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Exploring the GI System or "Gut to the Butt"

2023

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President, Diabetes Education Services

Diabetes Education SERVICES

Happy Diabetes Month

November Celebration Sales

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Miracle of Insulin

Patient J.L., December 15, 1922

February 15, 1923

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Beverly Thomassian, RN, MPH, CDCES, BC-ADM
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Bryanna is here to Help!

Bryanna Sabourin
Director of Operations
Certification Pathway Coach &
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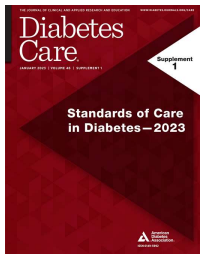
If you have questions, you can chat with Bryanna at www.DiabetesEd.net or call 530 / 893-8635 or email at info@diabetesed.net

Land Acknowledgment

- We acknowledge and are mindful that Diabetes Education Services stands on lands that were originally occupied by the first people of this area, the Mechoopda, and we recognize their distinctive spiritual relationship with this land, the flora, the fauna, and the waters that run through this area.

Coach Bev has no conflicts of interest

- Not on any speaker's bureau
- Does not invest in pharmaceutical or device companies
- Gathers information from reading package inserts, research and standards



Content from ADA Standards
www.Diabetes.org

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2023* FREE

Books

Learning Objectives Exploring the GI Tract

- Explain the links between diabetes and oral disease.
- Explore the co-relationship between hyperglycemia and the gastrointestinal system.
- Describe the pancreatic exocrine dysfunction in diabetes.
- List new nomenclature and screening guidelines for liver disease.
- Discuss the endocrine function of the intestine and the importance of a healthy microbiome.
- Enjoy a state of WONDER.

Type 2 Diabetes in America 2023

- 11.3% with Diabetes - 37 million adults
  - 23% don't know they have it
- 38% with Prediabetes – 96 million adults

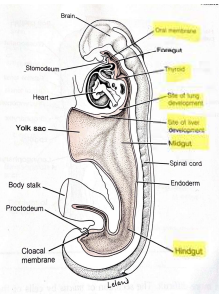
Figure 3. Age-adjusted, county-level prevalence of diagnosed diabetes among adults aged 20 years or older, United States, 2004, 2012, and 2019

Data sources: US Diabetes Surveillance System; Behavioral Risk Factor Surveillance System.

Centers for Disease Control and Prevention. National Diabetes Stats Report https://www.cdc.gov/diabetes/data/statistics-report/index.html. Accessed 1/23

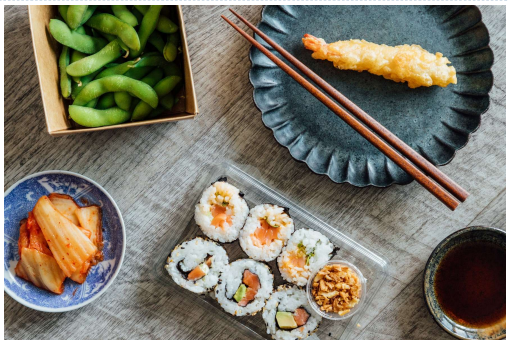
Gut Tube -Embryonic Starting Point

- Embryonic endoderm develops into the interior linings of two tubes in the body, respiratory *and*
- **Digestive Tube**
  - Salivary glands
  - Esophagus
  - Stomach
  - Small and Large Intestine
  - Liver
  - Gallbladder
  - Pancreas
- Thyroid gland
- Parathyroid glands
  - Lose connection with gut before birth to become endocrine organs



