

# The Basics of Bariatric Surgery:

## What RDNs need to know to serve this population

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**ADULT BARIATRIC SURGERY PROGRAM**  
UNIVERSITY OF MICHIGAN HEALTH SYSTEM



# Welcome!

- Objectives – Participants will be able to:
  - Distinguish between surgery types
    - RYGB, SG, AGB, VGB, BPD/DS
  - Understand eligibility requirements for surgery
  - Be introduced to the Michigan Bariatric Surgery Collaborative
  - Understand nutrition recommendations, including
    - Post-op diet progression
    - Protein needs
    - Vitamin/mineral recommendations
  - Learn about common nutrition complications for both:
    - Early post-op patients
    - Long-term patients
  - Become familiar with behavioral modifications for patient success



# Benefits to Bariatric Surgery

- Rapid, sustained weight loss
- Nearly instantaneous improvement of blood glucose control
- Improvements in disordered sleep/sleep apnea
- Better blood pressure control
- Increased fertility/reversal of PCOS
- Improvement of joint diseases/osteoarthritis
- Improved asthma symptoms and obesity hypoventilation syndrome
- Reduction of medications
- Bottom line: ***Improved quality of life!***



# Surgery Types

- 5 most common surgeries:
  - Roux-en-Y Gastric Bypass (RYGB) – the gold standard
  - Sleeve Gastrectomy (SG)
  - Adjustable Gastric Banding (AGB)
  - Vertical Gastric Banding (VGB)
  - Biliopancreatic Diversion with Duodenal Switch (BPD/DS)
- 3 surgery types:

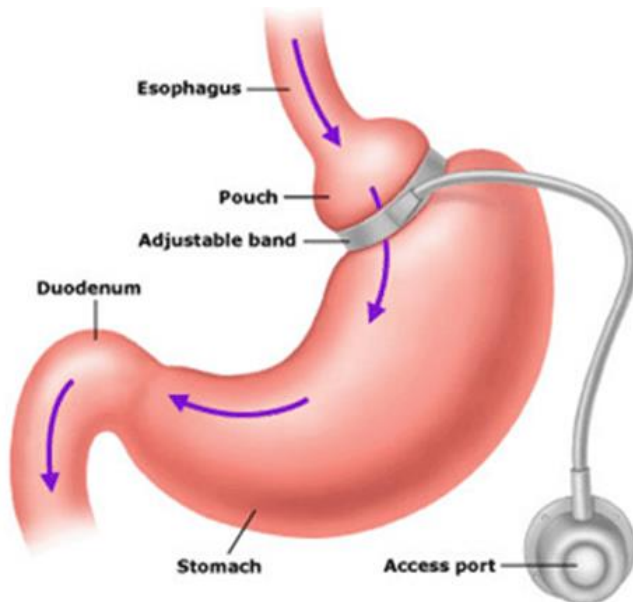
Restrictive	Restrictive with Gastric Manipulation	Severe Malabsorption
<ul style="list-style-type: none"><li>• Adjustable Band</li><li>• Vertical Gastric Band</li></ul>	<ul style="list-style-type: none"><li>• RNY Gastric Bypass</li><li>• Sleeve Gastrectomy</li></ul>	<ul style="list-style-type: none"><li>• Biliopancreatic Diversion w/ Duodenal Switch</li></ul>



