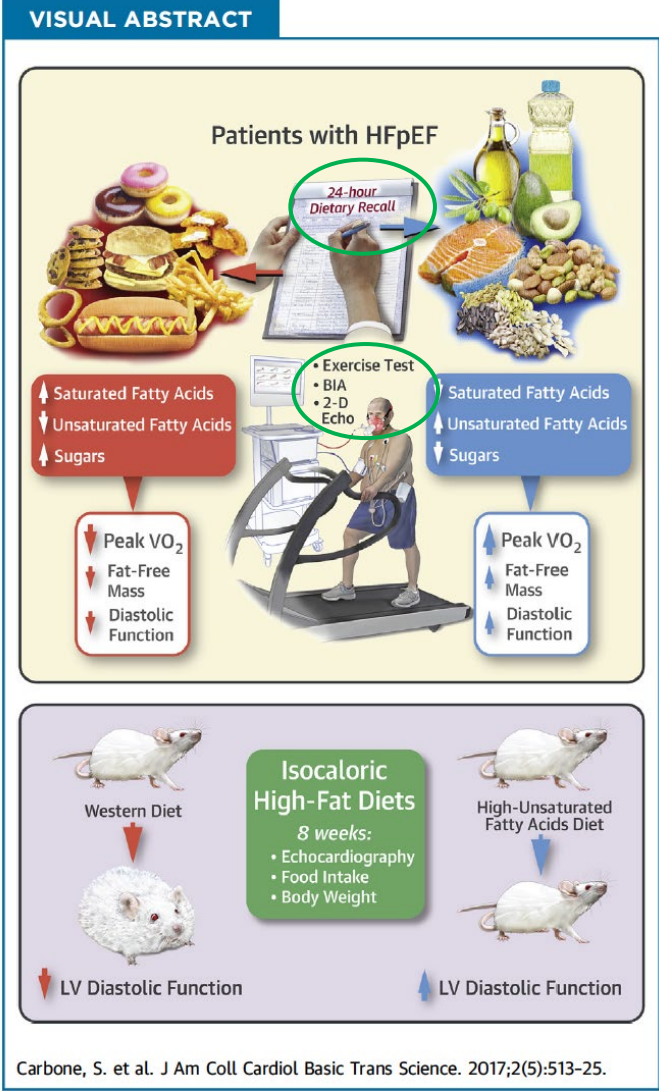
Hazard ratio 0.734 (0.55-0.97)
Log-rank p=0.032

Number at risk									
Low-fat diet	500	475	455	435	404	393	373	304	
Mediterranean diet	502	483	467	449	441	423	406	329	

↓ 27%

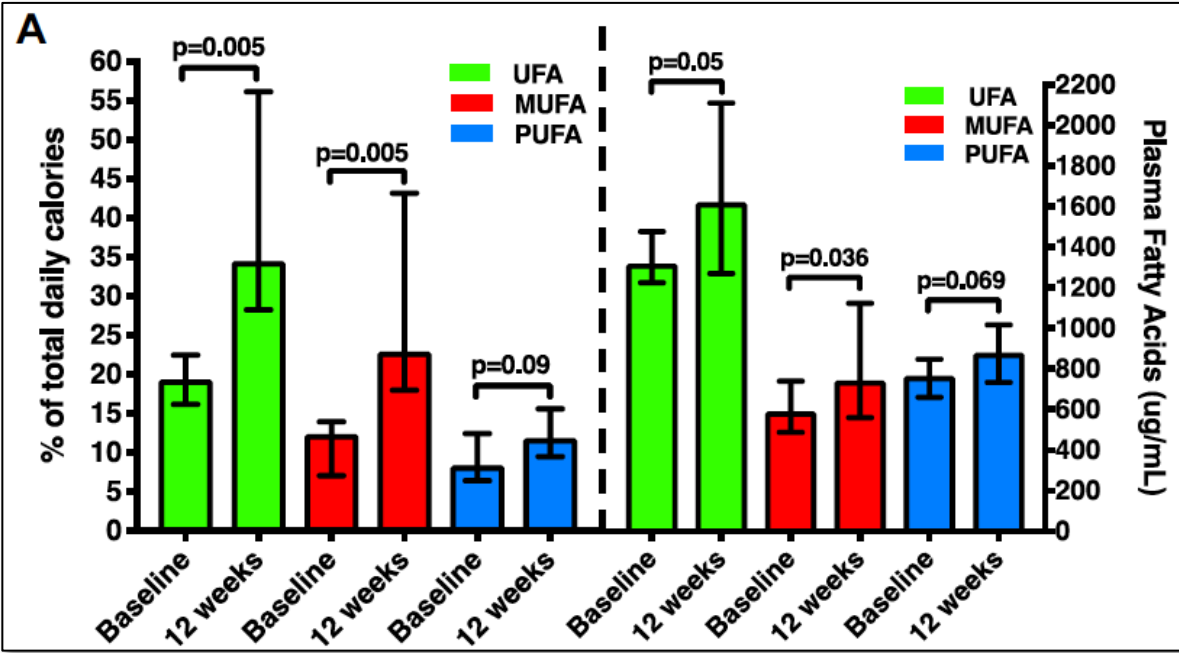
¹R Estruch et al. *N Engl J Med* 2018;378(25): e34
²Delgado-Lista J et al. *Lancet* 2022;399(10338):1876-1885

Dietary Fat, Sugar Consumption, and Cardiorespiratory Fitness in Patients With Heart Failure With Preserved Ejection Fraction



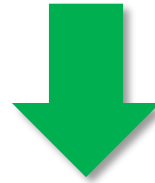
UFA-Preserved Study

FIRST CHOICE for Daily Consumption		SUBSTITUTES to First Choice for Daily Consumption	
Food	Quantity	Food	Quantity
Extra-virgin Olive Oil	1.8 oz/4 tbsp/54 g	Unsalted Seeds, mixed (pumpkin and sunflower)	1 oz/28 g
Canola Oil	1.8 oz/4 tbsp/54 g	Avocado, black skin (without skin)	2.5 oz/half avocado/50 g
Unsalted or lightly salted Mixed Dry Tree Nuts (walnuts, hazelnuts, almonds) and Peanuts	1 oz/1 handful/28 g	Fatty Fish, edible portion (salmon, trout, mackerel, sardines)	6 oz (after cooking)/170 g 3 oz (canned fish)



UFA: unsaturated fatty acids (MUFA + PUFA)
MUFA: monounsaturated fatty acids (oleic acid)
PUFA: polyunsaturated fatty acids (linoleic and α-linolenic acids)

Obesity Prevalence in the United States



Lifestyle (diet and/or exercise) for Weight Loss



New Pharmacotherapy and Weight Loss

Indication and Efficacy for Anti-Obesity Medications (AOM)

Indications:

- BMI ≥ 30 kg/m²
- BMI ≥ 27 kg/m² + weight-related comorbidity (HTN, HLD, T2DM, OSA, CVD)

AOM is considered effective when either:

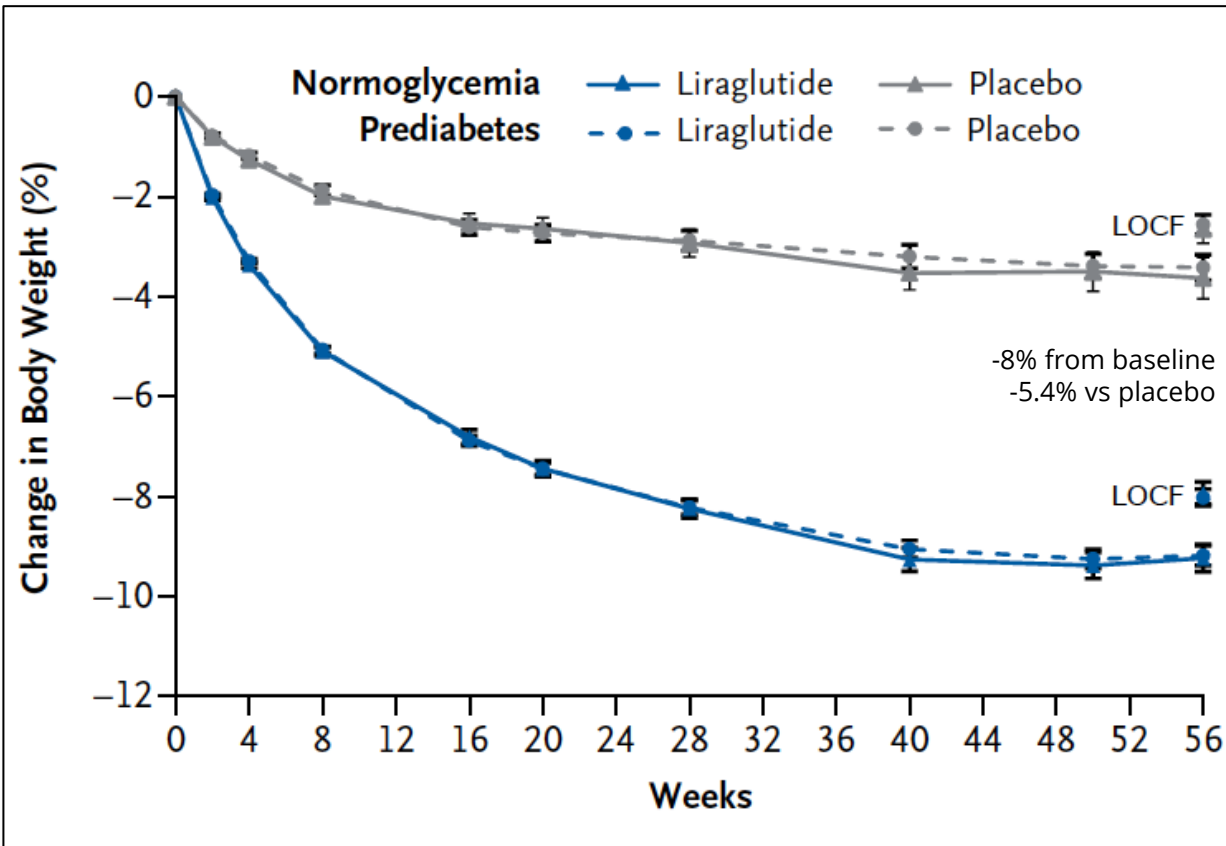
- $\geq 5\%$ of mean difference of BW between active product and control (SS)
- $\geq 35\%$ of patients lose $\geq 5\%$ of BW (SS)

liraglutide:

