Medical Nutrition Therapy for Disorders of the Lower Gastrointestinal Tract
Normal Function of Lower GI Tract

- Digestion
- Absorption
- Excretion
Normal Function of Lower GI Tract

- Digestion
  - Begins in mouth & stomach
  - Continues in duodenum & jejunum
  - Secretions:
    - Liver
    - Pancreas
    - Small intestine
Normal Function of Lower GI

Absorption

- Most nutrients absorbed in jejunum
- Small amounts of nutrients absorbed in ileum
- Bile salts & B_{12} absorbed in terminal ileum
- Residual water absorbed in colon
Sites of Digestion and Absorption

- Mouth and salivary glands
- Esophagus
- Stomach
- Pancreas
- Gallbladder
- Small intestine
  - Vitamin B-12, bile acids
  - Sodium, potassium
- Large intestine (colon)
  - Water (10% to 30% of total)
  - Some fatty acids
  - Gases
Sites of Secretion, Digestion and Absorption
Principles of Nutritional Care

Intestinal disorders & symptoms:

- Motility
- Secretion
- Absorption
- Excretion
Principles of Nutritional Care

Dietary modifications

- To alleviate symptoms
- Correct nutritional deficiencies
- Address primary problem
- Must be individualized
Common Intestinal Problems

- Intestinal gas or flatulence
- Constipation
- Diarrhea
- Steatorrhea

Photo courtesy http://www.drnatura.com/
**Constipation**

- Defined as hard stools, straining with defecation, infrequent bowel movements
- Normal frequency ranges from one stool q 3 days to 3 times a day
- Occurs in 5% to more than 25% of the population, depending on how defined
Causes of Constipation - Systemic

- Side effect of medication, esp narcotics
- Metabolic Endocrine abnormalities, such as hypothyroidism, uremia and hypercalcemia
- Lack of exercise
- Ignoring the urge to defecate
- Vascular disease of the large bowel
- Systemic neuromuscular disease leading to deficiency of voluntary muscles
- Poor diet, low in fiber
- Pregnancy
Causes of Constipation - Gastrointestinal

- Diseases of the upper gastrointestinal tract
  - Celiac Disease
  - Duodenal ulcer
  - Gastric cancer
  - Cystic fibrosis

- Diseases of the large bowel resulting in:
  - Failure of propulsion along the colon (colonic inertia)
  - Failure of passage though anorectal structures (outlet obstruction)

- Irritable bowel syndrome

- Anal fissures or hemorrhoids

- Laxative abuse
Diagnostic Tests Constipation

Begins with a physical exam including a digital rectal exam. Other tests can include the following:

- Thyroid tests
- Barium enema x-ray: colonic contrast study
- Sigmoidoscopy
- Colonoscopy
- Colorectal transit study
- Anorectal manometry tests to measure anal sphincter muscle tone and contraction.
- Evacuation proctography
Treatment of Constipation

- Encourage physical activity as possible
- Bowel training: encourage patient to respond to urge to defecate
- Change drug regimen if possible if it is contributory
- Use laxatives and stool softeners judiciously
- Use stool bulking agents such as psyllium (Metamucil) and pectin
A complete food history and 24-hour recall should be completed. Specific areas of concern should include the following:

- Number of daily servings from grains, fruits, vegetables, nuts, and legumes
- Caffeine intake
- Fluid intake
- Evaluation of exercise and activity patterns
To quickly estimate fiber intake from a food record (Marlett, 1997):

- Multiply number of servings of fruits and vegetables by 1.5 g
- Multiply number of servings of whole grains by 2.5 g
- Multiply number of servings of refined grains by 1.0 g
- Add specific fiber amounts for nuts, legumes, seeds, and high-fiber cereals
- Total = estimated fiber intake
MNT for Constipation

- Depends on cause
- Use high fiber or high residue diet as appropriate
- If caused by medication, may be refractory to diet treatment
Nutrition Intervention for Constipation

