The Obesity Medicine Association’s 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."
Overall Obesity Management Goals

Overall Management Goals

- Adult patient with overweight or obesity
  - Improve patient health
  - Improve quality of life
  - Improve body weight and composition

Within Subsets of Patients with Overweight and/or Obesity

- Deranged endocrine and immune responses
  - Sick Fat Disease (SFD) (Adiposopathy)
    - Endocrine/metabolic:
      - Elevated blood glucose
      - Elevated blood pressure
      - Dyslipidemia
      - Other metabolic diseases
  - Fat Mass Disease (FMD)
    - Biomechanical/structural:
      - Stress on weight-bearing joints
      - Immobility
      - Tissue compression (i.e., sleep apnea, gastrointestinal reflux, high blood pressure, etc.)
      - Tissue friction (i.e., intertrigo, etc.)

Adiposopathy Stress Cycle

- Obesity, Adiposopathy, and Metabolic Disease
- Worsening Adipose Tissue Function
- Chronic Stress
- Increasing Body Fat
- Behavior Changes, Endocrinopathies, and Immunopathies
Patient Evaluation: History and physical examination

- Timing
- Frequency (via questionnaire)
- Nutritional content
- Preparation of food
- Access to foods
- Location of home food consumption (i.e., eating area, television, computer, etc.)
- Location of away food consumption (i.e., workplace restaurants, fast food, etc.)

Behavior
- Previous nutritional attempts to lose weight and/or change body composition
- If unsuccessful or unsustained, what were short- and long-term barriers to achieving or maintaining fat weight loss
- Triggers (hunger cravings, anxiety, boredom, reward, etc.)
- Nighttime eating
- Binge eating
- Emotional eating
- Family/cultural influences
- Community influences
- Readiness for change

Records
- Food and beverage diary, including type of food or beverage consumed and amount consumed
  - 72-hour recall
  - Keep food and beverage record for a week and return for evaluation
  - Electronic application tools

Physical Activity History

- Success and/or failure of previous physical activity/exercise efforts
- Current mobility and equipment needs
- Current physical activity/exercise status
- Current fitness level or endurance capacity
- Access to locations amenable to increased physical activity/exercise (i.e., gym, workplace, exercise facilities, urban or rural home setting)
- Physical activity/exercise preferences

Patient Evaluation: Laboratory and Diagnostic Testing
**Laboratory: Routine**

**Adiposity-relevant Blood Testing**
- Fasting blood glucose and insulin
- Hemoglobin A1c
- Fasting lipid panel/NMR
- Liver Panel
- Electrolytes (i.e., potassium, sodium, calcium, phosphorous, etc.)
- Renal blood testing (i.e., creatinine, blood urea nitrogen, etc.)
- Uric acid
- Thyroid stimulating hormone (TSH)
- Vitamin D levels

**General Laboratory Testing**
- Complete blood count
- Urinalysis
- Urine for microalbumin

**Diagnostic Testing: Individualized**

- **Body Composition**
  - DEXA
  - Bioelectric impedance
  - Near-infrared interactance
  - Myotape measurements
  - Caliper percent body fat measurements (e.g., three-site skinfold calculations)
  - Underwater weighing
  - Quantitative magnetic resonance (QMR)
  - Computerized tomography (single slice or volume method)

- **Emerging Science Testing**
  - Leptin
  - Adiponectin
  - Leptin-to-adiponectin ratio
  - Free fatty acids
  - Immune markers
    - Tumor necrosis factor
    - Interleukin 1 and 6
  - Infectious testing
    - Gut microbiota
    - Adenovirus (36) assays
    - Evaluation for other microbes

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**Optimal Function**

- Impact of Pre-Obesity

**Intervention = Maintenance of healthy diet & lifestyle**

**Treatment**

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Treatment of Adult Patients with Overweight or Obesity

Medical Management and Coordination

- Nutrition
- Physical Activity
- Behavior Therapy
- Pharmacotherapy
- Bariatric Surgery

Concurrent Medications (iatrogenic obesity)

Identify and Manage Concomitant Pharmacotherapy That Might Alter Body Weight

Cardiovascular Medications
- May increase body weight:
  - Some beta-blockers
    - Propranolol
    - Atenolol
    - Metoprolol
  - Dihydropyridine ("dipine") calcium channel blockers
    - 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