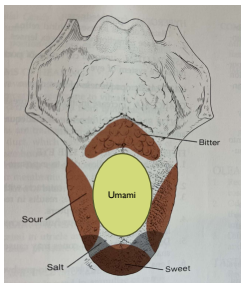
Basic Human Anatomy, A. Pense, 1982

Eating Starts with the Eyes



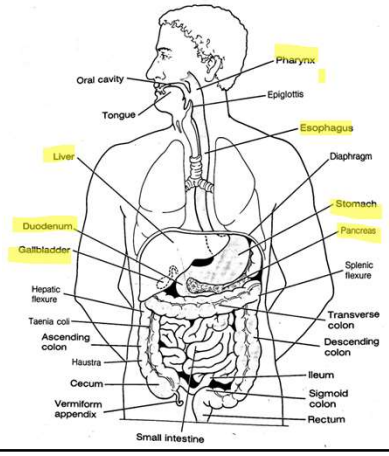
5 or 6 types of Flavor Detection

- Sweet
- Sour
- Bitter
- Salty
- Umami (savory)
- Tongue might also detect ammonium chloride (USC recent discovery) to avoid harmful substances?



Digestion Gets Started

- Eyes see food and make an appraisal of how to best prepare for incoming load.
- Glands secrete saliva to prepare for chewing.
- Salivary enzymes (amylase) help with initial digestion
- Creates bolus.
- Upper pharynx and esophagus under conscious control, the rest involuntary.
- Esophagus smooth muscle, controlled by brain.
- Lower esophageal sphincter gateway from esophagus to stomach.
  - Prevents reflux of gastric contents



Alimentary Canal

Buckle up!

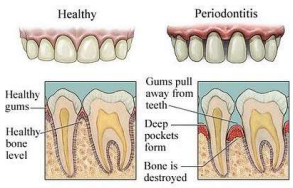
Quick Question

- Diabetes is associated with an increased risk of oral disease. Which of the following statements is true?

a. People with diabetes benefit from vinegar gargles to decrease bacterial load
b. People with diabetes are at greater risk for tongue cancer.
c. 1 in 5 cases of tooth loss is linked to diabetes
d. Diabetes is associated with increased tonsillitis.

Periodontal Disease

- More severe and prevalent with diabetes and elevated A1c levels.
  - periodontal treatment associated with better glycemic control
    (A1C 8.3% vs. 7.8%)
  - Benefits lasted for 12 mo's
- People with periodontal disease have higher rates of diabetes.
- Bidirectional

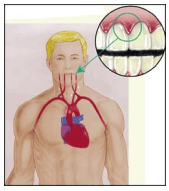


Oral Care Matters
- See dentist at least yearly
- Dental hygienist twice yearly
- Brush twice daily
- Floss daily

Salivary Dysfunction and Xerostomia (dry mouth) in DM

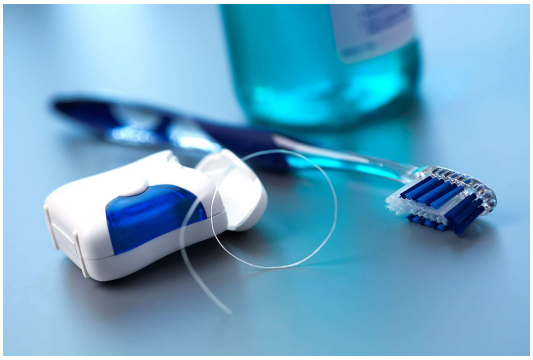
- Less saliva uptake and excretion = less protection against bacteria
- Hyperglycemia increases glucose levels in saliva, providing medium for bacterial growth- also promotes dry mouth
- Dry mouth increases risk o infection and can alter nutritional intake (due to chewing, swallowing difficulties)

Periodontal disease and Heart Disease

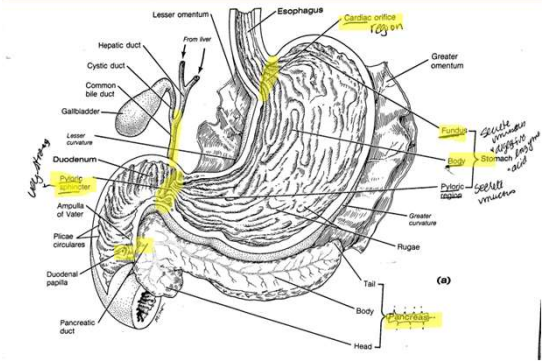


- Heart disease link:
  - oral bacteria enter the blood stream, attach to fatty plaques in coronary arteries increasing clot formation
  - inflammation increases plaque build up, which may contribute to arterial inflammation
- Hyperglycemia = Gingivitis = Heart Disease