- Eat adequate insoluble fiber (gradually increasing daily total fiber to 25-38 g/day)
- The major sources of insoluble fiber include cellulose, psyllium, inulin, and oligosaccharides. These types of fiber are primarily found in the skins of fruits, vegetables, wheat and rice bran, and whole wheat.
- Increase fluid intake to a minimum of 64 oz each day.
- Participate in daily physical activity.
- Use bulk-forming agents such as Psyllium, Calcium polycarbophil, or Methylcellulose.
- Avoid stool retention and initiate bowel retraining program if required

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Fiber, roughage, and residue

- **Fiber or roughage**
  - From plant foods
  - Not digestible by human enzymes

- **Residue**
  - Fecal contents, including bacteria and the net remains after ingestion of food, secretions into the GI tract, and absorption
High-Fiber Diets

- Most Americans = 10 – 15 g/day
- Recommended = 25 g/day
- More than 50g/day = no added benefit, may cause problems
High-Fiber Diet

- Increase consumption of whole-grain breads, cereals, flours, other whole-grain products
- Increase consumption of vegetables, especially legumes, and fruits, edible skins, seeds, hulls
- Consume high-fiber cereals, granolas, legumes to increase fiber to 25 g/day
- Increase consumption of water to at least 2 qts (eight 8 oz cups)
High-Fiber Diets: cautions

- Gastric obstruction, fecal impaction may occur when insufficient fluid consumed

- With GI strictures, motility problems, increase fiber slowly (~1mo.)

- Unpleasant side effects
  - Increased flatulence
  - Borborygmus
  - Cramps, diarrhea
Diarrhea

- Characterized by frequent evacuation of liquid stools
- Accompanied by loss of fluid and electrolytes, especially sodium and potassium
- Occurs when there is excessively rapid transit of intestinal contents through the small intestine, decreased absorption of fluids, increased secretion of fluids into the GI tract
Diarrhea Etiology

- Inflammatory disease
- Infections with fungal, bacterial, or viral agents
- Medications (antibiotics, elixirs)
- Overconsumption of sugars
- Insufficient or damaged mucosal absorptive surface
- Malnutrition

Should identify and treat the underlying problem
Diagnostics in Diarrhea

Stool cultures:

- Fecal fat: qualitative and quantitative to rule out fat malabsorption
- Occult blood
- Ova and paracytes
- Bacterial contamination (*Clostridium difficile*, foodborne illnesses, etc.)
- Osmolality and electrolyte composition
Diarrhea Diagnostics

Intestinal Structure and Function

- Sigmoidoscopy
- Colonoscopy

Evaluation of hydration status and electrolyte balance:

- Serum electrolytes, serum osmolality
- Urinalysis
- Physical examination
- Current weight, Usual weight, % weight change
Diarrhea Nutritional Care Adults

Restore normal fluid, electrolyte, and acid-base balance.

- Use oral rehydration solutions such as Pedialyte, Resol, Ricelyte, and Rehydralyte
- The World Health Organization has a standard recipe for an oral rehydration solution: 1/3-2/3 tsp table salt, 3/4 tsp sodium bicarbonate, 1/3 tsp potassium chloride, 1-1/3 Tbsp. sugar, 1 liter bottled or sterile water.
Nutritional Intervention Diarrhea

- Decrease gastrointestinal motility

- Avoid clear liquids and other foods high in simple carbohydrates (i.e., lactose, sucrose, or fructose) and sugar alcohols (sorbitol, xylitol, or mannitol)

- Avoid caffeine-containing products

- Avoid alcoholic beverages

- Avoid high-fiber and gas-producing foods such as nuts, beans, corn, broccoli, cauliflower, or cabbage
Nutrition Intervention Diarrhea

- Stimulate the gastrointestinal tract by slow introduction of solid food without exacerbation of symptoms.

- Low-residue, low-fat, lactose-free nutrition therapy should guide initial food selections.