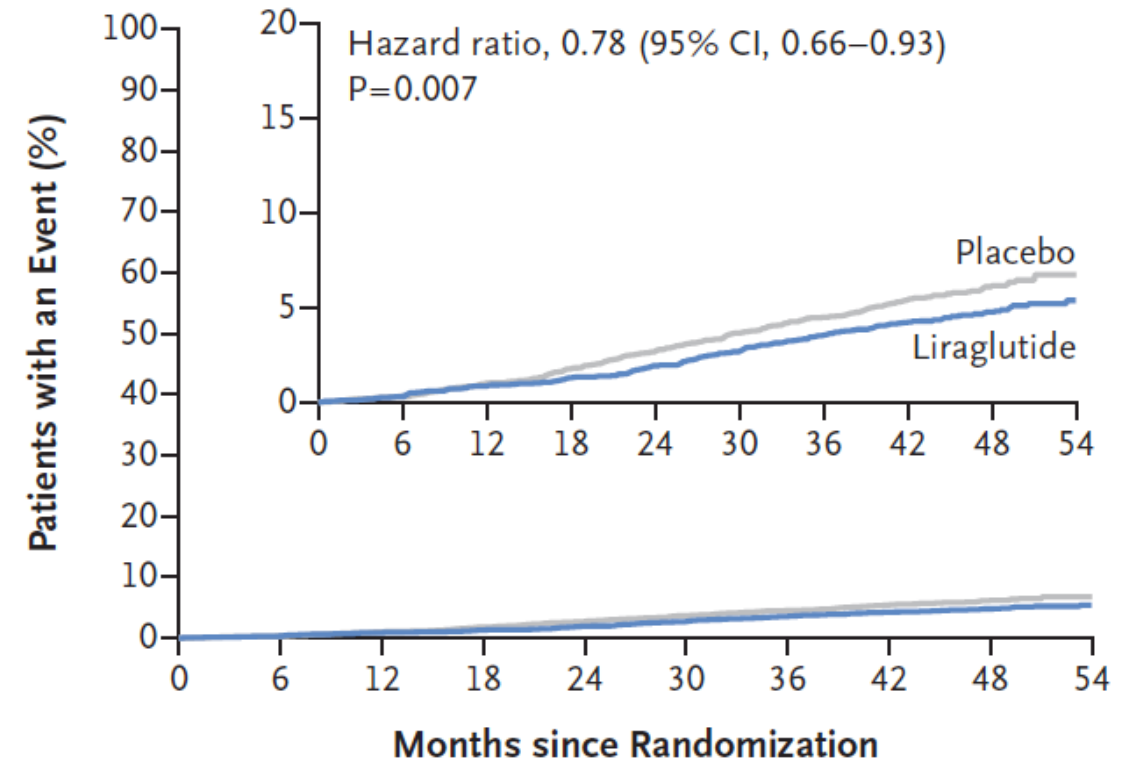
GLP1 RA (daily)

- up to 1.8 mg for T2DM (Victoza®)
- up to 3.0 mg for Obesity (Saxenda®)

Pi-Sunyer X et al. *N Engl J Med* 2015;373(1):11-22
Marso SP et al. *N Engl J Med* 2016;375(4):311-22x



B Death from Cardiovascular Causes



No. at Risk

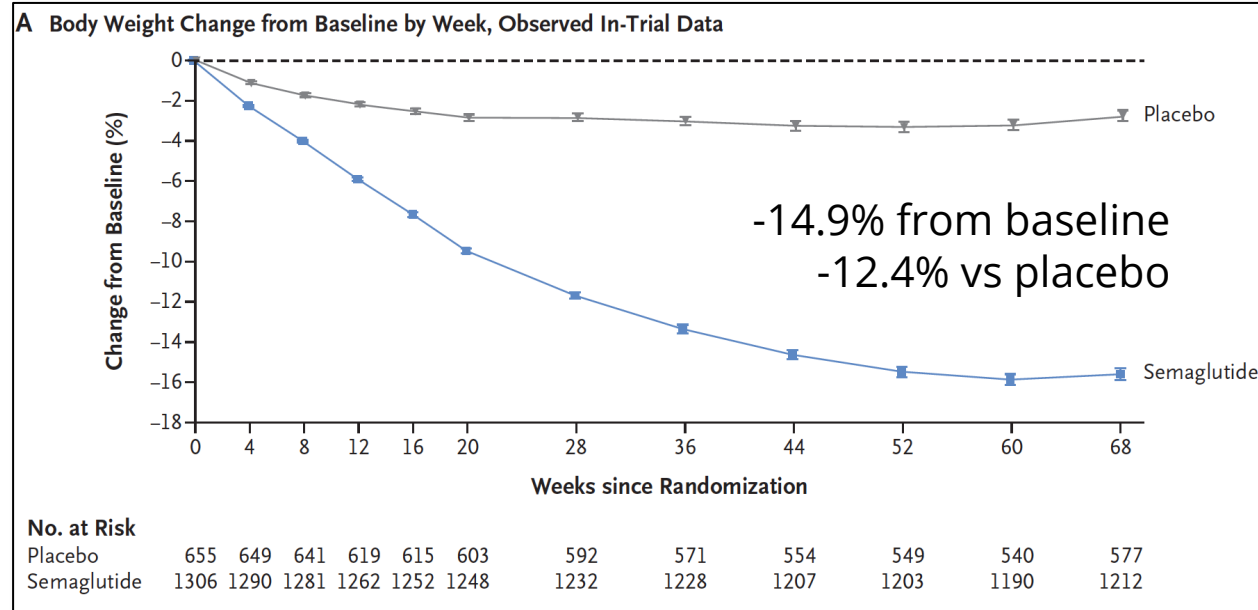
Liraglutide	4668	4641	4599	4558	4505	4445	4382	4322	1723	484
Placebo	4672	4648	4601	4546	4479	4407	4338	4267	1709	465

semaglutide:

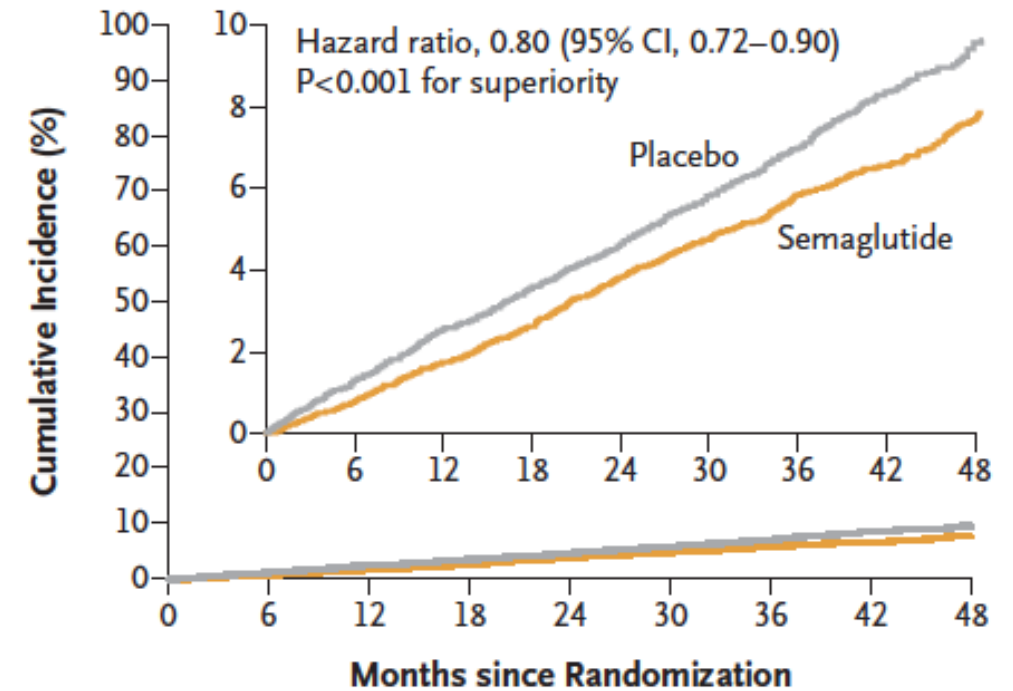
GLP1 RA (weekly)

- up to 2.0 mg for T2DM (Ozempic®)
- up to 2.4 mg for Obesity (Wegovy®)
- up to 14 mg for T2DM (oral, daily) (Rybelsus®)

Wilding JPH et al. *N Engl J Med* 2021; 384:989-1002
Lincoff AM et al. *N Engl J Med* 2023;389(24):2221-2232



