Overview of the Obesity Epidemic

Nicholas Pennings, DO
Chair Family Medicine
pennings@campbell.edu

Conflict of Interest Disclosure
I disclose that:
• I anticipate referencing the unlabeled / unapproved use of 3 medications for the treatment of obesity
• I have an affiliation with:
  • Medifast
  • Obesity Medicine Association

Learning Objectives

- Discuss the health consequences of obesity
- Identify the multiple factors that influence obesity
- Facilitate patient discussion about obesity
- Apply a comprehensive approach to obesity treatment
Definition of Obesity

Obesity is defined as a chronic, relapsing, multi-factorial, neurobehavioral disease, wherein an increase in body fat promotes adipose tissue dysfunction and abnormal fat mass physical forces, resulting in adverse metabolic, biomechanical, and psychosocial health consequences.

Adapted from Obesity Algorithm®, Obesity Medicine Association®

Measuring Obesity – Body Mass Index

Body Mass Index (BMI) = Body weight in kilograms / (Height in meters)^2

<table>
<thead>
<tr>
<th>Overweight and Obesity Classification: Body Mass Index (BMI) in kg/m^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal weight (18.5 – 24.9)</td>
</tr>
<tr>
<td>Overweight (25.0 – 29.9)</td>
</tr>
<tr>
<td>Class I obesity (30.0 – 34.9)</td>
</tr>
<tr>
<td>Class II obesity (35.0 – 39.9)</td>
</tr>
<tr>
<td>Class III obesity (≥ 40)</td>
</tr>
</tbody>
</table>

* Different BMI cut-off points may be more appropriate for women versus men, among those of different races, and among individuals

Measuring Obesity – Body Fat Composition

<table>
<thead>
<tr>
<th>Percent Body Fat</th>
<th>Category</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential</td>
<td>10-13%</td>
<td>2-5%</td>
<td></td>
</tr>
<tr>
<td>Athletic</td>
<td>14-20%</td>
<td>6-13%</td>
<td></td>
</tr>
<tr>
<td>Fitness</td>
<td>21-24%</td>
<td>14-17%</td>
<td></td>
</tr>
<tr>
<td>Acceptable</td>
<td>25-31%</td>
<td>18-24%</td>
<td></td>
</tr>
<tr>
<td>Obese</td>
<td>&gt;31%</td>
<td>&gt;25%</td>
<td></td>
</tr>
</tbody>
</table>
Measuring Obesity – Waist Circumference

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>40&quot;</td>
<td>35&quot;</td>
</tr>
<tr>
<td>African American</td>
<td>37&quot;</td>
<td>31.5&quot;</td>
</tr>
<tr>
<td>Latino</td>
<td>35.5&quot;</td>
<td>31.5&quot;</td>
</tr>
<tr>
<td>Asian</td>
<td>33.5&quot;</td>
<td>31.5&quot;</td>
</tr>
</tbody>
</table>

Question

- Where do you measure waist circumference?
  A. At Umbilicus
  B. Below umbilicus
  C. Iliac crests
  D. Maximum point of WC

Obesity is not about weight, it’s about disease

Inflammation
Edmonton Obesity Staging System

Staging according to medical consequences of obesity

<table>
<thead>
<tr>
<th>Stage</th>
<th>Risk Factors or Medical Conditions</th>
<th>Physical Symptoms</th>
<th>Psychological Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>Subclinical – not requiring treatment</td>
<td>Mild symptoms</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>Established Conditions</td>
<td>Moderate functional limitations</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>Significant w/ end-organ damage</td>
<td>Significant functional limitations</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>Severe – end stage</td>
<td>Severe – disabling</td>
<td>Severe – disabling</td>
</tr>
</tbody>
</table>