- If there is no evidence of lactose intolerance, then these foods should be added back to the meal plan (Steffen, 2004).
Diarrhea Treatment for Adults

Repopulate the GI tract with microorganisms

- Prebiotics in modest amounts including pectin, oligosaccharides, inulin, oats, banana flakes

- Probiotics, cultured foods and supplements that are sources of beneficial gut flora
Low- or Minimum Residue Diet

- Foods completely digested, well absorbed
- Foods that do not increase GI secretions
- Used in:
  - Maldigestion
  - Malabsorption
  - Diarrhea
  - Temporarily after some surgeries, e.g. hemorrhoidectomy
Foods to Limit in a Low- or Minimum Residue Diet

- Lactose (in lactose malabsorbers)
- Fiber >20 g/day
- Resistant starches
  - Raffinose, stachyose in legumes
- Sorbitol, mannitol, xylitol >10g/day
- Caffeine
- Alcohol, esp. wine, beer
Restricted-Fiber Diets

- Uses:
  - When reduced fecal output is necessary
  - When GI tract is restricted or obstructed
  - When reduced fecal residue is desired
Restricted-Fiber Diets

- Restricts fruits, vegetables, coarse grains
- <10 g fiber/day
- Phytobezoars
  - Obstructions in stomach resulting from ingestion of plant foods
  - Common in edentulous pts, poor dentition, with dentures
  - Potato skins, oranges, grapefruit
MNT for Infants and Children

- Acute diarrhea most dangerous in infants and children

- Aggressive replacement of fluid/electrolytes

- WHO/AAP recommend 2% glucose (20g/L) 45-90 mEq sodium, 20 mEq/L potassium, citrate base

- Newer solutions (Pedialyte, Infalyte, Lytren, Equalyte, Rehydralyte) contain less glucose and less salt, available without prescription
MNT for Infants and Children

- Continue a liquid or semisolid diet during bouts of acute diarrhea for children 9 to 20 months.
- Intestine absorbs up to 60% of food even during diarrhea.
- Early refeeding helpful; gut rest harmful.
- Clear liquid diet (hyperosmolar, high in sugar) is inappropriate.
Nutrition Intervention Diarrhea in Children

- Thicken consistency of the stool
- Banana flakes, apple powder, or other pectin sources can be added to infant formula
- If the infant has begun solid foods, use of strained bananas, applesauce, and rice cereal are the best initial food choices
- AAP no longer recommends the BRAT diet (bananas, rice, applesauce, and toast) for diarrhea in children
Diseases of Small Intestine

- Celiac disease
- Brush border enzyme deficiencies
- Crohn’s disease
Celiac Disease

- Also called Gluten-Sensitive Enteropathy and Non-tropical Sprue
- Caused by inappropriate autoimmune reaction to gliadin (found in gluten)
- Much more common than formerly believed (prevalence 1 in 133 persons in the US)
- Frequently goes undiagnosed
Celiac Disease

- Results in damage to villi of intestinal mucosa – atrophy, flattening
- Potential or actual malabsorption of all nutrients
- May be accompanied by dermatitis herpetiformis, anemia, bone loss, muscle weakness, polyneuropathy, follicular hyperkeratosis
- Increased risk of Type 1 diabetes, lymphomas and other malignancies
Celiac Disease Symptoms

- Early presentation: diarrhea, steatorrhea, malodorous stools, abdominal bloating, poor weight gain

- Later presentation: other autoimmune disorders, failure to maintain weight, fatigue, consequences of nutrient malabsorption (anemias, osteoporosis, coagulopathy)

- Often misdiagnosed as irritable bowel disease or other disorders
Normal human duodenal mucosa and peroral small bowel biopsy specimen from a patient with gluten enteropathy.