Identify and Manage Concomitant Pharmacotherapy That Might Alter Body Weight

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

### Identify and Manage Concomitant Pharmacotherapy That Might Alter Body Weight

#### May increase body weight:
- TCAs
  - Amitriptyline
  - Doxepin
  - Imipramine
- SSRIs (e.g. paroxetine)
- MAOIs
  - Isocarboxazid
  - Phenelzine
  - Mirtazapine

#### May decrease body weight:
- Bupropion

#### Variable effects on body weight:
- TCAs
  - Desipramine
  - Nortriptyline
  - Protriptyline
- SSRIs
  - Citalopram
  - Escitalopram
  - Fluoxetine
  - Sertraline
- SSNRIs
  - Desvenlafaxine
  - Duloxetine
  - Venlafaxine
- MAOIs (i.e., tranylcypromine)

### Identify and Manage Concomitant Pharmacotherapy That Might Alter Body Weight

#### Mood Stabilizers
**May increase body weight:**
- Gabapentin
- Lithium
- Valproate
- Vigabatrin

#### Variable/neural effects on body weight:
- Carbamazepine (sometimes reported to increase body weight)
- Lamotrigine (sometimes reported to decrease body weight)
- Oxcarbazepine

#### Migraine Medications
**May increase body weight:**
- Amitriptyline
- Gabapentin
- Paroxetine
- Valproic acid
- Some beta-blockers

**May decrease body weight:**
- Topiramate

### Principles of Healthy Nutrition

**Limit:**
- Highly processed foods of minimum nutritional value: sweets, "junk foods," cakes, cookies, candy, pies, chips
- Energy-dense beverages: sugar-sweetened beverages, juice, cream

**Encourage:**
- Consumption of healthy proteins and fats, vegetables, leafy greens, fruits, berries, nuts, legumes
- Complex carbohydrates over simple sugars: Low glycemic index over high glycemic index foods
- High-fiber foods over low-fiber foods
- Reading labels rather than marketing claims

Managing the *quality* of calories is important when reducing the quantity of calories, such as during weight loss.
Nutritional Therapy for Obesity

Factors related to improved outcomes:
- Evidence-based
- Quantitative
- Qualitative
- Patient preference
- Patient adherence

Choosing Nutritional Therapy for Obesity

The most appropriate nutritional therapy for weight loss should be safe, effective, and one to which the patient can adhere.

- Consider the following:
  - Individual food preferences, eating behaviors, and meal patterns
  - Cultural background, traditions, and food availability
  - Time constraints and financial issues
  - Nutritional knowledge and cooking skills

Nutritional Therapy for Obesity

Energy consumption intended to cause negative calorie balance and loss of fat mass

- Low-calorie diets: 1200-1600 calories/day
  - Restricted fat diet
  - Low-fat diet: <30% of total calories
  - Very low-fat diet: <10% of total calories

- Restricted carbohydrate diet
- Low-glycemic diet
- Very low-glycemic diet
- Very low glycemic index diet

- Very low-calorie diets: <500 calories/day
  - Physician supervision recommended
  - Recommended for shorter durations
  - Full medical fraught

References: [91] [54] [53] [59] [68] [29]
Low-calorie Diets: Restricted Carbohydrate Diet

Weight Loss
- May produce modestly greater weight loss compared to fat-restricted dietary intake for the first 6 months, wherein afterwards, the net weight loss may be similar to other calorie restricted nutritional interventions
- May assist with reducing food cravings

Metabolic Effects
- Reduces fasting glucose, insulin and triglycerides
- Modestly increases high-density lipoprotein cholesterol levels
- May increase low-density lipoprotein cholesterol levels
- May modestly reduce blood pressure
- The metabolic effects noted above may occur with or without weight loss
- In patients with epilepsy, a very low carbohydrate ketogenic diet (VLCKD) may reduce seizures
- LCKD may possibly improve diabetes mellitus complications (i.e., nephropathy)

Risks
- May produce carbohydrate cravings within the first few days of implementation, which may be mitigated by adding low-glycemic-index foods
- May induce gout flare if history of gout

References: [24] [25]

Low-calorie Diets: Restricted Fat Diet

Weight Loss
- Defined as 10-30 percent of total calories from fat
- After six months, fat-restrictive, low-calorie nutritional intervention generally produces the same amount of weight loss compared to the "low-carb" diet

Metabolic Effects
- May reduce fasting glucose and insulin levels
- Modestly decreases low-density and high-density lipoprotein cholesterol levels
- May modestly reduce blood pressure