A Primary Cardiovascular Composite End Point



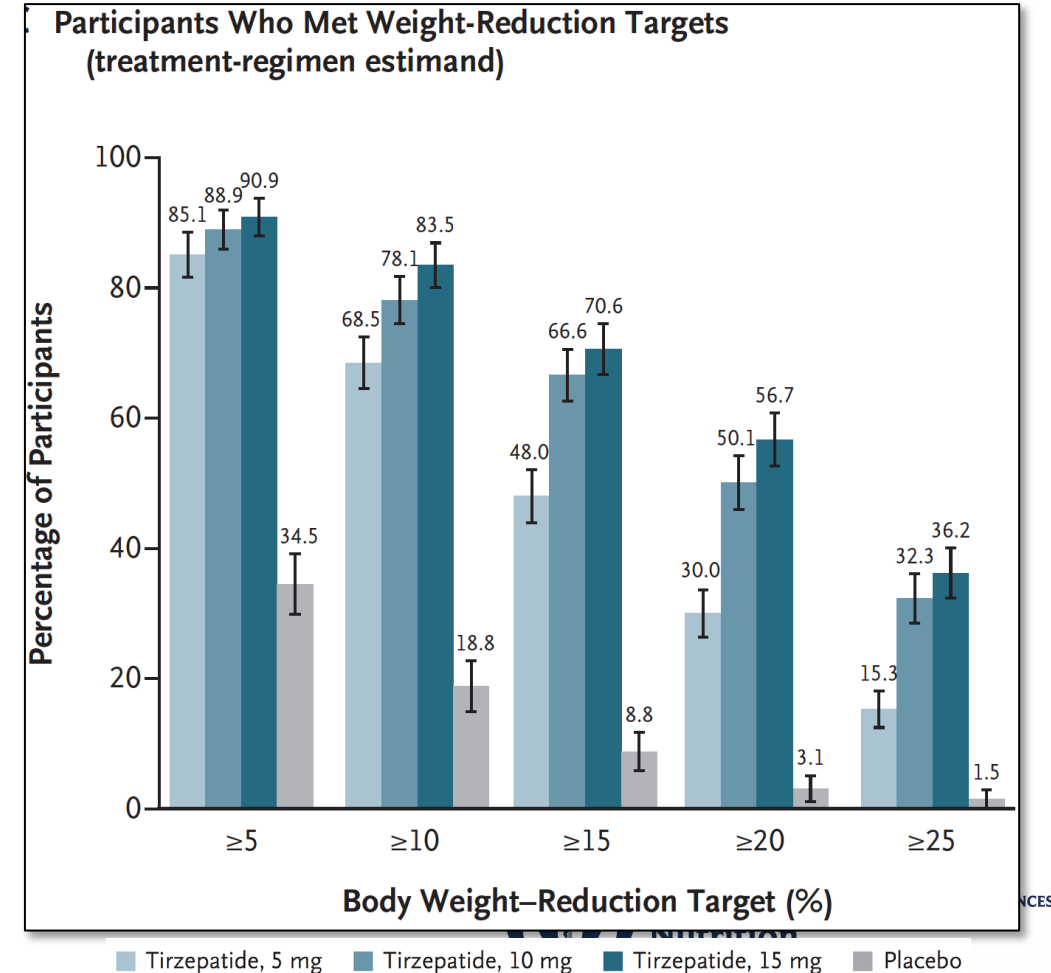
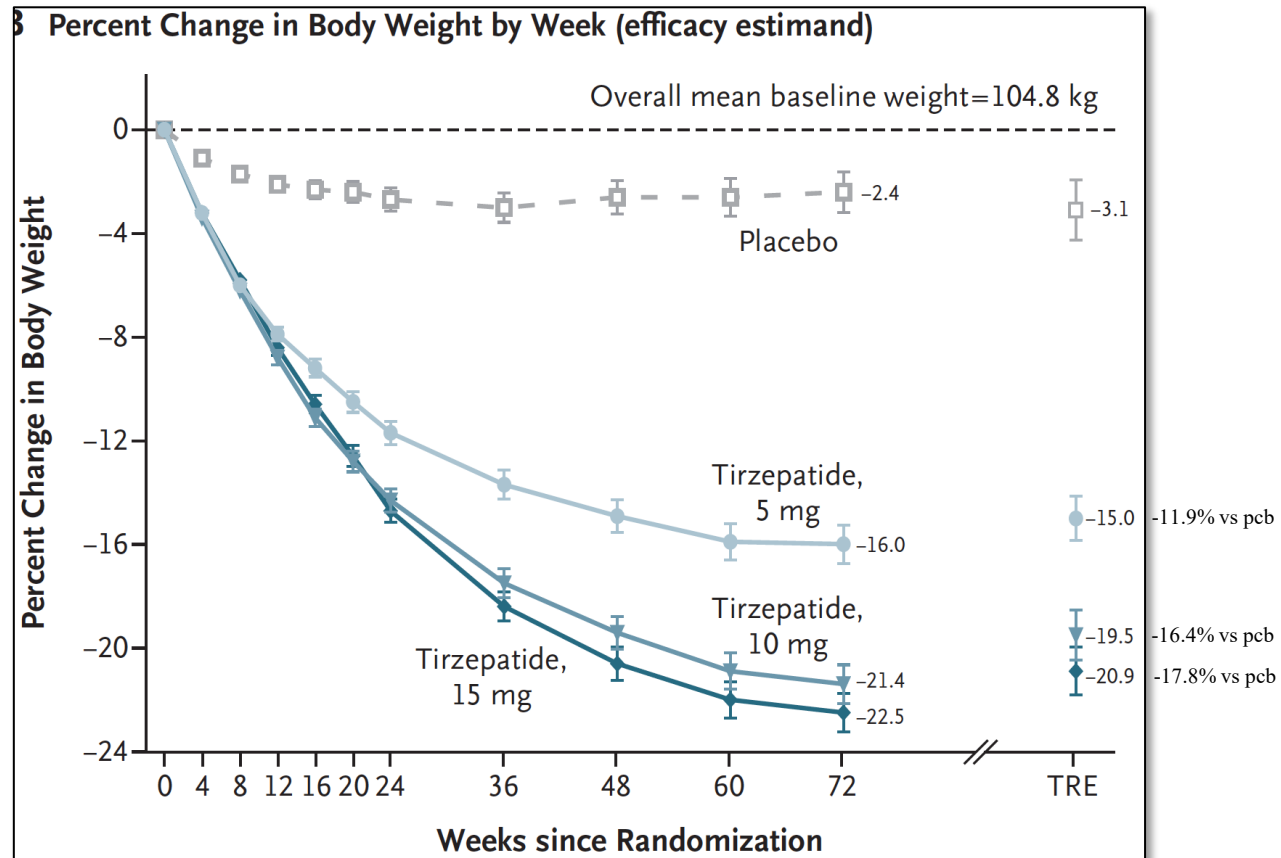
No. at Risk

Placebo	8801	8652	8487	8326	8164	7101	5660	4015	1672
Semaglutide	8803	8695	8561	8427	8254	7229	5777	4126	1734

tirzepatide:

dual glucose-dependent insulinotropic polypeptide (GIP)/GLP1 RA (weekly)

- up to 15 mg for T2DM (Mounjaro®)
- up to 15 mg for Obesity (Zepbound®)



Diabetes Prevention with incretin-mimetic agents

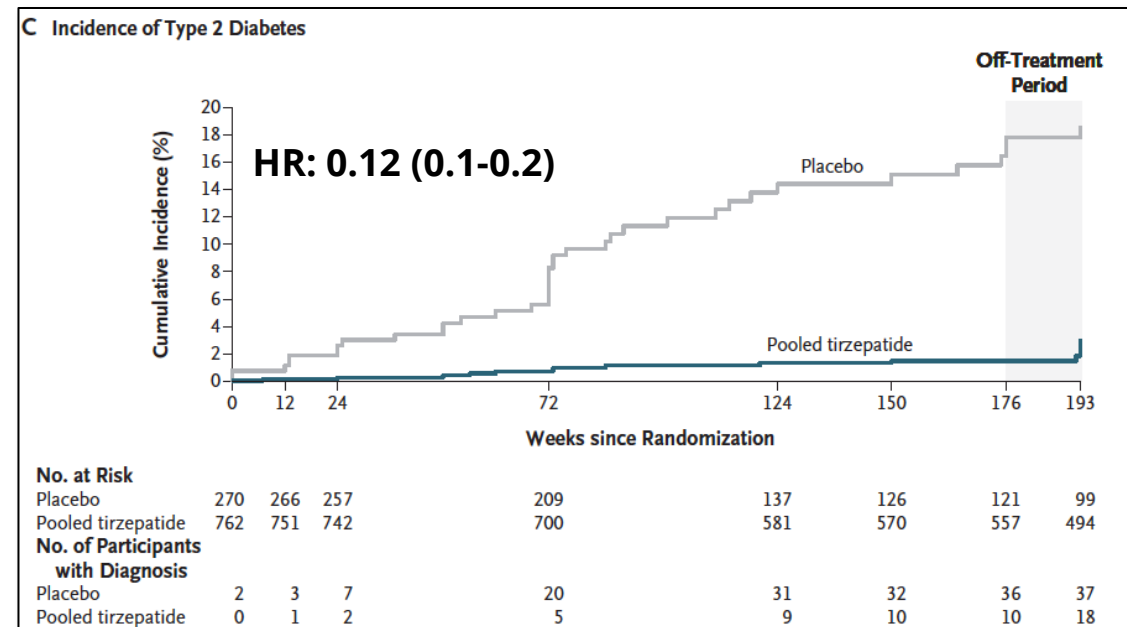
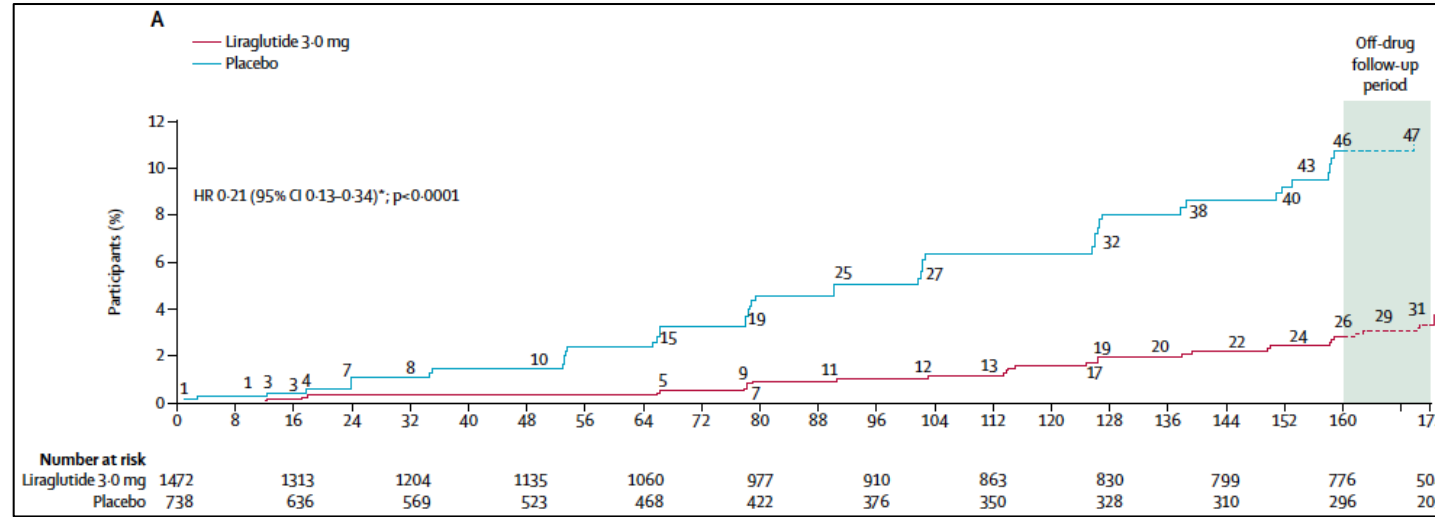


Table 1. FDA-approved weight loss medications for long-term use.