(From Floch MH. Nutrition and Diet Therapy in Gastrointestinal Disease. New York: Menum Medical Book Co., 1981.)
Celiac Disease Diagnosis

- Positive family history
- Pattern of symptoms
- Serologic tests: antiendomysial antibodies (AEAs), immunoglobulin A (IgA), antigliadin antibodies (AgG-AGA) or IgA tissue transglutaminase
- Gold standard is intestinal mucosal biopsy
- Evaluation should be done before gluten-containing foods are withdrawn
Celiac Disease: Diet IS the Therapy

- Electrolyte and fluid replacement (acute phase)
- Vitamin and mineral supplementation as needed (calcium, vitamin D, vitamin K, iron, folate, B12, A & E)
- Delete gluten sources from diet (wheat, rye, barley, oats)
- Substitute corn, potato, rice, soybean, tapioca, and arrowroot
- Patients should see a dietitian who is familiar with this disease and its treatment
Celiac Disease

- Read labels carefully for problem ingredients
- Even trace amounts of gliadin are problematic
- Common problem additives include fillers, thickeners, seasonings, sauces, gravies, coatings, vegetable protein
Gluten Intolerance and CAM

- Alternative medicine practitioners are recommending gluten free diets to treat a variety of ailments, including fatigue, depression, schizophrenia, arthritis, and digestive upsets.
Supplements Being Recommended for Gluten Intolerance

- Green food supplements, 1 tbsp.
- Evening primrose oil, two 500 mg capsules three times daily
- Multivitamin supplement, as directed on the label
- Medicinal clay, dissolve 1 tsp. of clay in 1/2 cup of water at room temperature and drink twice daily.
- Papain, 500 mg three times daily
- Pyridoxal-5-Phosphate, 50 mg daily
- Silica, 3-6 capsules; in the gel form, follow the directions on the label
- Vitamin B complex, 50 mg twice daily
- Vitamin B12, 100 mcg
- Vitamin C, with bioflavonoids, 5,000 mg one to three times daily

From www.celiac.com
Herbal Remedies Being Recommended in the Treatment of Celiac Disease

- Herbal remedies can help soothe intestinal irritation and inflammation and heal damaged mucous membranes.

- Take 4 drops of agrimony tincture in water, three times daily.

- Sufficient silica in the intestines will reduce inflammation, and strengthen and rebuild connective tissue. Take 3 cups of silica-rich horsetail tea or 15 drops of tincture in liquid three times daily.

- A combination of burdock, slippery elm, sheep sorrel and Turkish rhubarb tea helps different types of inflammations in the gastrointestinal tract.

- Use dandelion, saffron and yellow dock herbal teas to that purify and nourish the blood.

- Pickled ginger can be eaten for anti-inflammation properties.

From www.celiac.com
Tropical Sprue

- Cause unknown; possible infectious process
- Imitates celiac disease
- Results in atrophy and inflammation of villi
- Sx: diarrhea, anorexia, abdominal distention
- Rx: tetracycline, folate 5 mg/d, B₁₂ IM
Intestinal Brush Border Enzyme Deficiencies

- Deficiency of brush border disaccharidases
- Disaccharides not hydrolyzed at mucosal cell membrane
Intestinal Brush Border Enzyme Deficiencies

- May occur as
  - Rare congenital defects
    - Lack of sucrase, isomaltase, lactase in newborns
  - Secondary to diseases that damage intestinal epithelium
    - Crohn’s disease, celiac disease
  - Genetic form
    - Lactase deficiency
Lactase “Deficiency”

- 70% of adults worldwide are lactase deficient, especially Africans, South Americans, and Asians

- Maintenance of lactase into adulthood is probably the result of a genetic mutation

- Diagnosed based on history of GI intolerance to dairy products
Lactose Intolerance Diagnostics

**Lactose breath hydrogen test**

- Baseline breath hydrogen concentration is measured.
- Patient consumes 25 to 50 grams lactose.
- Breath hydrogen concentration is re-measured in 3 to 8 hours. An increase >20 ppm suggests lactose malabsorption (90% sensitivity).
Lactose Deficiency Diagnostics

Lactose tolerance test

- After 8-hour fast, baseline serum glucose is measured.
- Patient consumes 50-100 grams of lactose
- Serum blood glucose levels are measured at 30, 60, and 90 minutes after lactose ingestion
- No increase in blood glucose levels suggests lactose malabsorption (Pagana, 2004).
MNT for Lactose Intolerance