Best $10 You Will Ever Spend



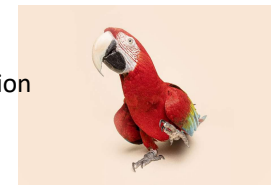
Stomach



Bonus Question

Best definition for borborygmi is:

- A tropical fruit used for nausea
- Stomach rumbling
- Gastric reflux
- Treatment for constipation



What Happens in Stomach?

- Food in fundus – serves as a holding and mixing area
- Gastric juice start breaking down larger particles.
- Bolus moved to lower regions and broken into smaller particles through stomach acid and motility.
- Gurgling and stomach rumbling is audible reflection of movement.
- Usual meal takes about 4 hours to pass through or 1-4 kcals per minute.
- Carbs take a few hours to pass through.
- Protein/fatty meals can take up to 6 hours.

Digestion Time based on Calories

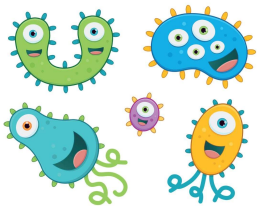
400 cals

- 4 cals a minute
- 100 minutes or
- 1 hour 40 minutes to digest

1000 cals

- 4 cals a minute
- 250 minutes or
- 4 hours and 10 minutes

Stomach Issues



- H. Pylori infection
- Gastroparesis
  - G-POEM
  - Gastric Pacer
- Vomiting syndrome
- Metabolic surgery

H. Pylori Quick Question

JR is 50, has type 2 diabetes. Referred to G.I. due to six months of stomach pain, intestinal, bloating, and generalized G.I. discomfort. Since they were due for their colonoscopy, provider also ordered an upper endoscopy to biopsy the esophagus, stomach and duodenum.

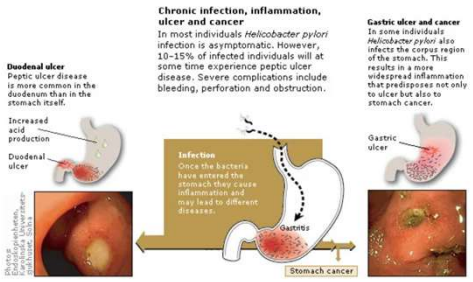
The biopsy revealed that JR had moderate chronic gastritis and an H. pylori infection. JR wants to learn more about H. pylori infection.

- **Which of the following statements are accurate?**

1. Since H. pylori is found in about half the population, it is a normal finding, and there is no need for treatment.
2. Treatment includes double antibiotic therapy and a medication to decrease gastric acidity.
3. The preferred treatment is the consumption of prebiotics and probiotics to increase bacterial diversity.
4. Most people with H. pylori infection experience stomach cancer within the next 20 years.

Nobel Prize for Link Between H. Pylori and Gastric Ulcers (Took 20 Years)

The Nobel Prize in Physiology or Medicine 2005 | The Nobel Prize In Physiology Or Medicine



H. Pylori Infection Symptoms

- 50% of world's population co-exist with H. Pylori
  - Causes inflammation in a small percentage of people
- Main Symptom - An aching or burning pain in abdomen which may be worse with an empty stomach.
- H. pylori infection symptoms include:
  - Feeling of fullness or bloating with fluid and solid food
  - Hunger and empty feeling in the stomach, often 1 to 3 hours after meal
  - Mild nausea that may go away with vomiting
  - Loss of appetite
  - Weight loss without trying
  - Burping
  - Bloody or dark, tarry stools or bloody vomit
- About 10% to 15% of people infected with *H pylori* develop peptic ulcer disease.
- About 1-3% develop stomach cancer

People with diabetes at risk for H. pylori and vice versa.