Adiposity-Related Diseases

- Neuronal Disease
- Brain Dysfunction
- Neurological Disease
- Multiple Sclerosis
- Trauma
- Chronic Fatigue Syndrome
- Sleep Disturbances
- Cardiac Disease
- Coronary Artery Disease
- Stroke
- Heart Disease
- Diabetes
- Insulin Resistance
- Hypertension
- Blood Pressure
- Pulmonary Disease
- Obstructive Sleep Apnea
- Arthritis
- Diabetes Mellitus
- Endocrine Disease
- Endocarditis
- Type 2 Diabetes
- Abnormal Metabolism
- Obstructive Airway Disease
- GERD
- Gastro-Intestinal Ulcers
- Chronic Kidney Disease
- MSK Disease
- Osteo-Arthritis
- Lupus
- Raynaud’s Phenomenon
- Autoimmune Disease
- Intermittent Seizures
- Neoplasia
- Neurological Syndromes

Edmonton Obesity Staging System

Stage 0:
- Obesity

Stage 1:
- Overweight

Stage 2:
- Obese

Stage 3:
- Morbid Obesity

Stage 4:
- Super-obese
Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2014


Age-adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

<table>
<thead>
<tr>
<th>Year</th>
<th>Obesity (BMI ≥30 kg/m²)</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>&lt;14.0%</td>
<td>&lt;4.5%</td>
</tr>
<tr>
<td>2015</td>
<td>&lt;14.0%</td>
<td>&lt;4.5%</td>
</tr>
</tbody>
</table>

Developing Diabetes

Source: Developed by CDC's Division of Diabetes Translation.
A patient with a BMI of 42 would be classified as?
- Overweight
- Class 1 obesity
- Class 2 obesity
- Class 3 obesity
- Morbid obesity

Health Consequences of Obesity
Is there a disease process present?

Yes
- Sick fat disease (adiposopathy)

No
- Metabolically healthy but obese (may help account for obesity paradox)

Health Consequences of Obesity

- Deranged endocrine and immune responses
- Endocrine/Metabolic
  - Elevated blood glucose
  - Elevated blood pressure
  - Hypoglycemia
  - Other metabolic diseases
- Abnormal and pathologic physical forces
- Biomechanical/Structural
  - Stress on weight bearing joints
  - Tissue compression
  - Tissue friction

Adapted from Obesity Algorithm®, Obesity Medicine Association®
Obesity – Driving Factors
• What makes weight management so difficult?
  • Neurohormonal/Enterohormonal design

Leptin
Ghrelin
PPH
CCK
Orexin
GLP-1
Resistin
Adiponectin

Obesity – Driving Factors
• What makes weight management so difficult?
  • Genetics - >150 genes

Obesity – Driving Factors
• What makes weight management so difficult?
  • Food portions
  • Food choices
  • Taste
Obesity – Driving Factors

• What makes weight management so difficult?
  • Patient and physician perceptions
  • Media influence

Comprehensive Treatment of Obesity

• Nutrition
• Physical Activity
• Behavior
• Medications
• Surgery

Physical Activity
Physical Activity

• Exercise Activity Thermogenesis (EAT)
• Non-Exercise Activity Thermogenesis (NEAT)
  • Yard work
  • Extra steps
  • Stairs
  • Household chores
  • Standing

Physical Activity

• Exercise Rx

Behavior
Behavior

• Why is it so difficult to discuss?
  • Judgment
  • Guilt
  • Shame
  • Blame
  • Failure

5A's of Obesity Management

Ask
• Ask for permission to discuss body weight.
• Explore readiness for change.

Assess
• Assess BMI, waist circumference, and obesity stage.
• Explore drivers and complications of excess weight.

Advise
• Advise the patient about the health risks of obesity, the benefits of modest weight loss (i.e., 5-10%), the need for long-term strategy, and treatment options.

Agree
• Agree on realistic weight-loss expectations, targets, behavioral changes, and specific details of the treatment plan.

Arrange/Assist
• Assist in identifying and addressing barriers; provide resources; assist in finding and consulting with appropriate providers; arrange regular follow-up.

Behavior

• Broaching the Topic
  • Tying weight to clinical condition
    • Diabetes
    • Hypertension
    • Arthritis
    • OSA
  • Focus on health improvement not weight loss
Behavior – Weight Bias in Healthcare

- Perceptions of Patients Affected by Obesity
  - 53% report inappropriate comments from their doctors about their weight.
  - Doctors are the second most common source of stigma (69%).
  - BMI > 55: 68% report delayed seeking health care because of their weight due to disrespectful treatment, embarrassment, inadequate gowns, equipment and chairs...