- Most lactase deficient individuals can tolerate small amounts of lactose without symptoms, particularly with meals or as cultured products (yogurt or cheese).
- Can use lactase enzyme or lactase treated foods, e.g. Lactaid milk.
- Distinct from milk protein allergy; allergy requires milk free diet.
MNT Strategies for Lactose Intolerance

- Start with small amounts of lactose containing foods (¼ cup of milk or ½ ounce of cheese)
- Start with foods lower in lactose content (see table)
- Only include 1 dairy food a day and gradually increase the amount as the days go by*
- Only eat 1 lactose-containing food/meal
- Drink milk or eat dairy foods with a meal or a snack, but not alone
- Space lactose-containing foods several hours apart
- If drinking milk, heating the milk may improve tolerance
MNT Strategies for Lactose Intolerance

- Try lactose-free or lactose-reduced milk
- Use lactase enzyme drops if you are drinking milk, however, they must be added at least 24 hours before drinking the milk or take lactase tablets before eating dairy foods
- Aged cheeses that are naturally lower in lactose than a processed cheese, such as Velveeta or cheese spread
- Yogurt, which contains bacteria that break down the lactose may be easier to digest
- Buttermilk may also be easier to tolerate as it is a fermented dairy food
- *A good strategy is to add in the equivalent of a maximum of 2-5 grams of lactose at a time.
Inflammatory Bowel Disease

- Crohn’s Disease and Ulcerative Colitis
- Autoimmune diseases of unknown origin
- Genetic component and environmental factors
- Onset usually between 15 to 30 years of age
Inflammatory Bowel Diseases (IBD)

Clinical features

■ Food intolerances
■ Diarrhea, fever
■ Weight loss
■ Malnutrition
■ Growth failure
■ Extraintestinal manifestations
  – Arthritic, dermatologic, hepatic
Inflammatory Bowel Disease

Crohn’s Disease
- Involves any part of the GI tract
- Segmental
- Involves all layers of mucosa
- Steatorrhea frequent
- Strictures and fistulas common
- Slowly progressive
- Malignancy rare

Ulcerative Colitis
- Involves the colon, extends from rectum
- Continuous
- Involves mucosa and submucosa
- Steatorrhea absent
- Strictures and fistulas rare
- Remissions and relapses
- Malignancy common
IBD Diagnostics

Tests for initial diagnosis:

- Colonoscopy
- Lower gastrointestinal (GI) series with barium enema
- ASCA (antisacchromyces antibodies) (Dubinsky, 2003)
- ANCA (antineutrophil cytoplasmic antibodies) (Dubinsky, 2003)
- Biopsy
Tests for diagnosis, exacerbation, and response to therapy

- C-reactive protein
- Erythrocyte sedimentation rate (ESR)
- Lactoferrin
- White blood count and differential
- Stool assessment for presence of leukocytes
Crohn’s Disease

■ May involve any part of GI: mouth – anus

■ Typically involves small & large intestine in segmental manner with skipped areas – healthy areas separate inflamed areas

■ Affects all layers of mucosa

■ Inflammation, ulceration, abscesses, fistulas
Crohn’s Disease

- Fibrosis, submucosal thickening, scarring result in narrowed segments, strictures, partial or complete obstruction

- Multiple surgeries common with major resection of intestine
  - Malabsorption of fluids, nutrients
  - May need parenteral nutrition to maintain adequate nutrient intake, hydration
Ulcerative Colitis

- Involves only colon, extends from rectum
- Continuous disease, no skipped areas
- Inflamed mucosa, small ulcers, but not through mucosa
- Strictures, significant narrowing not usual
- Rectal bleeding, bloody diarrhea common
- Often, colon removed
IBD Medical Management

- To induce and maintain remission
- To maintain nutritional status
- During acute stages:
  - Corticosteroids
  - Anti-inflammatory agents
  - Immunosuppressive agents
  - Antibiotics
IBS: Surgical Treatment

Before

After

Flow through after surgery
IBD Nutritional Management (acute)