H. Pylori Good or Bad?

Drawbacks

- Infection caused by this curved rod bacteria with flagella that burrows through your stomach mucus to infect the mucus & cells of your stomach lining.
- Uses stomach mucous lining for fuel.
- Locally neutralizes stomach acid so that it is not digested (produces a urease that makes ammonia).

Benefits

- 50% of the world's population is infected with H. pylori
  - it is a human-associated disease, we co-evolved with it in OUR stomachs!
  - Different strains in different human groups
- Instructs immune system not to overreact
- People with H. pylori seem to have less asthma and autoimmune conditions, like celiac and less risk of TB
- More research is needed

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6064966/

H. Pylori Infection – Test & Treat

Testing Options

- **Breath test** -- urea breath test (Carbon Isotope-urea Breath Test, or UBT).
- Swallow liquid with urea. If *H pylori* are present, the bacteria turn the urea into carbon dioxide. This is detected and recorded in your exhaled breath after 10 minutes.
- **Blood test** -- measures antibodies to *H pylori* in your blood.
- **Stool test** -- detects the presence of bacteria in the stool.
- **Biopsy** -- tests a tissue sample taken from the stomach lining using endoscopy. The sample is checked for bacterial infection.

Treatment

Combination of antibiotics and proton pump inhibitor for 14 days.

- **Antibiotics:** Usually two of these antibiotics choices: amoxicillin, clarithromycin (Biaxin®), metronidazole (Flagyl®) and tetracycline.
- **Proton pump inhibitor:** include lansoprazole (Prevacid®), omeprazole (Prilosec®), pantoprazole (Protonix®), rabeprazole (Aciphex®) or esomeprazole (Nexium®).
- **Bismuth subsalicylate:** Sometimes added to proton pump inhibitor to protect stomach lining.
- Newer medication, Talicia®, combines two antibiotics (rifabutin and amoxicillin) with a proton pump inhibitor (omeprazole) into a single capsule.

Quick Question: Bloating & Post Meal Hypo

- JR has lived with type 1 diabetes for over 30 years and has been complaining that they feel full and bloated after eating and experiencing more post-meal hypoglycemia.
- **Based on this information, what is the most appropriate recommendation for JR?**

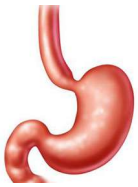
a. Evaluate transglutaminase levels.
b. Encourage small, frequent, low fiber meals.
c. Suggest a consult for a gastric pacemaker.
d. Recommend they try avoiding foods with gluten for a few weeks to see if they feel better.

Gastroparesis

- Gastroparesis: affects 20 – 30% of individuals with longstanding diabetes
- Delayed emptying of stomach contents due to nerve damage
- S/S include early satiety, fullness, postprandial hypo, vomiting
- Diagnosis: gastric emptying studies, post-prandial hypoglycemia
- Tx: improve BG, small, low fat & fiber meals & meds

Nutrition for Gastroparesis

- Dietary changes are a high priority in treatment
- Consider the following dietary modifications:
  - Decrease fiber (may lead to bezoar formation)
  - Evaluate fat intake
    - Fat is a good/high source of calories so limit only after other measures are exhausted
    - Liquid fats may be tolerated better



Nutrition for Gastroparesis

- Consider dietary modifications:
  - Multi supplement if intake is insufficient
  - Small and frequent meals
  - Liquid/pureed calories
    - May need to try liquid calories later in the day
  - Chew foods well
  - Sit up for 1-2 hours after eating

Gastric Electrical Stimulator

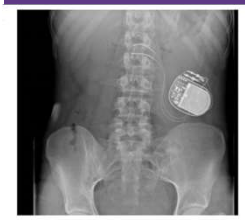


FIGURE 1. Radio of gastric electrical stimulator after implantation.