Behavior

- Behavior Rx

**Behavior Rx for Weight Management**

Patient Name: 

Self monitoring

- Weight
- Food diary: food, meal, snack, daily activity

Motivation Management

- Change eating
- Change thinking

Weight-Related Challenges to address:

- Physical discomfort
- Social discomfort
- Emotional discomfort

Drug

- Weight loss: orlistat, phentermine

Food & Eating

- Increase water
- Decrease large portions
- Decrease sugary snacks

Goals

- Increase activity
- Decrease food intake

Provider:

Medication
Treatment strategies for Obesity

Potential Mechanisms of Action
- Decrease appetite/cravings
- Decrease leptin resistance
- Increased energy expenditure
- Increase adherence by mitigating biological or genetic factors

York DA. Nutrition. 2000;16:967-75

Adapted from Ioannides-Demos LL, et al. J Obes 2011

Obesity Drugs alter physiology not only behaviors

Physiologic Response to a Calorie Deficit

- Negative energy balance triggers a physiologic increase in hunger and decrease in satiety

\[ \text{\( E_{IN} \)} \quad \uparrow \quad \text{Hunger} \quad \downarrow \quad \text{Satiety} \]
Why Use Anti-Obesity Medication (AOM)?

• Obesity is a **chronic disease**
• Counter the **physiologic response** to energy deficit
• Weight maintenance is **more challenging** than weight loss
• Hormonal responses are **long-term**

Hormonal responses are long-term

When to use Anti-obesity Medications

• **General Recommendations**
  • Indication for medication based on BMI
  • BMI ≥ 27 kg/m² + 1 or more adiposity related diseases (ARD)
  • BMI ≥ 30 kg/m²
• Ignores presence of adiposity related diseases
• Ignores racial differences for BMI thresholds and ARD
• Ignores body composition
Documentation

• Best Practices
  • Follow State Regulations
  • Previous anti-obesity medication use
  • Rationale for medication choice
  • Vital signs and BMI every visit
  • Mood and appearance
  • Rationale for continued use
  • Include nutritional, physical activity and behavioral change recommendations

Orlistat (Xenical/Alli)

Indication
- Obesity
- Chronic weight management

Dosage
- OTC – 60 mg TID w/ meals
- Rx – 120 mg TID w/ meals

MOA
- Gastric lipase inhibitor
- Pancreatic lipase inhibitor

Contraindications
- Pregnancy
- Chronic malabsorption
- Cholestasis
- Glaucoma, glaucoma
- Fecal incontinence
- Fat soluble vitamin deficiency

ADR

Weight Loss
• 1-year 3.5%  2-year 2.3%
• 10% 21% 10%-12%
### Lorcaserin (Belviq)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dosage</th>
<th>MOA</th>
<th>Contraindications</th>
<th>ADR</th>
<th>Weight Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>• BMI ≥ 30 kg/m²</td>
<td>• 10 mg BID</td>
<td>• Selective serotonin 5HT2c agonist</td>
<td>• Pregnancy</td>
<td>• Weight Loss</td>
<td>• ≥5% WL - 12.8 lbs.</td>
</tr>
<tr>
<td>• BMI ≥ 27 kg/m² + 1 ARD</td>
<td>• XR 20 mg daily</td>
<td>• Activates POMC neurons - ↑ satiety</td>
<td>• Hypersensitivities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Phentermine/Topiramate ER (Qsymia)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dosage</th>
<th>MOA</th>
<th>Contraindications</th>
<th>ADR</th>
<th>Weight Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>• BMI ≥ 30 kg/m²</td>
<td>• BMI ≥ 27 kg/m² + 1 ARD</td>
<td>• Phentermine – sympathomimetic</td>
<td>• Pregnancy</td>
<td>• Weight Loss</td>
<td>• ≥5% WL - 87% Placebo 1%</td>
</tr>
<tr>
<td>• 3.75/23 mg x 14d → ↑7.5/46mg</td>
<td>• If &lt;3% WL at 12 weeks then increase</td>
<td>• Topiramate - ↑ GABA / ↓ carb. anhy.</td>
<td>• Glaucoma, hyperthyroidism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 11.25/69mg x 14d → ↑15/92mg</td>
<td>• Uncontrolled HTN</td>
<td>• Uncontrolled HTN</td>
<td>• Headache, dizziness, fatigue</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Naltrexone/Bupropion HCl ER (Contrave)