- Low-residue, low-fiber liquid diet
- “Bowel rest” with parenteral nutrition
- Enteral nutrition may have better success at inducing remission
- Diet tailored to individual pt:
  - Minimal residue for reducing diarrhea
  - Limited fiber to prevent obstruction
  - Small, frequent feedings
  - Supplements, MCT with fat malabsorption
Nutritional Requirements Influenced by

- Extent of stool output
- Current medication regimen
- Previous medical and surgical history
- Energy: Use indirect calorimetry to establish requirements if possible. Infection and medical intervention will influence metabolic needs. Not all patients are hypermetabolic.
- Protein: Protein requirements may reach 150% of baseline requirements.
- Specific Nutrient Supplementation: Omega-3-fatty acids and glutamine should be considered.
Use DRI baseline recommendations. The patient may need higher levels of the following:

- Vitamin B-12
- Folate
- Thiamin
- Riboflavin
- Niacin
- Vitamin C
- Vitamin E
- Vitamin D
- Vitamin K
# Food and Symptom Diary

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IBD Nutritional Management (chronic)

- High protein, high calorie diet with oral supplements
- Monitor vitamin-mineral status of iron, calcium, selenium, folate, thiamin, riboflavin, pyridoxine, vitamin B12, zinc, magnesium, vitamins A, D, E
- High fiber diet as tolerated
- Avoid unnecessary restrictions
Nutrition Prescription During Remission

- Maximize energy and protein intake for maintenance of weight and replenishment of nutrient stores while tailoring for patient's current gastrointestinal function.

- Avoid foods high in oxalate: persons with Crohn’s at greater risk for oxalate stones due to fat malabsorption/loss of calcium.

- Increase antioxidant intake

- Use of probiotics and prebiotics

ADA Nutrition Care Manual online accessed 4-27-05
Diseases of Large Intestine

- Irritable Bowel Syndrome
- Diverticular Disease
- Colon Cancer and Polyps
Irritable Bowel Syndrome (IBS)

- Not a disease – syndrome
- Abdominal pain, bloating, abnormal bowel movements
  - Alternating diarrhea, constipation
  - Abdominal pain, relieved by defecation
  - Bloating w/ feeling of excess flatulence
  - Feeling of incomplete evacuation
  - Rectal pain, mucus in the stool
IBS: Incidence in U.S.

- 20% of women
- ~10 – 15% of men
- 20 – 40% of visits to gastroenterologists
- One of the most common reasons pts first seek medical care
- Increased absenteeism, decreased productivity
J. K. SIMMONS (Garth Pancake), an accomplished film stage and television actor, was most recently seen on the big screen in the blockbuster “Spider-Man” as J. Jonah Jameson, a role he will reprise in the upcoming sequel. He can currently be seen as Buffalo Bill in Touchstone Pictures’ “Hidalgo.” Other recent films include “The Gift,” “For the Love of the Game,” “The Mexican,” “Autumn in New York,” “The Ref,” “The Jackal,” “Above Friendship,” and “Off the Man.”
IBS: Etiology

- Increased visceral sensitivity and motility in response to GI and environmental stimuli

- React more to:
  - Intestinal distention
  - Dietary indiscretions
  - Psychosocial factors
  - Life stressors

- May have psych/social component (history of physical or sexual abuse)
IBS: Diagnosis

- Symptoms for 3 months or longer
- Positive family history
- Rule out other medical/surgical conditions
Irritable Bowel Syndrome

- Problem factors other than stress and diet:
  - Excess use of laxatives, OTC meds
  - Antibiotics
  - Caffeine
  - Previous GI illness
  - Lack of regular sleep, rest patterns
  - Inadequate fluid intake
IBS: Medications

- Antispasmodics
- Anticholinergics
- Antidiarrheals
- Prokinetics
- Antidepressants
**IBS: Nutritional Care**

- **ID individual food intolerances**
  - Keep food record, include symptoms, time they occur in relation to meals

- **Avoid offending foods, substances**
  - Milk, milk products (lactose) only in presence of lactase deficiency
  - Fatty foods
  - Gas-forming foods, beverages
  - Caffeine, alcohol
  - Foods w/ ↑ fructose or sorbitol
IBS: Nutritional Care