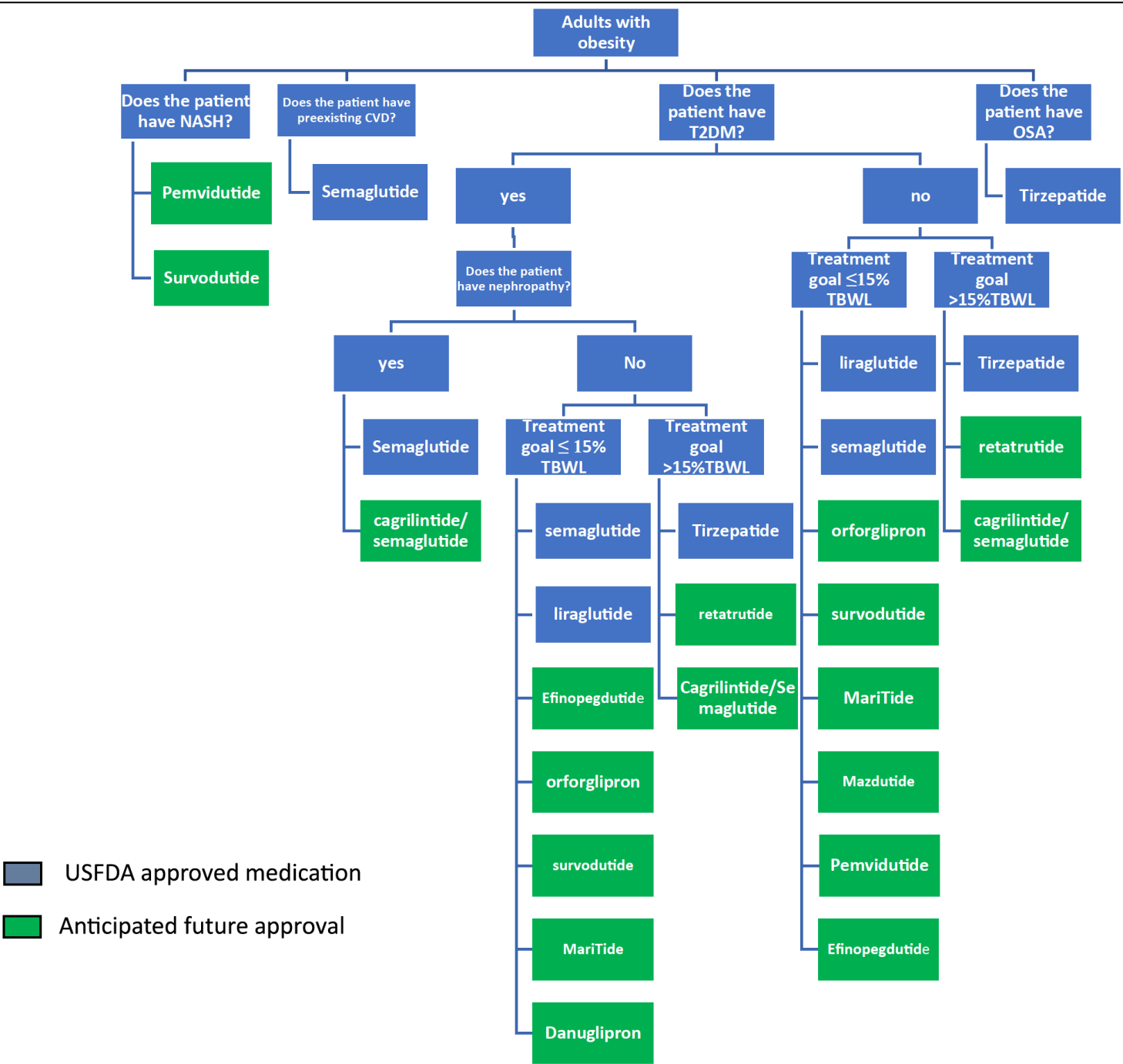
Medication	Dosing	Adverse effects	Safety Considerations	Drug–drug interactions
Orlistat (Rx: Xenical® OTC: Alli®)	Rx: 120 mg every 8 h with fat-containing meals OTC: 60 mg every 8 h with fat-containing meals No adjustment for renal/hepatic function necessary	Fatty/oily stool Flatulence Increased defecation	Reduced absorption of fat-soluble vitamins (A,D,E,K). Daily multivitamin required. Post-marketing reports of liver injury CV safety unknown	May reduce absorption of some medications Monitor patients on warfarin due to decreased vitamin K absorption
Lorcaserin (Belviq®)	10 mg twice daily or 20 mg once daily (extended-release) CrCl < 30 mL/min: Avoid use	Headache Dizziness Nausea Fatigue	↑ risk of serotonin syndrome if used with drugs affecting serotonin pathways (e.g. SSRIs, tramadol) Priapism can occur CV safe (CAMELLIA-TIMI) Clinicaltrials.gov: NCT02019264	CYP2D6 inhibitor: May increase concentration of beta-blockers, SSRIs, etc.
Bupropion-naltrexone (Contrave®)	90mg/8mg once daily titrated up to 2 tablets twice daily over 4 weeks Moderate-severe renal impairment: Do not exceed 1 tablet twice daily Avoid in patients with severe renal impairment	Nausea Constipation Headache Vomiting Dizziness Insomnia	Black box warning: ↑ risk of suicidal thoughts and behavior Avoid in patients with history of seizure disorders, chronic opioid users, or with uncontrolled hypertension Hepatotoxicity CV safety unknown	CYP2B6 substrate: Avoid use with CYP2B6 inhibitors (e.g. clopidogrel) CYP2D6 inhibitor: May increase concentration of beta-blockers, SSRIs, etc.
Phentermine–topiramate (Qsymia®)	Initial: 3.75mg/23mg once daily, then titrate based on % weight loss from baseline up to max dose of 15mg/92mg daily CrCl mL/min < 50: Do not exceed 7.5mg/46mg daily	Paresthesias Dry Mouth Constipation Headache	↑ risk of serotonin syndrome if used with drugs affecting serotonin pathways (e.g. SSRIs, tramadol) Suicidal behavior, mood/sleep disorders, cognitive impairment May worsen glaucoma CV safety unknown	Increased risk of hypokalemia when used with non-potassium sparing diuretics
Liraglutide (Saxenda®)	Initial: Inject 0.6 mg daily for 1 week, then titrate by 0.6 mg/day weekly up to max dose of 3 mg/day No adjustment for renal/hepatic function necessary	Nausea Vomiting Diarrhea	Black box warning: Avoid in patients with personal or family history of medullary thyroid carcinoma Cases of acute pancreatitis and acute gallbladder disease have been reported CV safety only known for liraglutide dose used for type 2 diabetes (LEADER), which showed a reduction CV events and mortality	Increased risk of hypoglycemia when used with insulin and sulfonylureas

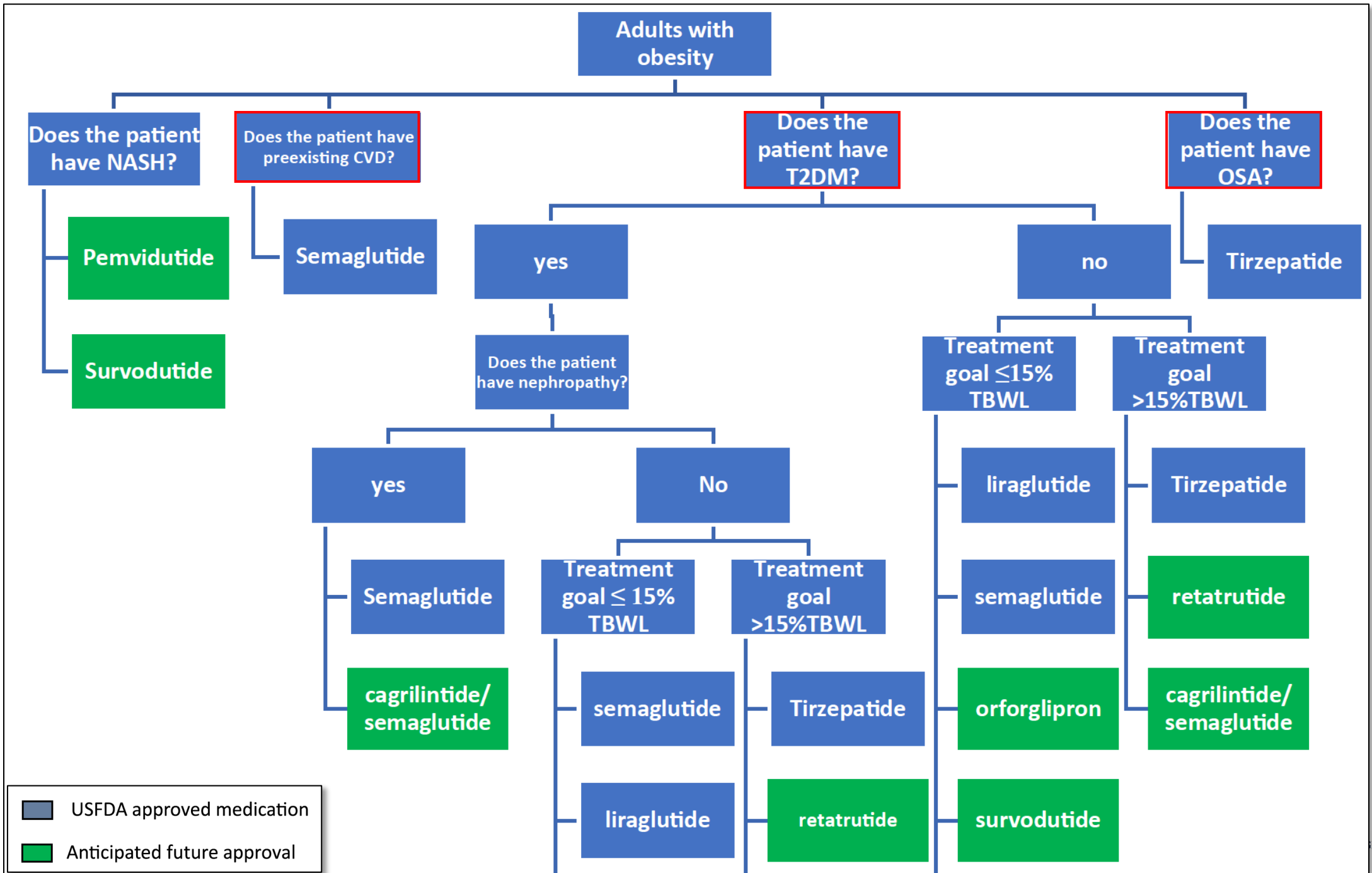
CrCl: creatinine clearance; CV: cardiovascular; OTC: over-the-counter; Rx: prescription only; SSRI: selective serotonin reuptake inhibitors.
Reference: Individual product package inserts.