<table>
<thead>
<tr>
<th>Indication</th>
<th>Dosage</th>
<th>MOA</th>
<th>Contraindications</th>
<th>ADR</th>
<th>Weight Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>• BMI ≥ 30 kg/m²</td>
<td>• BMI ≥ 27 kg/m² + 1 ARD</td>
<td>• Naltrexone – opioid antagonist</td>
<td>• Pregnancy</td>
<td>• Weight Loss</td>
<td>• WL 5.4 &amp; 8.1%; placebo 1.3% &amp; 4.9%</td>
</tr>
<tr>
<td>• bupropion/xylitol release bupropion</td>
<td>• Titrate 1 qAM x 7d; then 1 BID x 7d</td>
<td>• Bupropion - ↓NE &amp; dopamine uptake</td>
<td>• Uncontrolled HTN, Seizure d/o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Then 2 qAM, 1qPM x 7d; then 2 BID</td>
<td>• Naltrexone, eating disorder, MAOI use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DEA Schedule IV

- Lorcaserin (Belviq)
- Phentermine/Topiramate ER (Qsymia)
- Naltrexone/Bupropion HCl ER (Contrave)
**Indication**
- BMI ≥ 30 kg/m²
- BMI ≥ 27 kg/m² + 1 ARD

**Dosage**
- Titrate: 0.6 mg SC daily x 7d,
- then 1.2 mg x 7d,
- then 1.8 mg x 7d,
- then 2.4 mg x 7d,
- then 3.0 mg x 7d

**MOA**
- GLP-1 agonist
- Central satiety, ↓gastric emptying

**Contraindications**
- Pregnancy
- Personal or FH medullary thyroid CA
- MEN type 2, caution h/o pancreatitis

**ADR**
- N/V, diarrhea, constipation
- Headache, dizziness, fatigue
- Hypoglycemia, abdominal pain

- WL 9.2% vs 3.5% placebo
- >5% WL – 62%; placebo 34%
- >10% - 34%; placebo 15%

---

**Cardiovascular Outcomes with Anti-obesity Medications**

<table>
<thead>
<tr>
<th>Medication</th>
<th>LDL</th>
<th>TG</th>
<th>HDL</th>
<th>A1c</th>
<th>SBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phentermine/Topiramate CR</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Lorcaserin</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Naltrexone SR/Bupropion SR</td>
<td></td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Liraglutide 3.0mg</td>
<td></td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Journal of the American College of Cardiology, Volume 68, Issue 8, August 2016
Cardiovascular Effects of the New Weight Loss Agents
Matthew H. Vorsanger et al
Case Study

- A 26-year-old man presents for weight loss. His weight is 339 lbs. and BMI is 48.69 kg/m². He relates that no diet has worked for him and that he is always hungry, even when he is not on a diet. Has a mostly sedentary job but takes an occasional walk. Patient on AOM
  - 12/5/2017 - started phentermine ER ½ 37.5
  - 2/6/2018 - dose increased to 30 mg
  - 10/30/2018 - dose changed to 37.5 ½ bid

Total Weight Loss – 112 lbs.  
Total decrease in BMI – 16.1 kg/m²

Case Study – Patient on Phentermine

Phentermine (Adipex)

| Indication       | BMI ≥ 30 kg/m²  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMI ≥ 27 kg/m² + 1 ARD</td>
</tr>
<tr>
<td>Dosage</td>
<td>8 mg ½ to 1 qd to tid</td>
</tr>
<tr>
<td></td>
<td>ER 15mg, 30mg, 37.5mg scored tab</td>
</tr>
<tr>
<td>MOA</td>
<td>Sympathomimetic – centrally acting</td>
</tr>
<tr>
<td></td>
<td>NT: T-release, R-uptake → ↓ appetite</td>
</tr>
<tr>
<td>Contraindications</td>
<td>Pregnancy, Glaucoma, CVD</td>
</tr>
<tr>
<td></td>
<td>Uncontrolled HTN, hyperthyroidism</td>
</tr>
<tr>
<td>ADR</td>
<td>Headache, dizziness, fatigue</td>
</tr>
<tr>
<td></td>
<td>Nausea, dry mouth, constipation</td>
</tr>
<tr>
<td>Weight Loss</td>
<td>Hypoglycemia, back pain, cough</td>
</tr>
<tr>
<td></td>
<td>Limited data</td>
</tr>
<tr>
<td>DEA Schedule IV</td>
<td>Controlled Substance</td>
</tr>
</tbody>
</table>
Diethylproprion