Risks
- Hunger control may present challenges, which may be mitigated with weight-management pharmacotherapy
- If fat restriction results in a substantial increase in carbohydrate consumption, and if weight loss is not achieved, an increase in carbohydrate dietary intake may potentially contribute to hyperglycemia, hyperinsulinemia, hypertriglyceridemia, and reduced levels of high-density lipoprotein cholesterol

References: [26] [27] [28]

Very Low-calorie Diets

Defined as less than 500 kcal/day, typically implemented utilizing specifically formulated meal-replacement products supervised by a trained clinician

Weight Loss
- Produces more rapid weight loss than low calorie (low-fat or carbohydrate restricted) diets due to the lower energy intake

Metabolic Effects
- Reduces fasting glucose, insulin and triglycerides
- May modestly increase high-density lipoprotein cholesterol levels
- May modestly decrease low-density lipoprotein cholesterol
- Reduces blood pressure

Risks
- Fatigue, nausea, constipation, diarrhea, hair loss, and brittle nails
- Cold intolerance, dysmenorrhea
- Small increase in gallstones, kidney stones, gout flare
- If insufficient mineral intake, then may predispose to palpitations and cardiac dysrhythmias, muscle cramps
- Weight regain will occur if patients are not taught how to maintain healthy eating

References: [29] [30] [31] [32]

Physical Activity

References: [33] [34] [35] [36]
Medical Evaluation to Ensure Safety before Beginning New Exercise Program

- Exercise prescription (FITTE)
  - Frequency
  - Intensity
  - Time spent
  - Type
  - Enjoyment level

Assess Mobility

Unable to Walk
- Seated exercise program
- Arm exercises (i.e., arm cycling)
- Swimming/aquatic exercises (e.g., swimming or deep water exercise)
- Gravity-mediated physical activity
- Consider physical therapy evaluation
  - Recommend rehabilitation & physical therapy-guided activity program
  - Set physical activity goals
  - Assess special equipment needs

Limited Mobility, Able to Walk
- Walking
- Swimming/aquatic exercises (e.g., swimming or deep water exercise)
- Gravity-mediated physical activity
- Assess for special equipment needs

No Substantial Limitations to Mobility
- Exercise/physical activity prescription plan driven by patient and guided by clinician
- Assess for special equipment needs

Priority: Increase Energy Expenditure

Dynamic (Aerobic) Training
- Some physical activity is better than none
- At least 150 minutes (2.5 hours) per week of moderate physical activity or at least 75 minutes (1.25 hours) per week of vigorous intensity aerobic exercise = most health benefits, promote modest weight loss, and prevent weight gain
- > 300 minutes (5 hours) per week of moderate physical activity or 150 minutes (2.5 hours) per week of vigorous intensity aerobic exercise = promote more robust weight loss and prevent weight regain after weight loss

Resistive (Anaerobic) Strength Training
- Percent body fat better assessment of body composition than BMI
- Utilize appropriate weight lifting technique
- Emphasize "core" muscle exercises
- Using a variety of free weights, machines, and resistance bands may alleviate boredom and provide greater flexibility regarding scheduling and location
- Short-term sore muscles may be expected

Priority: Increase Energy Expenditure and Decrease Sedentary Time

Leisure Time Physical Activity
- Engage in competitive sport activities involving substantial physical activity, especially if willing to do so on a routine basis
- Engage in non-competitive sports such as running, hiking, cycling, crossfit training, etc.
- Outdoor warm weather physical activity in sunlight may facilitate negative caloric balance and have other health benefits, but requires awareness of potential sun damage
- Engage in physical activity sport-alternatives, such as dancing

Transportational/Occupational Non-exercise Activity Thermogenesis (NEAT)
- Walk short distances instead of automated transportation
- Take stairs instead of elevator
- Carry overnight travel bags instead of using rollers
- Active work environment (i.e., standing desks, walking desks)
- Avoid prolonged inactivity
  - Take breaks from inactivity
  - Walk, stand, incidental movements

References: [10] [10]

References: [108] [108]
References: [109] [109]
Motivational Interviewing

Micro-Counseling (OARS)

**Open-ended Questions**
- May help patient explore reasons for and possibility of change

**Affirmation**
- An expressed recognition of the patient’s strengths and how these strengths can be applied to implement favorable change
- Affirmations to the patient by the clinician should be:
  - Relevant
  - Genuine

**Reflections**
- Careful listening can often be the most effective form of empathy

**Summaries**
- Each counseling session should conclude with a summary of:
  - What was discussed
  - Shift attention from negative past failures and toward positive but realistic future goals
  - Establish metrics to measure success of future goals
  - Outline follow-up plans

Change Metric Examples

**Importance of Change**
- “On a scale of 1-10, where one is not important and 10 is most important, how important is it for you to change?”
- “Why are you not at a lower/higher number?”