Selecting appropriate weight loss pharmacotherapies in older adults to reduce cardiovascular risk

Table 1. FDA-approved weight loss medications for long-term use.				
Medication	Dosing	Adverse effects	Safety Considerations	Drug–drug interactions
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Lorcaserin (Belviq®)	10 mg twice daily or 20 mg once daily (extended-release) CrCl < 30 mL/min: Avoid use	Headache Dizziness Nausea	↑ risk of serotonin syndrome if used with drugs affecting serotonin pathways (e.g. SSRIs, tramadol) Pulsus can occur	CYP2D6 inhibitor: May increase concentration of beta-blockers, SSRIs, etc.
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CrCl: creatinine clearance; CV: cardiovascular; OTC: over-the-counter; Rx: prescription only; SSRI: selective serotonin reuptake inhibitors. Reference: Individual product package inserts.				

Semaglutide (Wegovy®)	Initial: Inject 0.25 mg once weekly for 4 weeks, then increase until 2.4 mg is reached (prefilled syringes: 0.25, 0.5, 1, 1.7, and 2.4 mg). No adjustments for renal/hepatic function.	Nausea Vomiting Diarrhea	- Same as liraglutide + - CV benefits shown in SELECT (obesity) and SUSTAIN 6 (T2DM: 0.5 and 1 mg) → FDA-Indication, safety in PIONEER 6 (T2DM and oral: 14 mg), benefits in SOUL (T2DM and oral: 14 mg) → FDA-indication pending - Renal benefits in FLOW (T2DM + CKD: 0.5, 1.0, and 2 mg) → FDA-Indication - Functional capacity benefits in HFpEF and obesity (STEP-HFpEF) - Improved pain in knee osteoarthritis and obesity (STEP 9) - Improved walking distance in patients with symptomatic peripheral artery disease and type 2 diabetes (STRIDE)	- Same as liraglutide. - Delay in gastric emptying could impact absorption of oral medications.
Tirzepatide (Zepbound®)	Initial: Inject 2.5 mg once weekly for 4 weeks, then increase in 2.5 mg increments once weekly every 4 weeks. Maintenance dosages are 5 mg, 10 mg, 15 mg (max dose) once weekly. (prefilled syringes: 2.5, 5, 7.5, 10, 12.5, 15 mg). No adjustments for renal/hepatic function.	Nausea Vomiting Diarrhea	- Same as liraglutide + - CV safety study in T2DM ongoing <u>vs dulaglutide</u> (SURPASS-CVOT) - Functional capacity and CV/HHF benefits in HFpEF (SUMMIT) - Improved outcomes in obstructive sleep apnea and obesity (SURMOUNT-OSA) → FDA-Indication	- Same as liraglutide. - Delay in gastric emptying could impact absorption of oral medications.

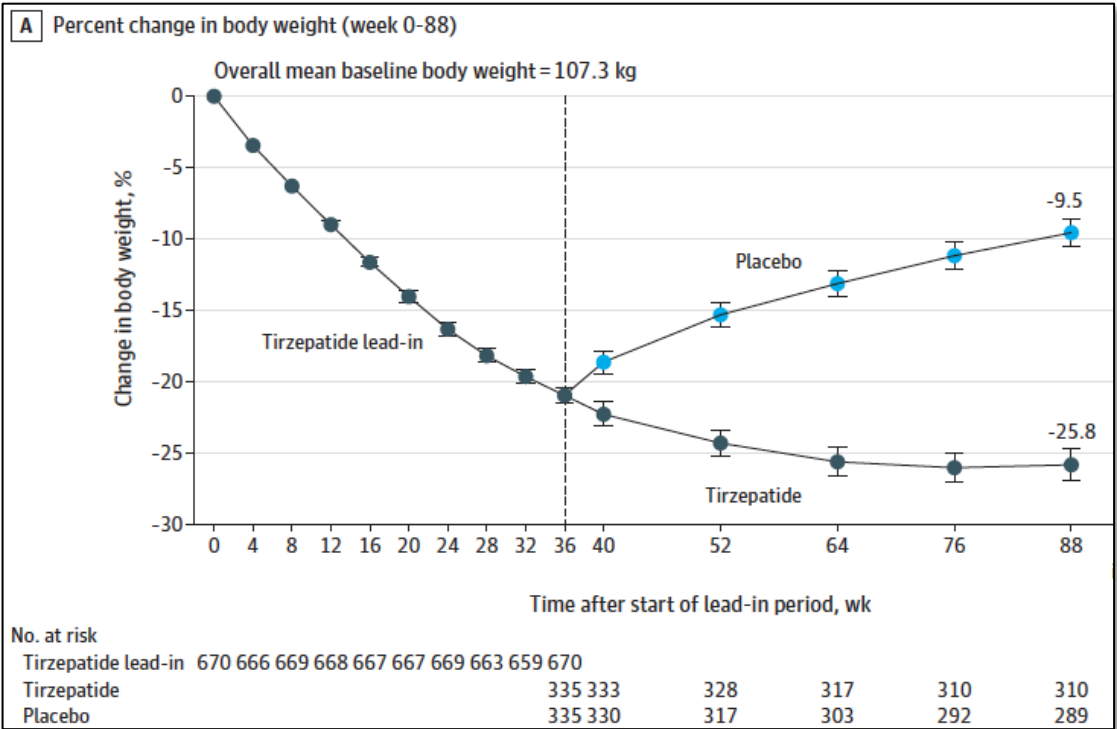
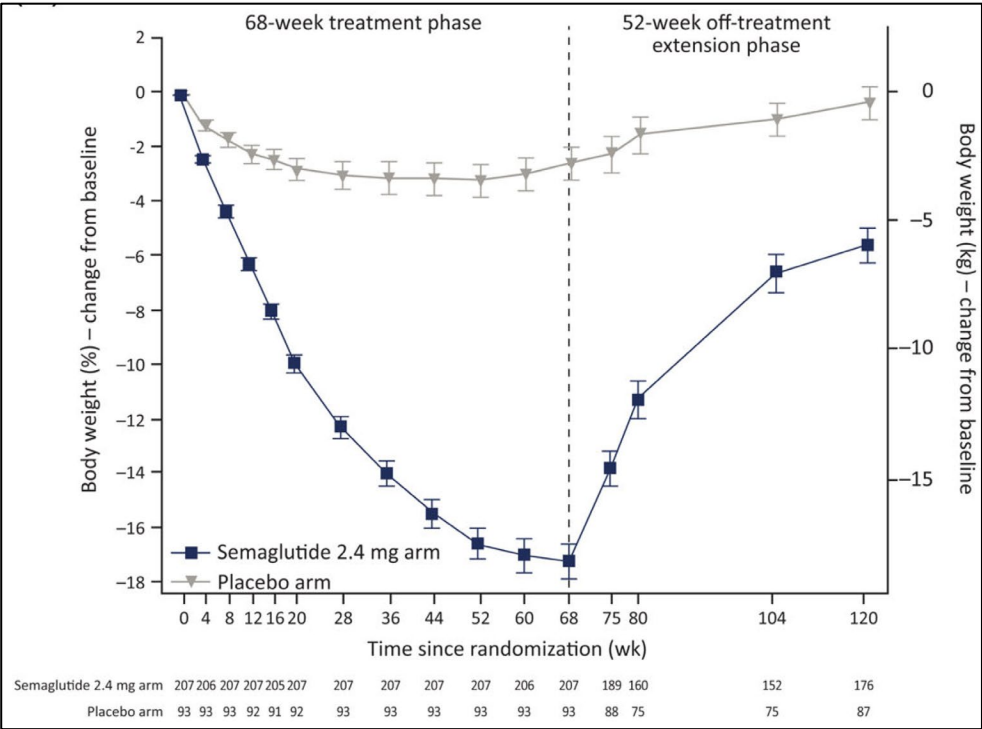