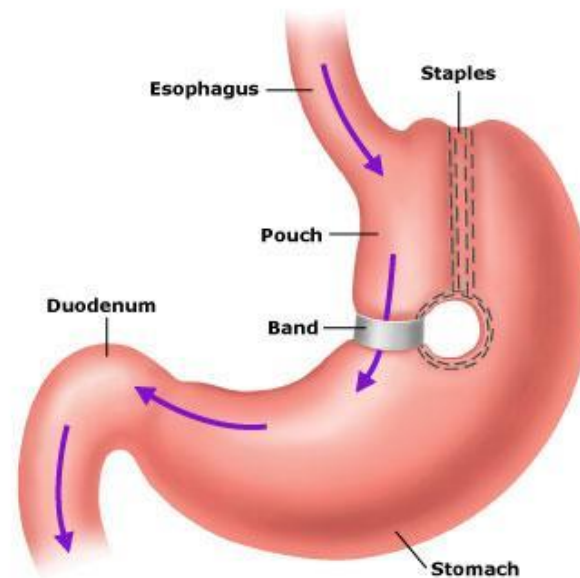
# Surgery Types

- Restrictive - restricts total amount of food that can be eaten at one time

Adjustable Gastric Banding (AGB)  
(more prevalent)



Vertical Gastric Banding (VGB)  
(less common)



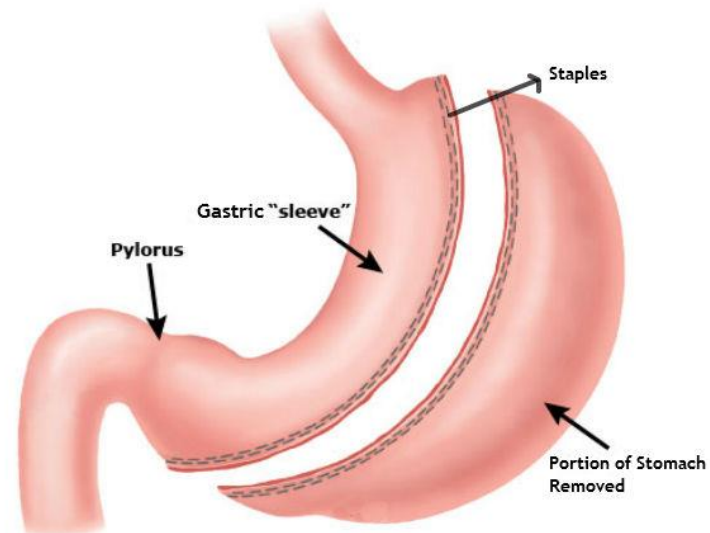
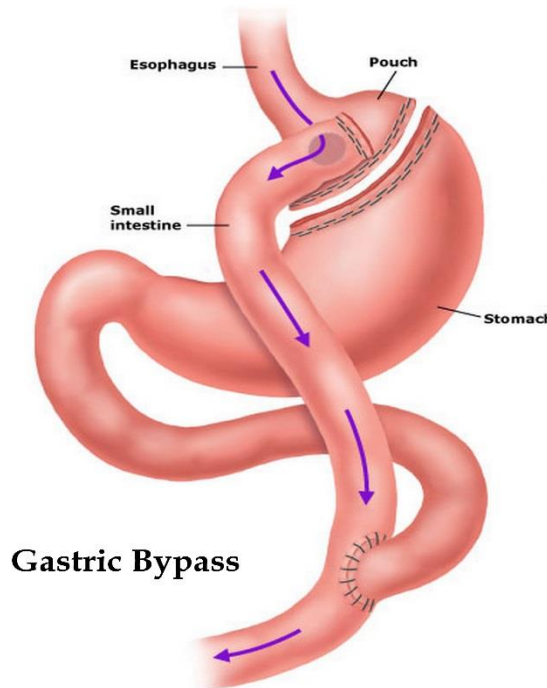


# Surgery Types

- Restrictive with Gastric Manipulation – causes some restriction and more profoundly affects secretion of gut hormones to decrease hunger and increase satiety

Roux-en-Y Gastric Bypass (RYGB)

Sleeve Gastrectomy (SG)