- Eat small frequent meals at relaxed pace, regular times
- Gradually add dietary fiber to diet
  - 20 – 30 g
  - Fiber supplements may help (psyllium)
- Fluids – 2 – 3 qts w/ fiber supp.
- Regular physical activity to reduce stress
Diverticulosis

- Sac-like herniations or outpouches of the colon wall
- Caused by long-term increased colonic pressures
- Believed to result from low fiber diet, constipation
Diverticulitis

- Caused when bacteria or other irritants are trapped in diverticular pouches
- Inflammation
- Abscess formation
- Acute perforation
- Acute bleeding
- Obstruction
- Sepsis
Diverticulitis: MNT for acute disease

- Use elemental diet if patient is acutely ill. Progress to clear liquids.
- Initiate soft diet with no excess spices or fiber. Avoid nuts, seeds, popcorn, fibrous vegetables.
- Ensure adequate intake of protein and iron.
- Progress to normal fiber intake as inflammation decreases.
- Low fat diet may also be beneficial.
Diverticulosis: MNT for chronic disease

- High fiber diet (increase gradually)
- Supplement with psyllium, methylcellulose may be helpful
- 2 – 3 qt water daily with high fiber intake
- Low fat diet may be helpful (?)
- ? Avoid seeds, nuts, skins of plants
Colon Cancer

- Second most common cancer in adults
- Second most common cause of death

Factors that increase risk:

- Family history
- Occurrence of IBD – Crohn’s, ulcerative colitis
- Polyps
- Diet
Colon Cancer/Polyps: dietary risk factors

- Increased meat intake, esp. red meats
- Increased fat intake
- Low intakes of vegetables, high fiber grains, carotenoids
- Low intakes of vitamins D, E, folate
- Low intakes of calcium, zinc, selenium
- Some food preparation methods (chargrilling)
Colon Cancer/Polyps: possible dietary protective factors

- Omega-3 fatty acids – fish oils, flaxseed, etc
- Wheat bran
- Legumes
- Some phytochemicals (plants)
- Butyric acid – dairy fats, bacterial fermentation of fiber in colon
- Calcium
Short-bowel syndrome (SBS)

- Consequence of significant resections of small intestine
  - Jejunal resections
  - Ileal resections
- 40 – 50% small bowel resected
- Crohn’s, radiation enteritis, mesenteric infarct, malignant disease, volvulus
- Peds: congenital anomalies, volvulus, necrotizing enterocolitis
SBS Complications

- Malabsorption of micronutrients, macronutrients
- Fluid, electrolyte imbalances
- Wt loss
- Growth failure in children
- Gastric hypersecretion
- Kidney stones, gallstones
SBS: Predictors of Malabsorption, Complications, Need for PN

- Length of remaining small intestine
- Loss of ileum, especially distal one third
- Loss of ileocecal valve
- Loss of colon
- Disease in remaining segments(s) of gastrointestinal tract
- Radiation enteritis
- Coexisting malnutrition
- Older age surgery
Short bowel syndrome
The short bowel syndrome resulting in dehydration and malabsorption occurs as a result of massive intestinal resection, especially of the ileum with or without the colon. Resection of up to 100 cm of ileum causes diarrhea, because there are progressively greater degrees of bile salt malabsorption. Malabsorbed bile salts enter the colon where they cause water secretion by activating cyclic adenosine monophosphate. When the resection exceeds 100 cm, there is progressively more fatty acid loss in the colon, which also adds to water secretion and diarrhea. There is also malabsorption of vitamin B₁₂. In addition, there is loss of energy in the form of increased fat loss. However, as the length of the resection increases, there is malabsorption of all macronutrients, namely, fat, carbohydrate, and protein. The malabsorbed carbohydrate entering the colon is fermented to produce flatulence and diarrhea. In addition, there is malabsorption of vitamins and trace elements such as zinc.