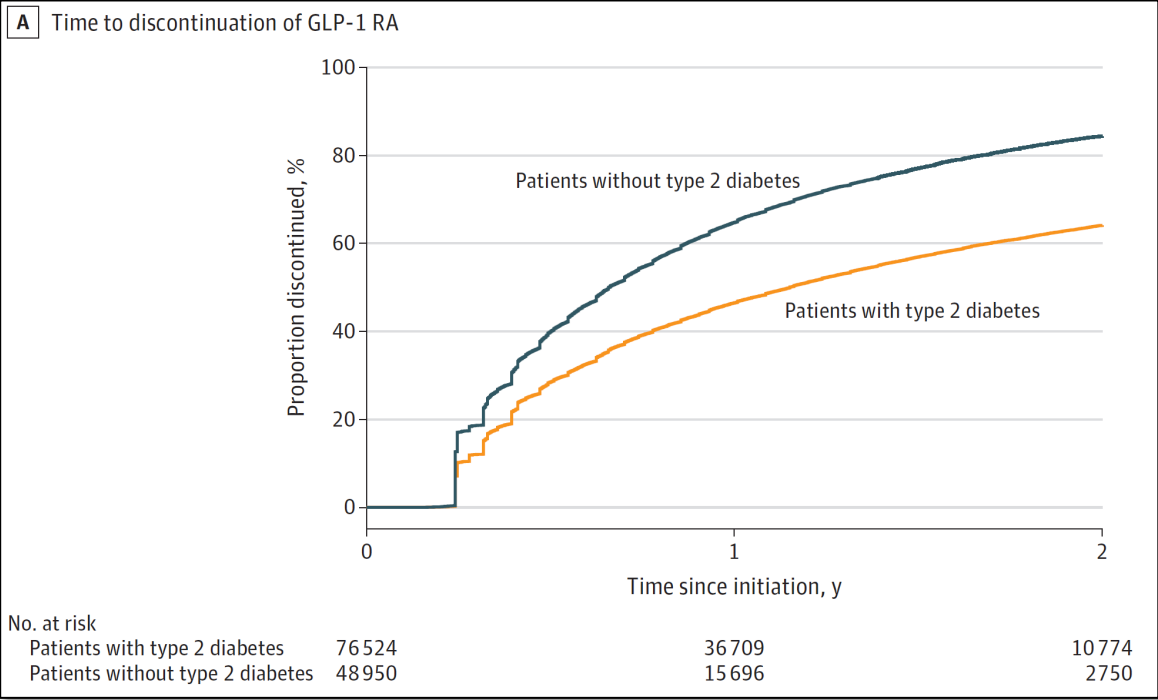
Are these agents curing obesity?

Weight regain and cardiometabolic effects after withdrawal of semaglutide: The STEP 1 trial extension

Continued Treatment With Tirzepatide for Maintenance of Weight Reduction in Adults With Obesity
The SURMOUNT-4 Randomized Clinical Trial

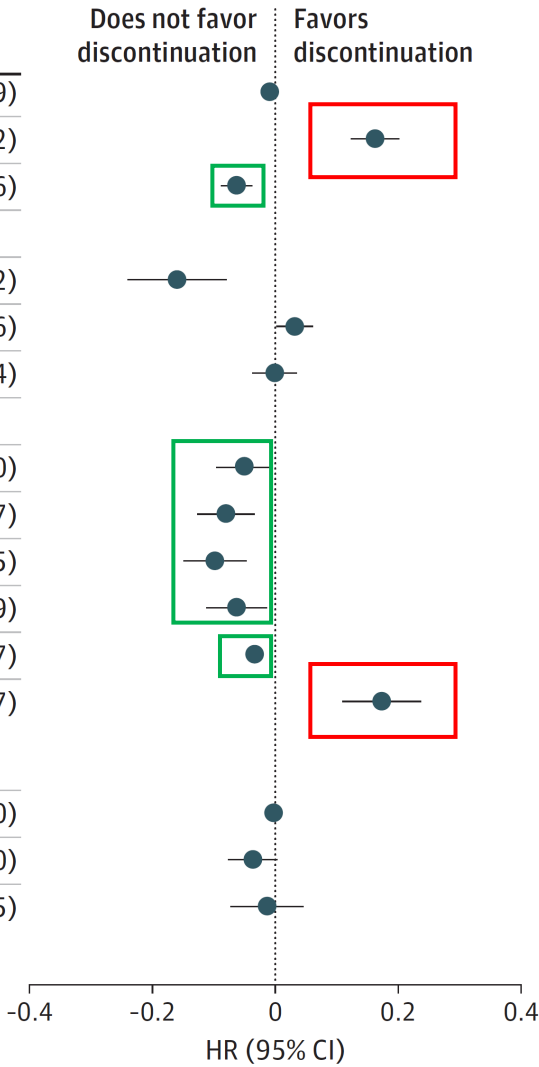


53.6% discontinued by 1 year, and 72.2% discontinued by 2 years



B Patients without type 2 diabetes

Covariate	HR (95% CI)
Age	0.99 (0.99-0.99)
Age ≥65 y	1.18 (1.13-1.22)
Male	0.94 (0.92-0.96)
Race and ethnicity	
Asian	0.85 (0.79-0.92)
Black	1.03 (1.00-1.06)
Other ^a	1.00 (0.96-1.04)
Income, \$	
30 001-50 000	0.95 (0.91-1.00)
50 001-80 000	0.92 (0.88-0.97)
>80 000	0.91 (0.86-0.95)
Unknown	0.94 (0.89-0.99)
Weight loss (per 1%)	0.97 (0.97-0.97)
Gastrointestinal adverse events with treatment	1.19 (1.12-1.27)
Baseline BMI	1.00 (1.00-1.00)
CKD	0.96 (0.93-1.00)
Heart failure	0.99 (0.93-1.05)





Incretin-Based Therapies and Lifestyle Interventions: The Evolving Role of Registered Dietitian Nutritionists in Obesity Care



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Medication adverse effect	Nutrition management strategies
Nausea	Eat regularly with smaller portions than usual Eat slowly Stop at first sign of fullness Limit high-fat or spicy foods Stay hydrated: daily fluid intake of 64 oz Moderate use of carbonated beverages
Constipation	High-fiber food diet with vegetables, fruits, whole grains Stay hydrated: daily fluid intake of 64 oz Increase physical activity; reduce sedentary behavior Consider a fiber supplement Consider a stool softener
Diarrhea	Avoid sugar alcohols Limit intake of coffee, dairy, alcohol, carbonated beverages Increase fiber intake Stay hydrated: daily fluid intake of 64 oz

Nutrition intervention	Recommendations
Nutrition adequacy Assess for nutrition quantity and quality	Assess for adequacy of nutrition intake and need for education based on food history Use shared decision making to outline healthful, nutrient-dense food choices and an eating pattern that is sustainable considering client food preferences and availability Assess food and nutrition security Provide guidance on evidence-based healthy eating patterns that promote weight-loss maintenance as well as cardiovascular health, such as the Mediterranean-style, plant-based (vegetarian or vegan), or Dietary Approaches to Stop Hypertension. ^{27,64,65}
Protein Assess quantity and quality of protein intake	Recommended Daily Allowance of 0.8 g protein/kg Minimum of 60 g protein daily and up to 1.2-1.5 g/kg ideal body weight recommended during weight reduction ^{10,63} Distribute intake throughout the day to maximize protein synthesis ^{66,67} Recommend lean meats, poultry, fish, eggs, legumes, tofu, low-fat dairy Supplement with protein powders, shakes, or bars if dietary intake is inadequate
Hydration Assess for sufficient noncaloric fluid intake	Recommend a minimum of 64 fl oz of water or other noncaloric beverages daily Moderate use of carbonated beverages ⁵⁵
Fiber Assess for adequate fiber intake	Recommend high-fiber diet (14 g/1000 kcal) to reduce risk of constipation ⁶⁸ Emphasize high-fiber foods, such as legumes, vegetables, fruit, and whole grains Suggest fiber supplement, with adequate hydration, if client experiences early satiety
Vitamins and minerals Assess for intake and status	Assess for potential micronutrient deficiencies. Consider multivitamin/mineral supplement if nutrient intake is inadequate



Conclusions

- Obesity remains highly prevalent in the United States.
- Lifestyle intervention (energy restriction with and without exercise) is effective in reducing body weight; however, long-term sustainability remains a major barrier.
- Improvements in diet quality should be recommended to reduce CV risk, even in absence of energy restriction.
- GLP1RA and GIP/GLP1-RA are powerful weight loss agents that also present CV, renal, and OSA benefits, among others.
- Chronic treatment is necessary; weight regain after interruption occurs in most patients.
- The role of nutrition is central in patients treated with AOM to prevent and treat GI-related side effects and maximize weight loss.



MACON & JOAN BROCK VIRGINIA HEALTH SCIENCES

Nutrition

AT OLD DOMINION UNIVERSITY

Update on Nonsurgical Therapies for Obesity

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Eastern Virginia Medical School Division of Endocrine & Metabolic Disorders, Strelitz Diabetes Center

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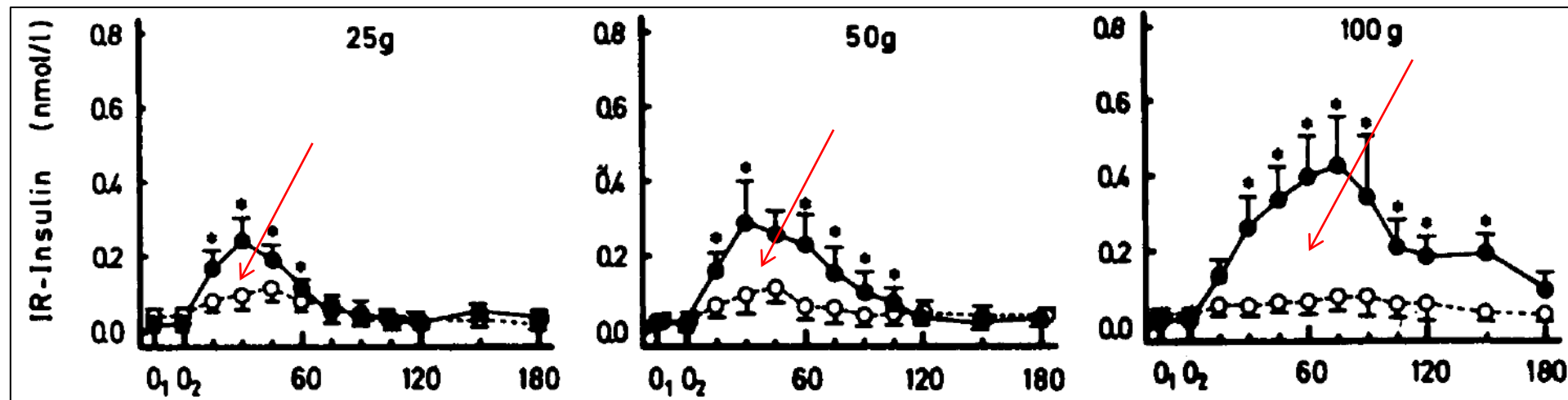
Email: scarbone@odu.edu