https://www.frontiersin.org/articles/10.3389/fnins.2022.909149/full

Bielefeldt (2017) analyzed the adverse events recorded in the manufacturer registry from 2001 to 2015. Perioperative complications are quite rare, with mainly hematoma after surgery. The complications related to the device mostly occur during the first 2 years after surgery. The most commonly reported adverse event is abdominal pain after implantation. Pain can either be reported as pain at the pocket or as an electrical shock sensation, with rarely muscle contractions. This sensation could be due to the leads, with also a role of visceral hypersensitivity. In the study of Ducrotte et al. (2020), pain was reported in 16% of patients and was always medically managed. Serious adverse events are rare. Site infection must be suspected in case of fever after surgery (6–10%), and it rarely leads to device explantation (1.5%; Abell et al., 2003b; Ducrotte et al., 2020). Intestinal occlusion has been reported and might be due to the position of the lead and the device. Thus, it is important to minimize the intraabdominal length of the leads during surgery, positioning the device in the left upper quadrant if possible (Zoll et al., 2019). Rare perforation of the leads has been reported and also requires explantation, but is very uncommon. GES safety during pregnancy has never been assessed. One case report in a female with type 1 diabetes reported a favorable outcome (Fuglsang and Ovesen, 2015).

Gastric peroral endoscopic myotomy or G-POEM

- The gateway from the small intestine to the duodenum is the pylorus.
- Food knocks of the pyloric sphincter for admission to duodenum
- Doors usually easily open, with limited resistance.
- With gastroparesis, pyloric sphincter is stiff and closed shut.

- This endoscopic G-POEM procedure cuts the muscles near the pyloric sphincter (a myotomy).
- Helps to permanently relax the sphincter, so food can empty freely.

https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/peroral-endoscopic-myotomy

Cannabinoid Hyperemesis Syndrome (CHS)

CHS is defined as recurrent nausea, vomiting and cramping abdominal pain that is associated with at least weekly cannabis use.

- A common treatment for this syndrome is hot bath or shower.
- Heavier marijuana use increases risk for Cyclic Vomiting Syndrome (CVS) with unrelenting nausea and vomiting.
- Treatment includes abstaining from cannabis for at least a few weeks.
- People with type 1 diabetes and gastroparesis are especially at risk for both CHS and CVS.
- A person with type 1 and gastroparesis at more risk for other neuropathies and the associated chronic, often debilitating pain.

https://diabetesjournals.org/care/article/45/2/481/139018/Differentiating-Diabetic-Ketoacidosis-and

Treatment options for elevated BMI - ADA

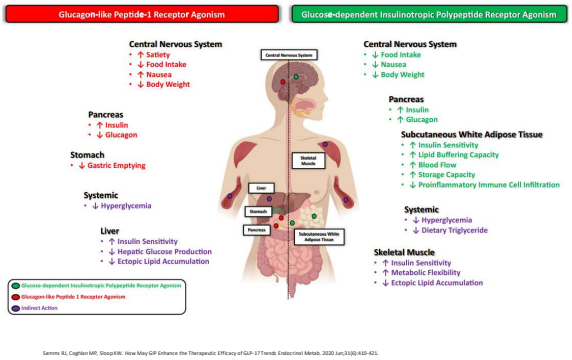
Treatment options for overweight and obesity in type 2 diabetes

Treatment	BMI category (kg/m²) 25.0–26.9 (or 23.0–24.9*)	27.0–29.9 (or 25.0–27.4*)	≥30.0 (or ≥27.5*)
Diet, physical activity, and behavioral therapy	+	+	+
Pharmacotherapy		+	+
Metabolic surgery			+

Consider using diabetes medications that contribute to weight loss, including GLP-1 RAs and SGLT-2 inhibitors.

BMI in parenthesis represent ranges for Asian Americans

GLP-1 & GIP Hormones



Samms RJ, Coghlan MP, Sloop KW. How May GIP Enhance the Therapeutic Efficacy of GLP-1? Trends Endocrinol Metab. 2020 Jun;31(6):410-421.