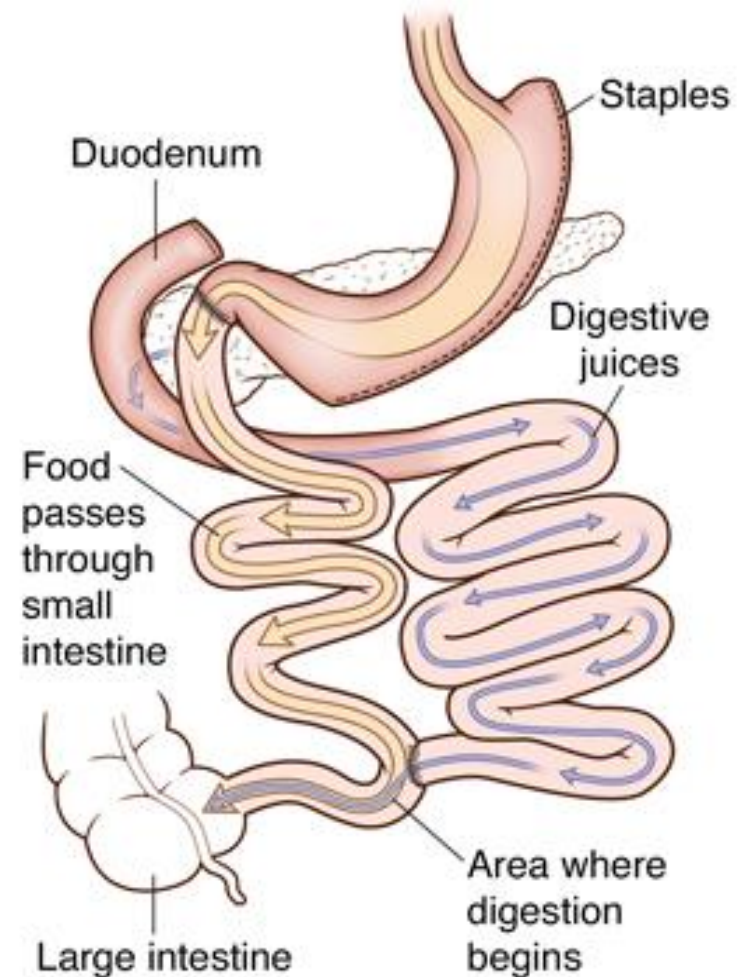


# Surgery Types

- Severe Malabsorption— results in significant intestinal malabsorption of protein, calories, and micronutrients

## Biliopancreatic Diversion with Duodenal Switch (BPD/DS)

Fun Fact: the BPD/DS began as a 2-procedure operation. The 1<sup>st</sup> procedure, gastric manipulation, produced weight loss even before the 2<sup>nd</sup> procedure, diversion of the intestine, occurred. That 1<sup>st</sup> procedure is now called the “sleeve gastrectomy.”





# Surgery Types

- Pros and Cons to each
- UofM offers:

Surgery	AGB & VGB	SG	RYGB	BPD/DS
Pros	<ul style="list-style-type: none"> <li>• Reversible</li> <li>• No malabsorption</li> </ul>	<ul style="list-style-type: none"> <li>• No hardware</li> <li>• Less technically complicated</li> <li>• Less malabsorption</li> <li>• Dumping Syndrome</li> <li>• Good weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• Reversible</li> <li>• Gold Standard (most researched)</li> <li>• Significant weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• Best weight loss</li> </ul>
Cons	<ul style="list-style-type: none"> <li>• Hardware inserted causes complications</li> <li>• Low weight loss</li> <li>• Adjustments/fills needed (AGB)</li> </ul>	<ul style="list-style-type: none"> <li>• Non-reversible</li> <li>• Not ideal for those with uncontrolled acid reflux</li> </ul>	<ul style="list-style-type: none"> <li>• Malabsorption more likely</li> <li>• Greater risk of Dumping Syndrome</li> <li>• No NSAIDS after</li> </ul>	<ul style="list-style-type: none"> <li>• Non-reversible</li> <li>• Severe malabsorption</li> <li>• Technically difficult = high surgical risk</li> </ul>
Excess Body Weight Loss (EBWL)	20-30% EBWL	55-65% EBWL (70-100 lbs.)	65-75% EBWL (100-150 lbs.)	Greater than 80% EBWL

85%

15%





# Eligibility Requirements

- In 1991, the National Institute of Health developed inclusion criteria, now used by insurance companies:
  - BMI greater than 40
  - or, BMI greater than 35 with 2 obesity-related comorbidities, such as diabetes, OSA, HTN, PCOS, etc.
  - Failure of nonsurgical weight loss
  - Absence of medical contraindications
  - Well-informed, compliant, motivated patient
- Exclusion Criteria:
  - Reversible endocrine disorders, current drug or alcohol abuse, severe uncontrolled psychiatric illness, pregnancy



# Eligibility Requirements

What does “Failure of nonsurgical weight loss” mean?