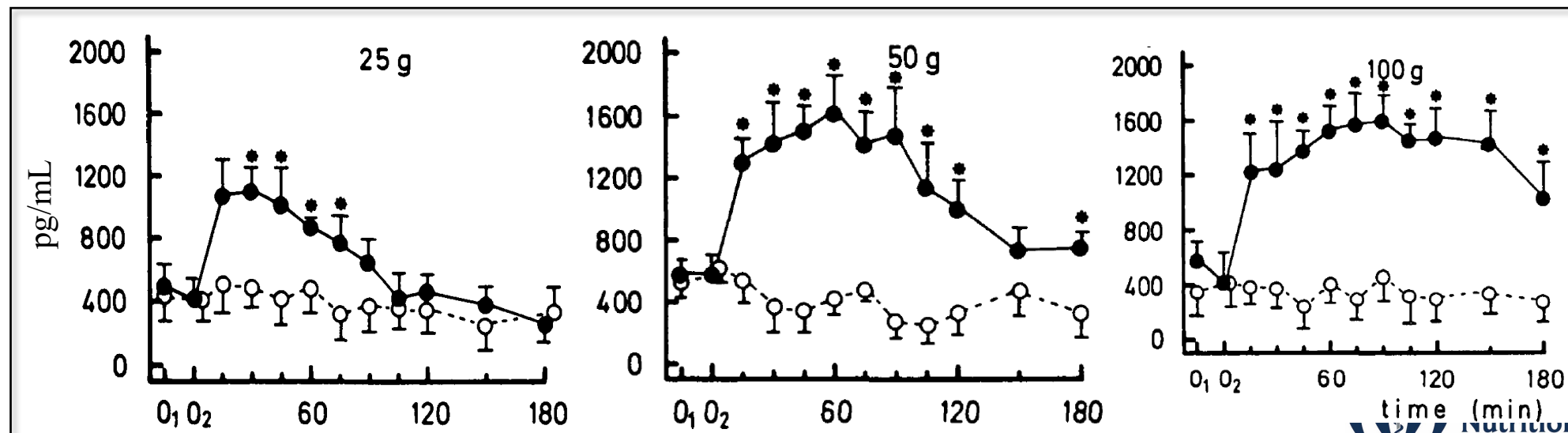
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Backup Slides

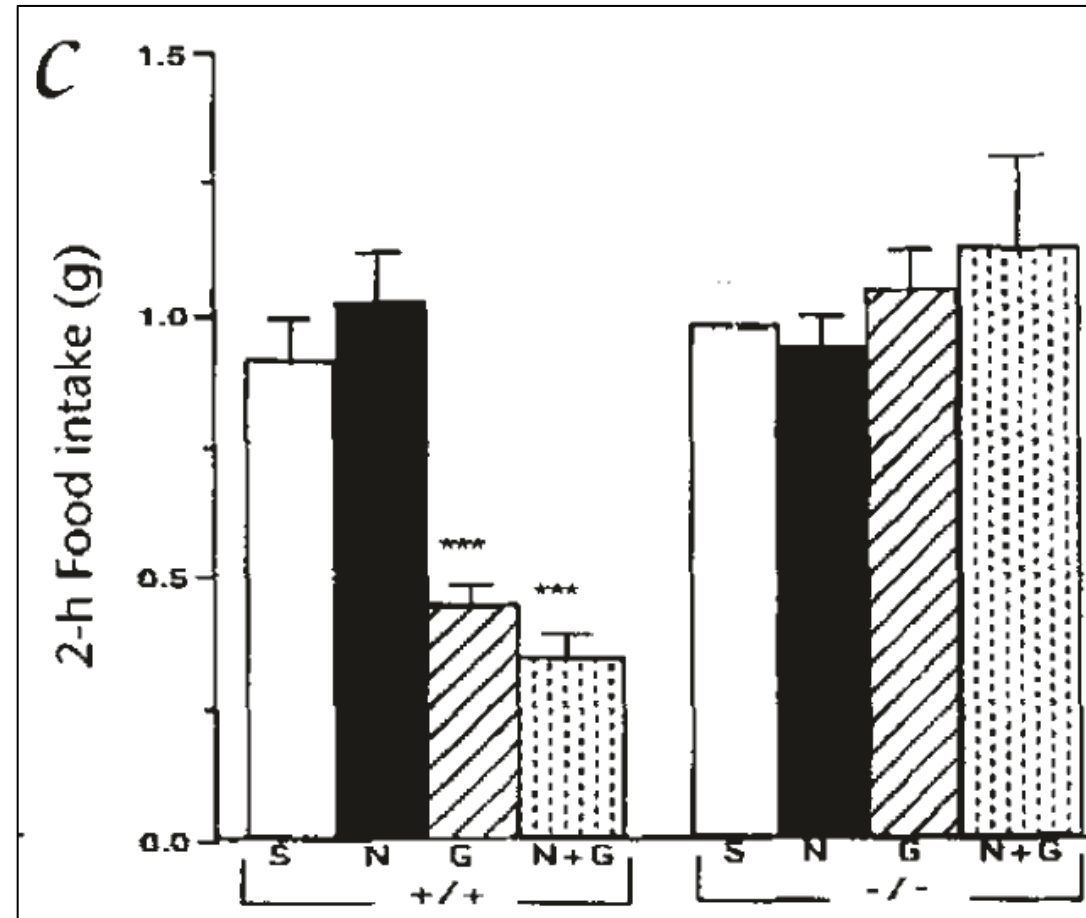
Incretin Effect → Incretin (Intestin – Secretion – Insulin)



Glucose-dependent insulinotropic peptide (GIP) and Glucagon Like Peptide-1 (GLP-1)



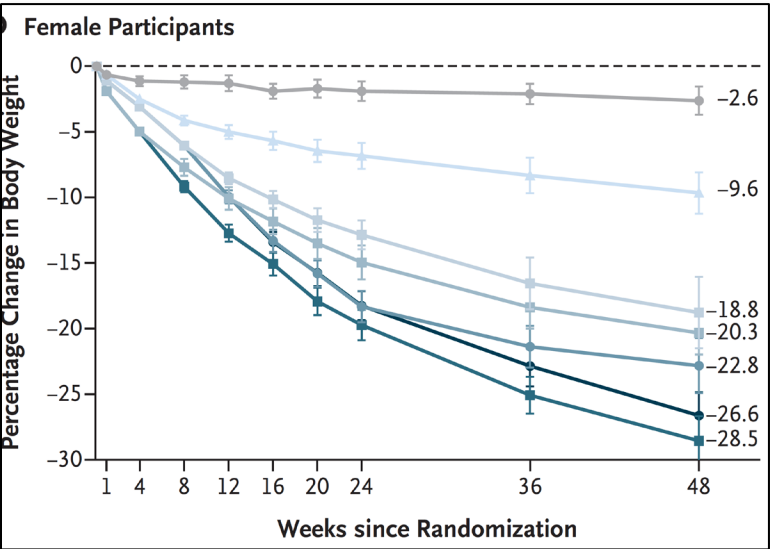
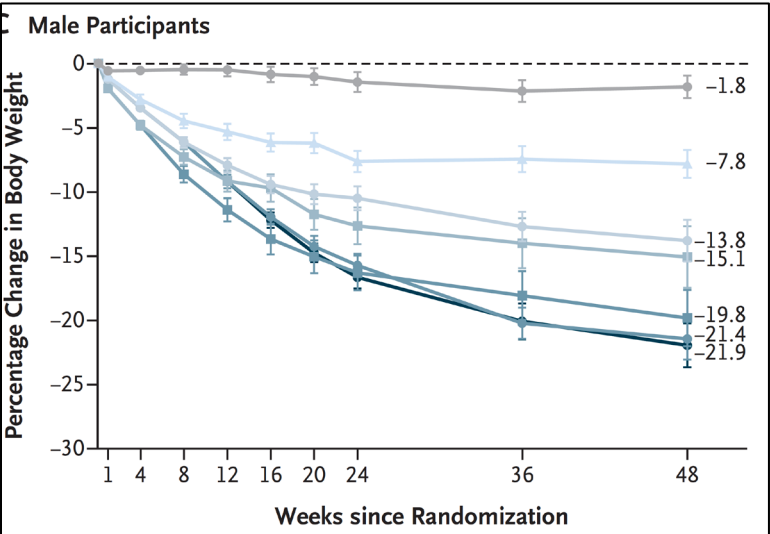
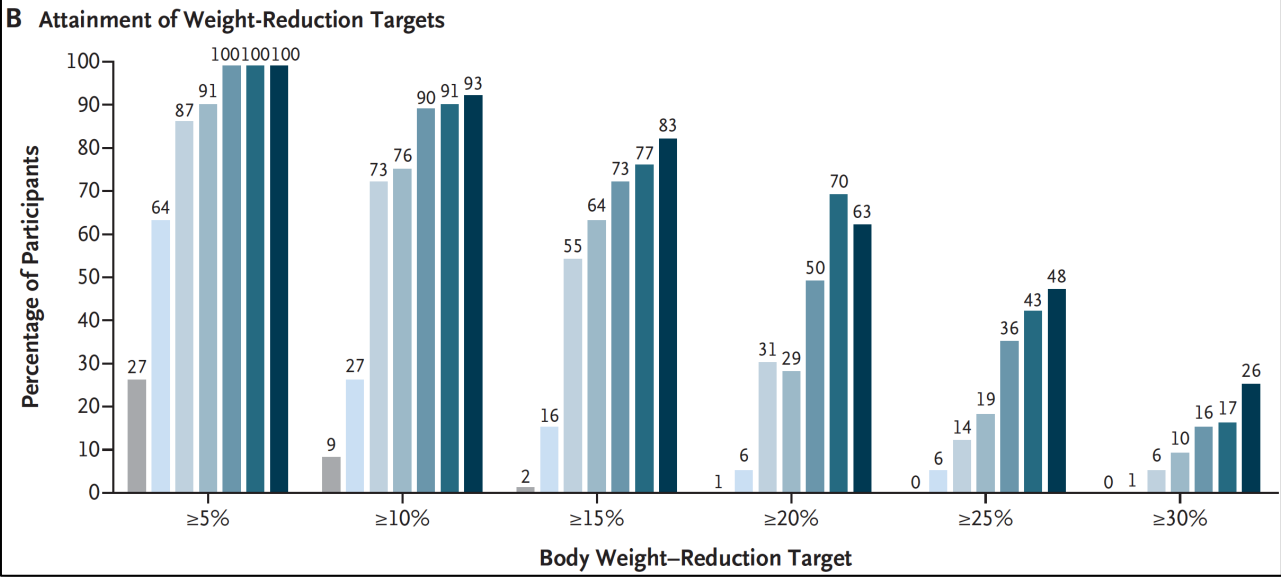
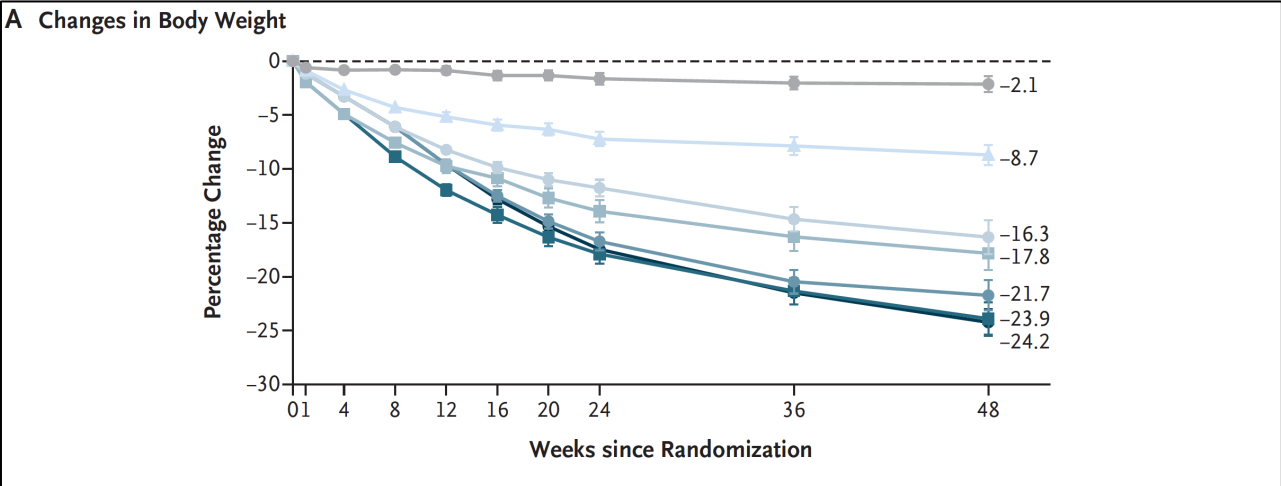
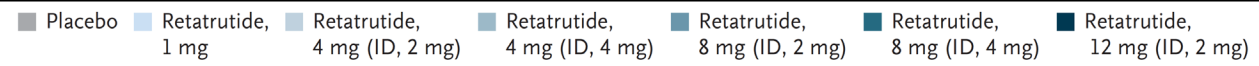
Reduced food intake after Intracerebral injection GLP1