**Readiness to Change**
- “On a scale of 1-10, where one is not ready to change and 10 is absolutely ready to change, how ready are you to change?”
- “Why are you not at a lower/higher number?”

**Confidence in Ability to Change**
- “On a scale of 1-10, where one is not at all confident and 10 is absolutely confident, how confident are you in your ability to change?”
- “Why are you not at a lower/higher number?”

5 A’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 percent), 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.

References: [122] [119]
Behavior Therapy

Eating Disorders and Obesity: Binge-eating Disorder

**Diagnosis:**
- Frequent episodes of consuming large amounts of food more than once per week for at least three months
  - No self-induced vomiting (purging)
  - No extra exercising
  - Feelings of lack of self-control, shame, and guilt
- Occurs in 2-3% of U.S. adults
- Often considered the most common eating disorder
- May occur in up to 50 percent of patients with severe obesity
- Eating Attitudes Test may assist with diagnosis

**Treatment:**
- Cognitive behavior therapy
- Lisdexamfetamine dimesylate is the only pharma therapy with an FDA indication to treat binge-eating disorder
  - Although not FDA indicated for this use, clinical trials suggest other pharma therapies may be efficacious
    - Some selective serotonin reuptake inhibitors
    - Topiramate

Eating Disorders and Obesity: Night-eating Syndrome

**Diagnosis:**
- At least 25 percent of daily food consumption (often greater than 50 percent) consumed after evening meal
- Recurrent awakenings from sleep that require eating to go back to sleep, often involving carbohydrate-rich snacks
- Little interest in breakfast (morning anorexia)
- Night eating may occur in as much as 5 percent of the U.S. population

**Treatment:**
- Behavioral therapy regarding nutritional timing and content

Anti-obesity Medications
**Anti-obesity Medications**

Adjunct to nutritional, physical activity, and behavioral therapies

**Objectives:**
- Treat disease
  - Adiposopathy or sick fat disease (SFD)
  - Fat mass disease (FMD)
- Facilitate management of eating behavior
- Slow progression of weight gain/regain
- Improve the health, quality of life, and body weight of the patient with overweight or obesity

5-10 percent weight loss may improve both metabolic and fat mass disease

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**Food and Drug Administration (FDA) Principles**

**FDA-approved anti-obesity medication indications:**
- Patients with obesity (e.g., BMI ≥ 30 kg/m²)*
- Patients who are overweight (e.g., BMI ≥ 27 kg/m²) with presence of increased adiposity complications (e.g., type 2 diabetes mellitus, hypertension, dyslipidemia)*

If no clinical improvement after 12 weeks with one anti-obesity medication, consider alternative anti-obesity medication or increasing anti-obesity medication dose (if applicable).

*While body mass index (BMI) is the only measure listed in the prescribing information for anti-obesity medications, BMI has limitations; Especially in muscular individuals or those with sarcopenia, overweight and obesity are more accurately assessed by other measures.

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**Pharmacotherapy**

**Examples of anti-obesity medications approved in 1999 or before**
- Phentermine
- Diethylpropion
- Phendimetrazine
- Benzphetamine
- Orlistat

**Examples of anti-obesity medications approved in 2012 and beyond**
- Lorcaserin
- Phentermine HCL/topiramate extended release
- Naltrexone HCL/bupropion HCL extended release
- Liraglutide

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**Sympathomimetic Amines**

- Examples: Phenetermine, Diethylpropion, Phendimetrazine, Benzphetamine
- Increases salinity
- Drug Enforcement Agency (DEA) Schedule weight-management agents
  - DEA IV for phentetermine and diethylpropion
  - DEA III for phendimetrazine and benzphetamine
- Potential adverse experiences include:
  - Palpitation
  - Tachycardia
  - Increased blood pressure
  - Overstimulation
  - Tremor
  - Dizziness
  - Insomnia
  - Dysphoria
  - Headache
  - Dryness of mouth
  - Dryness
  - Diarrhea
  - Constipation
  - Pregnancy category X