- Patients need to prove they attempted weight loss
- Usually required to complete 3, 6, or 12 consecutive months of medically supervised weight loss documentation with an MD, typically their PCP
  - May be waived if BMI exceeds 50
  - 4 topics must be addressed in every visit:
    - Diet
    - Exercise
    - Behavioral interventions (food records, support groups, etc)
    - Pharmacotherapy



# Michigan Bariatric Surgery Collaborative (MBSC)



- Research group that collects data on bariatric patients across the state of Michigan.
- 38 participating hospitals
- Funded by BCBS of Michigan
- Approximately 70K participants in database



# MBSC Outcomes Calculator

WEIGHT LOSS		
	SLEEVE GASTRECTOMY	RYGB
WEIGHT (LOST) AT YEAR 1	217 (83)	203 (97)
COMORBIDITY RESOLUTION		
	SLEEVE GASTRECTOMY	RYGB
NON-INSULIN DEPENDENT	81 %	86 %
HYPERCHOLESTEROLEMIA	59 %	77 %
SLEEP APNEA	70 %	76 %
COMPLICATIONS		
	SLEEVE GASTRECTOMY	RYGB
ANY	4.1 %	7.06 %
SEVERE	1.33 %	2.06 %



# Nutrition Requirements

- Pre-operative diet: Generally a structured full-liquid VLC diet which uses protein shakes
  - Done to help reduce liver size, reduce abdominal adiposity, and help eliminate solids from the GI tract
- Peri-operative diet (POD 1 & 2): Clear liquids
- Post-operative diet: Staged advancements to help support easy digestion during the healing process
  - 4 stages
  - Length of stages vary based on procedure



# Nutrition Requirements

- Post-Operative Diets:
  - Stage 1 – Clear Liquids, POD 1-2
  - Stage 2 – Full liquid diet with main source of calories derived from protein shakes/drinks; starts at discharge
  - Stage 3a – Pureed diet with main source of calories from protein shakes/drinks
  - Stage 3b – Soft food diet with fewer protein shakes/drinks needed
  - Stage 4 – Regular Bariatric Diet: low-fat, low-sugar, focused on protein, fruits/vegetables and no/very-limited grain-based carbohydrates.



# Diet Stage Timeline

Surgery	AGB & VGB	SG	RYGB & BPD/DS	Food Examples
Stage 2- Full Liquid	POD 3 - 2 weeks	POD 3 - 2 weeks	POD 3 - 2 weeks	Shakes, thinned mashed potatoes, yogurt, fat-free strained cream soups
Stage 3a- Pureed	POD 14 - 2 weeks	POD 14 - 2 weeks	POD 14 - 4 weeks	Oatmeal, applesauce, eggs, pureed chili/soups, fat-free refried beans
Stage 3b- Soft Foods	2-4 weeks	4 weeks	2 weeks	Fish, moist-cooked meats, cooked vegetables, cubed cheese, baked potatoes
Inclusion of Raw Fruits/ Vegetables	4-6 weeks post-op	6 weeks post-op	6 weeks post-op	Leafy greens, all raw vegetables, all raw fruit
Stage 4 - Bariatric Regular	6-8 weeks post-op	After 8 weeks post-op	After 8 weeks post-op	Nuts, seeds, grilled or baked (dry-cooked) meats, fruit skins & seeds