Retatrutide (not FDA approved):

triple GIP/GLP1/glucagon RA (weekly)

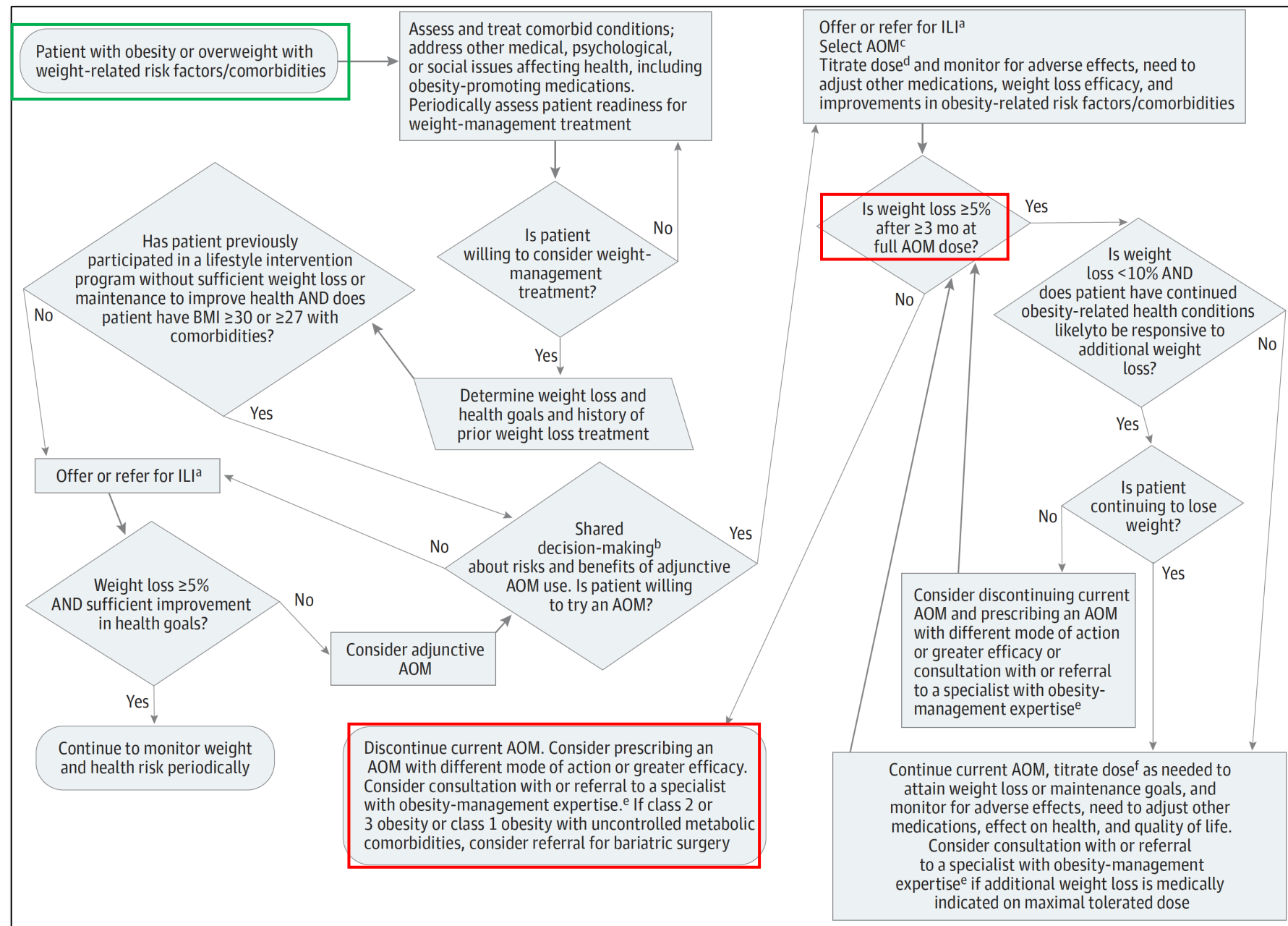
Triple-Hormone-Receptor Agonist
Retatrutide for Obesity — A Phase 2 Trial



GINIA HEALTH SCIENCES

Approach to Obesity Treatment in Primary Care

A Review



Common side effects reported in semaglutide and tirzepatide trials for obesity¹.

Side effect	Semaglutide 2.4 mg group (%)	Placebo group (%)	Tirzepatide 15 mg group (%)	Placebo group (%)
Nausea	44	16	28	8
Diarrhea	30	16	23	8
Vomiting	24	6	13	2
Constipation	24	11	11	5
Abdominal pain	20	10	10	5
Headache	14	10	-	-
Fatigue	11	5	7	3
Dyspepsia	9	3	10	4
Dizziness	8	4	4	2
Abdominal distension	7	5	4	2
Eructation	7	<1	5	1
Hypoglycemia ²	6	2	-	-
Flatulence	6	4	4	2
Gastroenteritis	6	4	-	-
Gastroesophageal reflux	5	3	5	2
Gastritis	4	1	-	-
Hair loss	3	1	5	1

¹ Data from references [42] and [43], based on follow-up periods of up to 68 wk (semaglutide) or 72 wk (tirzepatide).
² Among individuals with type 2 diabetes.

Key dietary recommendations to support effective GLP-1 therapy¹.

Factors to encourage	Factors to minimize/avoid
Food groups	
Fruits (e.g., berries, apples, citrus fruits, banana, grapes, avocado)	Refined carbohydrates (processed grains, flours, added sugars)
Vegetables (e.g., broccoli, leafy greens, tomatoes, carrots, peas, squashes)	Sugar-sweetened beverages
Whole grains (e.g., oats, quinoa, brown rice, and whole-grain breads, cereals, and pastas)	Red and processed meats
Dairy (e.g., yogurt, milk, cheese)	Most fast foods
Lean proteins (e.g., poultry, fish/seafood) and eggs	Sweets and savory snacks
Nuts and seeds (e.g., almonds, peanuts, chia seeds, sesame seeds, hemp seeds)	
Plant fats/oils (e.g., olive, canola, avocado oils)	
Ginger or peppermint tea	
Eating habits²	
Regular, small meals at consistent times	Emotional, mindless, or nighttime eating
Flexibility with food choices	Long periods without meals (i.e., becoming overly hungry)
Enjoy portion-controlled treats	Consumption of large meals
Ensure adequate fluids	
Minimal alcohol intake	