**Gastrointestinal Lipase Inhibitors**

- Example: Orlistat
- Impairs gastrointestinal energy absorption (fat)
- Potential adverse experiences include:
  - Oily discharge from the rectum
  - Flatus with discharge
  - Increased defecation
  - Fecal incontinence
  - May increase risk of cholelithiasis
  - May increase risk of urinary oxalate
  - Rare post-marketing reports of severe liver injury
  - May decrease fast-soluble vitamin absorption (e.g., vitamins A, D, E, K, and beta carotene)
  - Pregnancy category X

**Lorcaserin**

**Indications and Use**

- Serotonin (5-hydroxytryptamine) 2c receptor agonist
- Increased satiety
- DEA/IV drug
- Dose = 10 milligrams (mg) twice per day

**Potential Adverse Experiences**

- Headache
- Dizziness
- Fatigue
- Nausea
- Dry Mouth
- Constipation
- Cough
- Reduced Heart Rate
- Hypertension

**Cautions and Contra-indications**

- If signs or symptoms of valvular heart disease develop, then discontinuation of lorcaserin should be considered during evaluation for valvulopathy
- Use with caution with use of hazardous machinery because of the potential for cognitive impairment with disturbances in attention or memory
- Use with caution among patients with psychiatric disorders, including euphoria and dissociation
- Use with caution among patients with psychiatric disorders and predisposed to depression who should be monitored for depression or suicidal thoughts; discontinue lorcaserin if symptoms develop
- Weight loss with lorcaserin may reduce hypoglycemic in patients treated for diabetes mellitus
- Use with caution in men with history of priapism or predisposition to priapism
- Contra-indicated during pregnancy or nursing mothers (pregnancy category X)
Phentermine HCL/Topiramate Extended Release

Completion of Risk Evaluation and Mitigation Strategy (REMS) program to inform prescribers and female patients about the increased risk of congenital malformations (especially orofacial clefts) in infants exposed to phentermine HCL/topiramate extended release during the first trimester of pregnancy.

Indications and Use
- DEA IV drug
- Doses = Once daily in the morning without or without food
  - Starting dose = 3.75 mg/23 mg (phentermine/topiramate extended release)
  - After 14-day intervals, and as clinically indicated, escalate doses to:
    - Recommended dose = 7.5 mg/46 mg
    - Titrination dose = 11.25 mg/59 mg
    - Top dose = 15 mg/92 mg

Phentermine HCL/Topiramate Extended Release

Potential Adverse Experiences
- In clinical trials, adverse reactions occurring more than or equal to 5% of the time include:
  - Paresthesia
  - Dizziness
  - Dysgeusia (taste distortion/perversion)
  - Insomnia
  - Constipation
  - Dry mouth

Laboratory abnormalities may include:
- Metabolic acidosis
- Elevated creatinine
- Lowering of glucose levels

Contra-indications
- Contraindicated:
  - Glaucoma
  - Hyperthyroidism
  - During or within 14 days of taking monoamine oxidase inhibitors
  - Women of reproductive potential should have a negative pregnancy test before treatment and monthly thereafter and should use effective contraception while on phentermine HCL/topiramate extended release
  - Pregnancy or nursing (Pregnancy category X)
- Should be discontinued in patients with:
  - Unacceptable increases in adrenergic responses, such as increase in heart rate, especially in those with cardiovascular or cerebrovascular disease
  - Suicide behavior and ideation
  - Acute myopia and secondary angle-closure glaucoma
  - Unacceptable mood and sleep disorders
  - Cognitive impairment
  - Pregnancy or nursing

Naltrexone HCL/Bupropion HCL Extended Release

Indications and Use
- Naltrexone is an opioid antagonist
- Bupropion is an aminoantidepressant
- Tablets = 8 mg/90 mg (naltrexone HCL/bupropion HCL extended release)
- Dosing:
  - Week 1 = 1 tablet in AM, no tablets in PM
  - Week 2 = 1 tablet in AM, 1 tablet in PM
  - Week 3 = 2 tablets in AM, 1 tablet in PM
  - Week 4 and beyond = 2 tablets in AM, 2 tablets in PM
Naltrexone HCL/Bupropion HCL Extended Release

Potential Adverse Experiences
- Nausea
- Constipation
- Headache
- Vomiting
- Dizziness
- Insomnia
- Dry mouth
- Diarrhea