# Protein Needs

- “Many programs encourage patients to consume **60 to 80g protein per day** or set a goal of 1 to 1.5g protein per kg ideal body weight.
- “...In the uncomplicated patient, the latter amount of protein likely exceeds the patient’s metabolic requirements and would likely limit the consumption of other important macronutrients due to volume restriction.
- “...RD should encourage patients to achieve a balanced diet.” (1)





# Vitamins & Minerals after Surgery

Surgery	AGB & VGB	SG	RYGB & BPDDS
Multivitamin with Iron	1 daily	1 daily	2, BID
Calcium Citrate	Consider if diet is low in dairy	500-600mg BID, apart from MVI (iron)	500-600mg TID, apart from MVI (iron)
Sublingual Vitamin B12	Not needed	500 mcg daily	500 mcg daily
Vitamin D	2000-3000 IU daily	2000 IU daily	2000 IU daily
Frequency of Supplements	Once	3 times	5 times



# Vitamins & Minerals after Surgery

## Multivitamin with Iron

- Reasoning:
  - Patients with restrictive eating or malabsorption procedures should take additional vitamin/mineral supplementation as needs might not be met through diet alone.
- Deficiency:
  - Monitor blood serum levels
- Toxicity:
  - Patients should avoid “mega-dose” varieties of MVI
  - Pregnant patients need to be cautious of excessive Vitamin A intake



# Vitamins & Minerals after Surgery

## Calcium Citrate

- Reasoning:
  - Reduced stomach acid greatly reduces absorption of dietary Ca.
  - Calcium Citrate does not require an acidic environment for absorption and can be taken regardless of meal time
  - 1,000-1,500mg/d divided into 2-3, 500mg doses for maximum absorption
  - Best to take doses 4 hours apart
- Deficiency:
  - Serum Calcium levels are unreliable to detect deficiency. Bone density scan needed.
- Toxicity:
  - If high serum levels occur, patient should cease until levels normalize.



# Vitamins & Minerals after Surgery

## Vitamin B12 (cobalamin)

- Reasoning:
  - Low stomach acid and reduced production of Intrinsic Factor inhibits the absorption of dietary Vitamin B12.
  - Recommended to take 500 mcg/day sublingually or 1000mcg intramuscular monthly injections
- Deficiency:
  - Deficiency may not be evident for up to 2 years. Symptoms include weakness, shortness of breath, numbness/tingling, heart palpitations
- Toxicity:
  - If high serum levels present, what to do? Stop supplementation for 1-2 months, or keep taking? No risk of toxicity.
  - Check to make sure patient is using correct dose



# Vitamins & Minerals after Surgery

## Vitamin D

- Reasoning:
  - 2016 Micronutrient Update (2) states that 90% of pre-bariatric patients are deficient, and 100% of bariatric patients are deficient.
  - Total of 3,000 international units daily recommended
  - Subtract amount in Calcium Citrate to determine amount needed in single format
- Deficiency:
  - No symptoms. Serum levels must be monitored. Markers include low Vit D 25-OH, increased PTH, increased ALP, low serum phosphorous
- Toxicity:
  - No risk of toxicity unless taken in extreme amounts (50,000 IU daily)



# Vitamins & Minerals after Surgery

## Single Format Iron

- Reasoning:
  - After RYGB or BPD/DS, major sites of iron absorption are bypassed
  - 18mg/d for low-risk patients, generally iron in MVI is sufficient
  - 45-60mg/d total for high-risk populations including menstruating women
- Deficiency:
  - Iron-deficient anemia, presents as extreme fatigue, weakness, pale skin
  - Encourage addition of single format Vitamin C to aid absorption.
  - Important to separate Calcium intake (supplement or dietary) from Iron intake (or MVI w/ Iron) by a minimum of 2 hours.
- Toxicity:
  - Rare, patients encouraged to cease iron supplementation



# Vitamins & Minerals after Surgery

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Frequency of Supplements	Once	3 times	5 times

Let's Review!