Fig. 1: The relative locations of digestion and absorption of nutrients in the healthy gastrointestinal tract. CHO = carbohydrate.
Jejunal Resection

- Most digestion, absorption in first 100 cm of small intestine
- After period of adaptation, ileum can perform functions of jejunum
- With loss of jejunum, less digestive, absorptive surface
Ileal Resections

- May produce major nutritional, medical problems with 100 cm+ resections

- Distal ileum:
  - Site for absorption of vit B\(_{12}\)/intrinsic factor complex, bile salts, fluid
  - Impaired bile salt absorption results in malabsorption of fats, fat-sol vits, minerals ("soaps")
  - Increased absorption of oxalates = renal stones
Small Bowel Surgery – Nutritional Care

- Initially may require TPN
- 2 general principles for resuming enteral nutrition:
  - Start enteral feedings early
  - Increase feeding concentration, volume gradually
Ileal Resection

- In immediate post-op period, replace fluid losses and sodium, magnesium, potassium via IV and make pt NPO to control diarrhea
- Use medications to control gastric hypersecretion
- Slow GI transit with opioids and anticholinergics such as Lomotil

Jeejeebhoy KN. CMAJ 166;10:1297, 2002
Ileal Resection

- Transition to oral feedings using carbohydrate-electrolyte feeds (oral rehydration fluids) containing glucose, sodium chloride, sodium citrate
- Replace specific mineral and vitamin deficiencies such as zinc, potassium, magnesium, vitamins A, B12, D, E, K

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Small Bowel Surgery – Nutritional Care

- Small frequent mini-meals (6 – 10)
- Transition to more normal foods, meals may take weeks to months
- Some pts never tolerate normal concentrations or volumes of food
- Maximal adaptation of GI tract may take up to 1 yr after surgery
Ileostomy or Colostomy

- Surgical creation of an opening from the body surface to the intestinal tract = “stoma”
- Permits defecation from intact portion of intestine
- “ileostomy” = removal of entire colon, rectum, anus with stoma into ileum
- “colostomy” = removal of rectum, anus with stoma into colon
Ileostomy or Colostomy

- Sometimes temporary

- Output from stoma depends on location
  - Ileostomy output will be liquid
  - Colostomy output more solid, more odorous
Colostomy Illustration
Types of ileostomies

- Brooke Ileostomy
- Continent Ileostomy
Ileoanal Pouch
Ileostomy or Colostomy – Nutritional Care

- Increase water, salt with ileostomies
- Pt w/ normal, well-functioning ileostomy usually does not become nutritionally depleted – no higher energy intake needed
- W/ resection of terminal ileum need $B_{12}$ supplement
Ileostomy or Colostomy – Nutritional Care

Avoid practices that may contribute to swallowed air and gas formation such as the following:

- Chewing gum
- Use of drinking straws
- Carbonated beverages
- Smoking
- Chewing tobacco
- Eating quickly
Add foods that may decrease odor, such as the following:

- Buttermilk
- Parsley
- Yogurt
- Kefir
- Cranberry juice
Ileostomy or Colostomy – Nutritional Care

- May restrict fruits & vegetables so may need vitamin C
- May need to avoid very fibrous vegetables, chew well
- Individual tolerances: address issues such as odor or gas individually
- For high output ileostomy may need to follow dumping recommendations; use soluble fiber (oatmeal, applesauce, banana, rice); monitor fat soluble vitamins
Client Education Materials - Survival Skills

US versions

Ileostomy after Gastrointestinal Surgery Nutrition Therapy - Survival Skills

Ileostomy after Gastrointestinal Surgery Nutrition Therapy - Survival Skills - LARGE print

Metric versions

Ileostomy after Gastrointestinal Surgery Nutrition Therapy - Survival Skills

Ileostomy after Gastrointestinal Surgery Nutrition Therapy - Survival Skills - LARGE print
Rectal Surgery

- Low residue to allow wound repair, prevent infection
- Chemically defined diets may be used to reduce stool volume and frequency
Lower GI Disorders Summary

- Food intolerances should be dealt with individually
- Patients should be encouraged to follow the least restrictive diet possible
- Patients should be re-evaluated frequently and the diet advanced as appropriate