Contra-indications
- Uncontrolled hypertension
- Seizure disorders, anorexia nervosa or bulimia, or undergoing abrupt discontinuation of alcohol, benzodiazepines, barbiturates, and antiepileptic drugs
- Use of other products containing bupropion
- Chronic opioid use
- During or within 14 days of taking monoamine oxidase inhibitors
- Known allergy to any of its ingredients
- Contra-indicated during pregnancy or nursing mothers (pregnancy category X)

Liraglutide

Indications and Use
- Liraglutide is a glucagon-like peptide-1 (GLP-1) receptor agonist
- Solution for subcutaneous injection, pre-filled, multidose pen that delivers doses of 0.6 mg, 1.2 mg, 1.8 mg, 2.4 mg, or 3 mg
- Inject subcutaneously in the abdomen, thigh, or upper arm; the injection site and timing can be changed without dose adjustment
- Recommended dose of liraglutide for treatment of obesity is 3 mg daily, any time of day, without regard to the timing of meals
- Dosing:
  - Week 1 = 0.6 mg per day
  - Week 2 = 1.2 mg per day
  - Week 3 = 1.8 mg per day
  - Week 4 and beyond = 3.0 mg per day

Potential Adverse Experiences
- Nausea
- Hypoglycemia
- Diarrhea
- Constipation
- Vomiting
- Headache

Contra-indications
- Personal or family history of medullary thyroid carcinoma or Multiple Endocrine Neoplasia syndrome type 2
- Hypersensitivity to liraglutide or any product components
- Contra-indicated during pregnancy or nursing mothers (pregnancy category X)

Bariatric Surgery
**Potential Bariatric Surgery Candidate**

What is the patient's BMI (in kg/m²)? Does clinical evidence exist confirming the presence of adverse health consequences (AHC) due to excessive and/or dysfunctional body fat?

- BMI > 35 with one or more AHC
- BMI > 40 with or without AHC

*BMI 30-34.9 with one or more AHC: mounting evidence supports surgical intervention as a treatment option in this group

**Bariatric Surgery Pre-operative Evaluation**

- Medical evaluation by physician specializing in the care of patients with overweight or obesity
- Surgical consultation by bariatric surgery specialist
- Cardiology, pulmonary, gastroenterology, and/or other specialty consultation as indicated
- Mental health assessment: underlying eating disorders; mood disorders; substance abuse; history of physical or emotional trauma; education regarding potential for increased suicide risk and transfer/addictions post-op; evaluation of existing coping mechanisms
- Nutritional assessment (e.g., dietitian)
- Educational support (e.g., pre-operative seminar)

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**Roux-en-Y Gastric Bypass (RNY)**

A surgical procedure wherein the stomach is completely divided into a small proximal gastric pouch leaving a large "bypassed" gastric remnant in situ. The proximal gastric pouch is attached to a "roux" limb of small bowel, bypassing the large gastric remnant, all of the esophagus, and a portion of the proximal small intestine.

**General**
- Hospital stay = 1-4 days
- Recovery = 1-2 weeks
- Contra-indications:
  - Poor surgical candidate
  - Severe psychiatric disorder
  - Intolerance to general anesthesia
  - Pregnancy
  - Drug or alcohol addiction
  - Untreated gastric ulcer
  - Crohn's disease
  - Patient demonstrates an unwillingness or an inability to follow long-term recommendations which can lead to life-threatening micronutrient deficiencies

**Most Common Acute Complications**
- Nasopharyngitis
- Dehydration
- Gastroenteritis obstruction
- Gastrointestinal bleeding
- Acute gastric dilation
- Anesthesic leaks
- Infection
- Cardiac dysrhythmias
- Anesthesia and pneumonia
- Deep-vein thrombosis
- Patent atrial entrapment
- Death

**Common Chronic Complications**
- Weight gain
- Pouch Anastomotic dilation
- Anastomotic/ marginal ulcers
- Esophageal dilation
- Dumping syndrome with reactive hypoglycemia
- Small bowel obstruction caused by internal hernias or adhesion
- Anastomotic strictures or stenosis
- Anorexia
- Malabsorption
- Iron deficiency
- Protein malnutrition
- Other mineral and vitamin deficiencies (i.e., deficiencies of vitamins A, D, C, B, and K, folate, zinc, magnesium, thiamine)
- Anemia (often related to mineral and nutrition deficiencies)
- Neuropathies (resulting from nutritional deficiencies)
- Gout exacerbation
- Osteopenia (often caused by calcium deficiency and chronically elevated parathyroid hormone levels)
- Depression
- Potential need for revision or conversion to another procedure

References: [190] [191] [192] [193] [194] [195] [196] [197] [198] [199]
**Vertical Sleeve Gastrectomy (VSG)**

A surgical procedure wherein the stomach is reduced to about 25 percent of its original size by the surgical removal of a large portion of the stomach along the greater curvature, resulting in a narrower sleeve or tube-like structure.