# Biochemical Surveillance

- Labs to monitor following bariatric surgery:
  - □ Lipid Panel
  - Kidney Function
  - Liver Profile
  - □ CBC
  - □ Iron (serum iron, ferritin, TIBC)
    - Thiamin (B1) – only if vomiting present
  - □ Folate (RBC folate, serum folate)
- □ B-12 (serum B-12)
- □ Vitamin D, 25-OH
  - Serum Calcium\*
  - PTH – RYGB only
  - Insulin – as needed
  - TSH – as needed
- □ Hemoglobin A1C

\*Baseline DXA to assess bone density, and repeat DXA recommended every 2 years after surgery, especially for peri- and post-menopausal women.





# Early post-op Complications

- Medical complications:
  - Stricture, Leak, Wound Infection, Leg Cramps, DVT/PE
- Nutritional Complications:
  - Vomiting
    - Reduce diet to clear liquids, encourage fluids
      - Clear protein drinks are advantageous
    - RD should consult medical team
  - Nausea/Regurgitation
    - Problem-solve possible causes
      - Eating/drinking too quick? Chewing well? Overeating? Food is moist? Drinking while eating? Eating appropriate foods? Acid reflux?
    - Return to earlier diet stage if problem not identified
    - Refer to RN for prescription anti-nausea medication



# Early post-op Complications

- Nutritional Complications:
  - Dehydration
    - #1 reason for ER visits post-operatively
    - Severe? Consult medical team or present to ER for IV fluids
    - Encourage electrolyte-rich, low-calorie beverages (Smart Water, Propel, Powerade Zero) or regular bouillon/broth
    - Prioritize fluids above all else
  - Lactose Intolerance
    - If severe, omit all milk-based until diarrhea subsides
    - Switch to lactose-free products or add lactase-enzyme tablets
    - Add water to protein or use clear fruity protein drinks





# Early post-op Complications

- Nutritional Complications, continued:
  - Constipation
    - The RD should assess frequency & consistency of BMs
    - Less frequent but soft and easy to pass = no concern
    - Hard consistency and difficult to pass = intervention needed:
      - Okay to use stool softener, Miralax, Milk of Magnesia
      - Avoid laxatives or colon stimulants
      - Behavioral: Increase fluids, increase dietary fiber or add powdered fiber supplement, increase exercise as tolerated
  - Diarrhea
    - RD should consider possible lactose-intolerance
    - Additionally, consider overuse of sugar alcohols
    - Drinking while eating? Food choices?
    - Encourage fluids to avoid dehydration



Look for Sugar-free options!



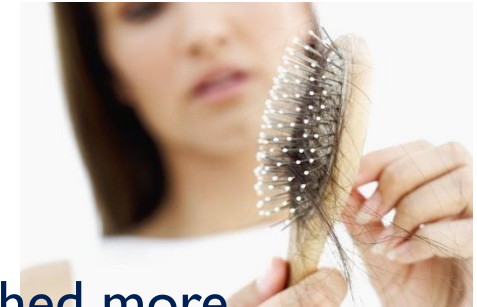
# Early post-op Complications

- Nutritional Complications, continued:
  - Dumping Syndrome (early & late stages)
    - More prevalent in RYGB, reported in 1/3 SG patients
    - Early dumping (RYGB only) occurs 10-30 minutes post-prandial. Results in nausea, weakness, rapid pulse, cold sweats, cramps, and diarrhea.
    - Late dumping (RYGB & SG) occurs 1-3 hours after meal. Results in reactive hypoglycemia symptoms
    - Prevention of Dumping Syndrome includes:
      - Avoiding hypertonic solutions: juice, soda, frosting, concentrated sweets
      - Limit food choices to less than 25 grams total sugar per serving/meal
      - Avoid added sugars: sucrose, honey, HFCS



# Early post-op Complications

- Nutritional Complications, continued:
  - Hair Loss/Shedding
    - Peaks around 3-6 months post-op
    - Patients who lose weight rapidly tend to shed more
    - No true preventative measures
      - RD should encourage adherence to vit/min and ensure protein needs are met
  - Food intolerances
    - Patient's learn by trial and error
      - “it sits heavy,” “it get's stuck,” “felt pressure in my chest”
    - Common ones: Beef/steak, eggs, raw leafy greens
    - Could be anything; intolerances are individual