**Indication**
- BMI ≥ 30 kg/m²
- BMI ≥ 27 kg/m² + 1 ARD

**Dosage**
- 25mg tid
- SR 75mg

**MOA**
- Sympathomimetic – centrally acting
- NE ↑ release/↓ uptake → ↓ appetite

**Contraindications**
- Pregnancy, Glaucoma, CVD
- Uncontrolled HTN, hyperthyroidism

**ADR**
- Headache, dizziness, fatigue
- Nausea, dry mouth, constipation
- Hypoglycemia, back pain, cough

**Weight Loss**
- Limited data

DEA Schedule IV controlled substance

Phendimetrazine (Bontril)

**Indication**
- BMI ≥ 30 kg/m²
- BMI ≥ 27 kg/m² + 1 ARD

**Dosage**
- 35mg capsule tid
- SR 105mg capsule daily

**MOA**
- Sympathomimetic – centrally acting
- NE ↑ release/↓ uptake → ↓ appetite

**Contraindications**
- Pregnancy, Glaucoma, unstable CVD
- Uncontrolled HTN, hyperthyroidism

**ADR**
- Headache, dizziness, fatigue
- Nausea, dry mouth, constipation
- Hypoglycemia, back pain, cough

**Weight Loss**
- Limited data

DEA Schedule III controlled substance

Medication Treatment

- **Medications not FDA Approved for Weight Loss**
  - Metformin
  - Topiramate
  - Naltrexone
Above all do no harm

Medications That Cause Weight Gain

• Diabetes Medications
  • Insulin
  • Sulfonylureas
• Steroids
• Chronic pain medication
• Anti-depressants
• Antipsychotic medications

Surgery
Bariatric Surgery

- Restriction
- Malabsorption
- Metabolic impact
  - Alters hormones that affect appetite
  - Alters bile acid metabolism
  - Alters gut nutrient sensing
  - Alters glucose sensing

Sleeve Gastrectomy  Gastric Bypass (Roux-en-Y)

Laparoscopic Adjustable Gastric Band  Duodenal Switch

Bariatric Surgery

- Indications
  - BMI ≥ 40
  - BMI ≥ 35 + severe obesity related medical condition
  - BMI ≥ 30 + T2D
  - Patient prepared to commit to lifestyle change required after surgery
Bariatric Surgery

- Contraindications
  - Substance abuse
  - Eating disorder
  - Active psychiatric problem
  - Medically unstable
  - Women who plan to become pregnant w/in 12 months

Bariatric Surgery: Common Micronutrient Deficiencies

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>RNY</th>
<th>Sleeve</th>
<th>LAGB</th>
<th>BPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>B2</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>B6</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>B9</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>B12</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>D</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>E</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>K</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Ca</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Fe</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Zn/Cu</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

- Vitamin D deficiency is seen in a significant number of patients with obesity at baseline. However, due to malabsorption, the risk is further increased post-op.


Bariatric Surgery Patients Need Lifetime Monitoring!

Current Treatment of Patients with Obesity

- 234.4 MM Adults
  - 4.6 MM AOM (4%)
  - 228 K Surgery (1%)
Summary

- Obesity rates have increased dramatically in the past 30 years
- Health consequences of obesity impact every organ system
- Approach to obesity treatment should include:
  - Nutritional intervention
  - Physical activity
  - Behavioral therapy
  - Pharmacotherapy
  - Surgery consideration
- Obesity is an undertreated disease

Resources for Obesity Medicine

- Obesity Medicine Association
  - obesitymedicine.org
- Obesity Algorithm
  - obesitymedicine.org/obesity-algorithm/
- ASMBS
  - ASMBS.org
- The Obesity Society
  - Obesity.org