**General**
- Hospital stay: 1-2 days
- Recovery: ~12 weeks
- Contra-indications:
  - Poor surgical candidate
  - Severe psychiatric disorder
  - Intolerance to general anesthesia
  - Pregnancy
  - Drug or alcohol addiction
  - Untreated gastric ulcer
  - Barrett’s esophagus
  - Achalasia
  - Previous gastrectomy
  - Previous gastric bypass
- Sometimes used as a staged approach to gastric bypass or duodenal switch

**Most Common Acute Complications**
- Nausea/Vomiting
- Dehydration
- Gastrointestinal obstruction
- Gastrointestinal bleeding
- Staple line leaks
- Infection
- GERD
- Cardiac dysrhythmias
- Atelectasis and pneumonia
- Deep vein thrombosis
- Pulmonary emboli
- Death

**Most Common Chronic Complications**
- Weight regain or lack of long-term weight loss
- Sleeve dilatation
- Gastric ulcer
- Worsening GERD or de novo GERD
- Luminal stenosis/strictures
- Alkaline reflux gastritis
- Staple line leaks
- Fistula formation
- Gallstones
- Calcium deficiency
- Secondary hyperparathyroidism
- Iron deficiency
- Anemia (related to mineral and nutrition deficiencies)
- B12 & B1 deficiency (IF)
- Protein malnutrition uncommon
- Vitamin deficiencies uncommon
- Kidney stones (oxalosis)
- Depression
- Potential need for revision or conversion to another procedure

**References:** [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

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**Laparoscopic Adjustable Gastric Banding (LAGB)**

A surgical procedure where an adjustable band is placed around the upper stomach creating a small pouch. The band diameter is adjustable through the percutaneous introduction of saline via a subcutaneous port which is accessed in the upper abdomen.

*Performance of LAGB has declined due to limited long-term efficacy and international removal rate of at least 25 percent at five years.*

**General**
- Outpatient procedure
- Recovery usually one week
- Food bolus obstruction (dry meat; starchy)
- Contra-indications:
  - Poor surgical candidate
  - Severe psychiatric disorder
  - Intolerance to general anesthesia
  - Pregnancy
  - Drug or alcohol addiction
  - Untreated gastric ulcer, severe GERD, Barrett’s disease
  - Autoimmune disease

**Most Common Acute Complications**
- Nausea/vomiting
- Dehydration
- Band too tight with gastrointestinal obstructive symptoms (i.e., dysphagia)
- Hernorhaphy
- Gastrointestinal bleeding
- Infection
- Cardiac dysrhythmias
- Atelectasis and pneumonia
- Deep vein thrombosis

**Most Common Chronic Complications**
- No weight loss or weight regain
- Band slippage, erosion, ulceration, port infection, disconnection, and displacement
- Esophageal dilatation
- Rare nutrient deficiencies if persistent vomiting or marked and sustained decrease in nutritional intake
- Depression
- Potential need for removal, revision or conversion to another procedure

**References:** [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]
Biliopancreatic Diversion with Duodenal Switch (BPD/DS)

Procedure in which a partial gastrectomy (much like a sleeve) is performed, removing 70-80% greater curvature of the stomach sparing the pylorus and a small portion of the duodenum and the creation of a Roux-en-Y duodeno-ileostomy bypassing a large portion of the intestine.

**General**
- Hospital stay = 3-4 days
- Recovery = 2-4 weeks
- Contra-indications:
  - Poor physical candidate
  - Severe psychiatric disorder
  - Intolerance to general anesthesia
  - Pregnancy
  - Drug or alcohol addiction
  - Untreated gastric ulcer
  - Crohn’s disease
- Patient demonstrates an unwillingness or an inability to follow long term recommendations which can lead to life threatening micronutrient deficiencies

**Most Common Acute Complications**
- Nausea/Vomiting
- Dehydration
- Gastrointestinal obstruction
- Gastrointestinal bleeding
- Acute gastrointestinal infection
- Anastomotic leaks
- Infection
- Cardiac dysrhythmias
- Atelecstasis and pneumonitis
- Deep vein thrombosis
- Pulmonary emboli
- Death