# Early post-op Complications

- Nutritional Complications, continued:
    - Acid Reflux
      - Avoid: carbonation & drinking with straws, spicy food, laying down for 2 hours after meal, foods too hot/cold
      - OTC medications may help, or prescription
      - Severe? Consult medical team, could indicate surgical complication
    - Dizziness, lightheadedness or headaches
      - Increase fluid intake with electrolyte-rich beverages
      - Eat every 3-4 hours
      - Avoid concentrated sugars
      - Avoid drinking while eating
- } Possible Dumping Syndrome



# Long-Term post-op Complications

- Medical Complications: Gallstones, muscle wasting, depression/psychiatric disorders, excess skin
- Nutritional Complications
  - Protein Deficiency
    - More likely with BPD/DS, uncommon in others
    - RD should assess dietary intake at every visit
      - Help patient prioritize protein, protein at every meal/snack
  - Vitamin/Mineral Deficiency
    - RD should monitor supplement intake at every visit, specifically timing of intake & dosages
    - Single format vit/min can be added to typical routine
    - Routine biochemical surveillance necessary



# Long-Term post-op Complications

- Nutritional Complications
  - Hair loss beyond 1-yr post op
    - Evaluate for deficiencies in protein, iron, zinc, selenium, biotin, essential fatty acids
  - Reactive Hypoglycemia
    - Occurs 1-4 hours post-prandial in response to higher carbohydrate meal
      - Symptoms: Perspiration, palpitations, hunger, weakness, syncope
      - Treatment: Pair protein & fiber at meals/snacks, eat small frequent meals, avoid refined carbohydrates







# Long-Term post-op Complications

- Nutritional Complications
  - Weight Regain
    - Research from MBSC shows that patients typically regain 10-15% of loss between years 2 & 3 post-op
    - RD should evaluate behaviors at 2 year post-op visit
    - Why? Many reasons:
      - Metabolism adapts to lower calorie intake
      - Old behaviors creep back in
      - Cravings return
      - Lack of consistency with exercise
  - Disordered Eating related to fear of Regain





# Behavioral Modifications

- Prioritize protein
  - Protein at every meal and snack
  - Eat protein foods first, then fruits/vegetables, then anything else
  - Spread protein throughout day
    - No more than 30grams at any meal
- Avoid grain-based food items, especially bread, pasta, rice
  - Filler foods that can cause pain/discomfort
- 4-6 small meals or snacks, No Grazing
  - Greater than 7 eating occasions per day considered grazing
  - In one study, 72% of patients who grazed regained weight compared to 11.7% without grazing habits (3)





# Behavioral Modifications

- Separate fluids from foods by 30 minutes
  - Flushing foods through stomach too fast can lead to diarrhea
  - Causes hunger to come on sooner
  - Can cause discomfort, nausea, regurgitation
- Avoid carbonation & straws
  - These exacerbate acid reflux
- Avoid alcohol
  - Greater risk if alcoholism following bariatric surgery
  - Addiction transference happens





# Behavioral Modifications

- Chew foods thoroughly & eat slowly
- Avoid overeating
- Avoid foods not well tolerated
  - High-fat, high-sugar items
  - Bread, Pasta, Rice and flour-based items
  - Personal intolerances
- Limit caffeine
- Exercise!
  - Cardio for calorie burn
  - Strength training to prevent muscle wasting





# Special Considerations

- Post-op patients who have:
  - Type I Diabetes
  - CKD and end-stage renal disease, on dialysis
  - Renal transplants
  - Kidney stones
- Pregnancy
- Cases that require a second surgery
  - Reversals (AGB/VGB, RYGB)
  - Revisions (any)
  - Conversions (SG → RYGB)

# Questions?

## Thank you!

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