Supplement

Medication & Weight Change
Pharmacotherapy that May Alter Body Weight

Cardiovascular Medications
May increase body weight:
- Some beta-blockers
  - Propranolol
  - Atenolol
  - Metoprolol
- Older and/or less lipophilic dihydropyridine ("dipine") calcium channel blockers may increase body weight gain due to edema, compared to non-dihydropyridines and lipophilic dihydropyridines, and the increased edema may exacerbate obesity-related edema (and sleep apnea related peripheral edema), and also confound body weight as a measure of body fat
  - Nifedipine
  - Amlodipine
  - Felodipine

Diabetes Mellitus Medications
May increase body weight:
- Most insulins
- Sulfonylureas
- Thiazolidinediones
- Meglitinides
May decrease body weight:
- Metformin
- Glucagon-like peptide-1 agonists
- Sodium glucose co-transporter 2 inhibitors
- Alpha glucosidase inhibitors

Reference/s: [12, 27, 113, 114, 310]

Hormones
May increase body weight:
- Glucocorticoids
- Estrogens
Variable effects on body weight:
- Progestins
  - Injectable or implantable progestins may have greatest risk for weight gain
  - May be dependent upon the individual
- Testosterone
  - May reduce percent body fat and increase lean body mass, especially if used to replace testosterone deficiency in men

Anti-seizure Medications
May increase body weight:
- Carbamazepine
- Gabapentin
- Valproate
May decrease body weight:
- Lamotrigine
- Topiramate
- Zonisamide

Antidepressants
May increase body weight:
- Some tricyclic antidepressants (tertiary amines)
  - Amitriptyline
  - Doxepin
  - Imipramine
- Some selective serotonin reuptake inhibitors (e.g. sertraline)
- Some irreversible monoamine oxidase inhibitors
  - Phenelzine
  - Mirtazapine
May decrease body weight:
- Bupropion
Variable effects on body weight:
- Some tricyclic antidepressants
  - Desipramine
  - Nortriptyline
  - Protriptyline
- Some SSRI
  - Citalopram
  - Escitalopram
  - Fluoxetine
  - Sertraline
- Some SSRI & SNRI
  - Desvenlafaxine
  - Duloxetine
  - Venlafaxine
- Some irreversible monoamine oxidase inhibitors (i.e., tranylcypromine)
Pharmacotherapy that May Alter Body Weight

Mood Stabilizers
May increase body weight:
• Gabapentin
• Lithium
• Valproate
• Vigabatrin
Variable/neutral effects on body weight:
• Carbamazepine (sometimes reported to increase body weight)
• Lamotrigine (sometimes reported to decrease body weight)
• Ocarbazepine

Migraine Medications
May increase body weight:
• Amitriptyline
• Gabapentin
• Paroxetine
• Valproic acid
• Some beta-blockers
May decrease body weight:
• Topiramate

Migraine Medications
May increase body weight:
• Amitriptyline
• Gabapentin
• Paroxetine
• Valproic acid
• Some beta-blockers
May decrease body weight:
• Topiramate

Antipsychotics
May substantially increase body weight:
• Clozapine
• Olanzapine
• Zotepine
May somewhat increase body weight:
• Asenapine
• Paliperidone
• Quetiapine
• Risperidone
• Lithium
Variable/neutral effects on body weight:
• Amisulpride
• Aripiprazole
• Haloperidol
• Lurasidone
• Ziprasidone

Hypnotics
May have limited effects on body weight:
• Benzodiazepines
• Melatonergic hypnotics
• Trazodone
May increase body weight:
• Diphenhydramine

Pharmacotherapy that May Alter Body Weight

Human Immunodeficiency Virus (HIV) Medications
May increase body weight:
• Some highly active antiretroviral therapies (HAART) protease inhibitors without HIV lipodystrophy
May decrease body weight:
• Some highly active antiretroviral therapies (HAART) protease inhibitors with HIV lipodystrophy

Chemotherapies
May increase body weight:
• Tamoxifen
• Cyclophosphamide
• Methotrexate
• 5-fluorouracil
• Aromatase inhibitors
• Corticosteroids