*The BPD/DS has a much higher incidence of both macro- and micronutrients deficiencies compared to other bariatric surgeries.*

Bariatric Surgical Procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Result</th>
<th>Expected Loss (%)</th>
<th>Optimally suited for patients with</th>
<th>Other comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roux-en-Y Gastric Bypass</td>
<td>Greater improvement in metabolic disease</td>
<td>60-75%</td>
<td>Higher BMI, GERD, Type 2 DM</td>
<td>Largest data set more technically challenging than LAGB, VSG</td>
</tr>
<tr>
<td>Vertical Sleeve Gastrectomy</td>
<td>Improved metabolic disease, minimal internal anatomy, minimizes deficiencies infrequent</td>
<td>50-75% (3-5 years)</td>
<td>Metabolic disease</td>
<td>Can be used as the first step of staged approach, most common based on 2014 data</td>
</tr>
<tr>
<td>Laparoscopic Adjustable Gastric Banding</td>
<td>Least invasive, removable</td>
<td>25-40% 5 year removal rate minimally</td>
<td>Lower BMI no metabolic disease</td>
<td>Any metabolic benefits achieved are dependent on weight loss</td>
</tr>
<tr>
<td>Biliopancreatic Diversion with Duodenal Switch</td>
<td>Greatest amount of weight loss and resolution of metabolic disease</td>
<td>70-80%</td>
<td>Higher BMI, Type 2 DM</td>
<td>Most technically challenging</td>
</tr>
</tbody>
</table>

Vitamins

<table>
<thead>
<tr>
<th>*</th>
<th>B1</th>
<th>B12</th>
<th>C</th>
<th>E</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
<th>25(OH)D</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNY</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sleeve</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>LAGB</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Relatively Common Micronutrient Deficiencies

*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.*

For a complete explanation of micronutrient deficiencies, refer to "Clinical Practice Guidelines for the Perioperative Nutritional, Metabolic, and Non-surgical Support of the Bariatric Surgery Patient" at [www.asmba.org](http://www.asmba.org)
### Evaluation and Treatment Summary

#### Comprehensive Evaluation of the Patient with Overweight/Obesity

<table>
<thead>
<tr>
<th>History</th>
<th>Weight history, past medical history, family history, social history, screening for weight-promoting medications, food intake, activity, review of systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Examination</td>
<td>Height, weight, blood pressure, body composition analysis, waist measurement, complete physical examination</td>
</tr>
<tr>
<td>Laboratory Tests*</td>
<td>Complete blood count, electrolytes, liver function, kidney function, fasting lipid profile, thyroid tests, hemoglobin A1c, uric acid, vitamin D</td>
</tr>
<tr>
<td>Diagnostic Testing*</td>
<td>EKG, chest X-ray, exercise stress test, sleep study, barium swallow or esophagogastroduodenoscopy</td>
</tr>
</tbody>
</table>

*Lab and diagnostic testing should be individualized.

#### Individualized Treatment Plans*

<table>
<thead>
<tr>
<th>Diet</th>
<th>Use calorie restriction, carbohydrate restriction, food journaling; very low-calorie diet programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Give exercise prescription, use pedometer, limit TV and computer time, decrease sedentary time; initial goal of 150 minutes per week of moderate-intensity physical activity</td>
</tr>
<tr>
<td>Counselling</td>
<td>Eliminate provider bias and stigma; identify self-sabotage; develop strong support, address stress management, sleep optimization, other psychological substrate as needed</td>
</tr>
<tr>
<td>Pharmacotherapy</td>
<td>Use pharmacotherapy in part of a comprehensive program</td>
</tr>
<tr>
<td>Referral</td>
<td>Consider referral to an obesity medicine specialist</td>
</tr>
</tbody>
</table>

*If ineffective, consider referral to a metabolic and bariatric surgeon. Optimal pre- and post-operative care includes an obesity medicine specialist.

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### Current Treatment Options for Obesity

#### Potency*

- **Lifestyle + Medication**: Includes lifestyle, and anti-obesity medications

#### Risk/Cost

- **Surgery**: Thicker of lowest risk/best for patients
  - LAP (NY) => LAG (NY)

*Potency includes many factors, such as the amount, rate, and sustainability of weight loss, and the long-term resolution of comorbidities and obesity-related disease. Potency varies greatly for each individual (i.e., long-term adherence to a lifestyle program can be as potent as gastric bypass surgery).