GLP-1 & GIP Receptor Agonists

Class/Main Action	Name	Dose Range	Considerations
GLP-1 RA - Glucagon Like Peptide Receptor Agonist **"Incretin Mimetic"** • Increases insulin release with food • Slows gastric emptying • Promotes satiety • Suppresses glucagon	exenatide (Byetta)	5 and 10 mcg BID	**Side effects:** nausea, vomiting, weight loss, injection site reaction. Report signs of acute pancreatitis or intestinal blockage (ileus) and stop med. Increase dose monthly to achieve targets. **Black box warning:** Thyroid C-cell tumor warning (avoid if family history of medullary thyroid tumor). *Significantly reduces risk of CV death, heart attack, and stroke. †Approved for pediatrics 10-17 yrs Lowers A1C 0.5 – 1.6% Weight loss: 4-6% body weight loss.
	exenatide XR† (Bydureon)	2 mg 1x a week Pen injector - Bydureon BCise	
	liraglutide (Victoza)*†	0.6, 1.2 and 1.8 mg daily	
	dulaglutide* (Trulicity)†	0.75, 1.5, 3.0 and 4.5 mg 1x a week pen injector	
	semaglutide* (Ozempic)	0.25, 0.5, 1.0 and 2.0 mg 1x a week pen injector	
	(Rybelsus) Oral tablet	3, 7, and 14 mg daily in a.m. Take on empty stomach with sip of water	
GLP-1 & GIP Receptor Agonist Activates receptors for GLP-1 (see above) & Glucose-dependent Insulinotropic Polypeptide (GIP).	Tirzepatide (Mounjaro)	2.5, 5.0, 7.5, 10, 12.5 and 15 mg 1x a week prefilled single dose pen Increase dose by 2.5 mg once monthly to reach targets.	**Side effects:** nausea, diarrhea, injection site reaction. Report pancreatitis, signs of intestinal blockage. **Black box warning:** Avoid if family history of medullary thyroid tumor. Lowers A1C ~ 1.8 - 2.4% Weight loss: 7-13% body weight loss at max dose.

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Gut Hormones

- Gut hormones secreted by the L-cell of the intestine. Some in the small intestine, but more the larger intestine.
- People with type 2 make about 50% less of gut hormones, but new study shows that people with type 1 may benefit from GLP-1 therapy early in diagnosis.
- Can slow peristalsis down too much, and lead to an intestinal blockage – Ozempic warning.

GLP-1 RA's as Adjunctive Therapy for Newly Diagnosed Type 1

- NEJM study looked at the effects of semaglutide on new-onset type 1 diabetes.
- Study evaluated blood glucose of 10 adults, ages 21-39, who had started taking semaglutide within three months of diagnosis.
- At diagnosis, all the participants were taking basal and mealtime insulin.
- Participants started with 0.125 mg semaglutide per week, with a maximum of 0.5 mg semaglutide per week, while mealtime insulin dose was lowered.
- Basal insulin dose was reduced based on CGM readings.

https://www.nejm.org/doi/full/10.1056/NEJMc2302677

GLP-1 RA's as Adjunctive Therapy for Newly Diagnosed Type 1

What were the key findings?

- Within 3 months, participants no longer needed mealtime insulin.
- At six months, 7 out of 10 no longer needed basal insulin.
- Most of the people in the study were able to stop taking any insulin after six months of treatment with semaglutide.
- A1C levels fell from an average of 11.7% at diagnosis to 5.9% at six months and 5.7% at one year,
- Participants also achieved time in range (70-180) of 89%.
- **Side effects:**
  - Some participants experienced mild hypo while the semaglutide dose was increased. Once the semaglutide dose stabilized, there were no problems with hypoglycemia.
  - There were no reports of diabetic ketoacidosis or other serious side effects.

GLPs & Intestinal Blockage

- More than a dozen reports of intestinal blockage or ileus among people using semaglutide (Ozempic).
- New warning to report any signs of intestinal blockage including:
  - Bloating, abdominal cramps, constipation, nausea, vomiting, and constipation that doesn't subside within a few days.
- Encourage individuals to report these signs and consult with a healthcare provider.

Metabolic Surgery for Weight Loss

- *Considered* as an option to treat T2DM for screened surgical candidates with:
  - BMI 30 – 34.9 kg/m^2 for those who don't achieve wt. loss w/ nonsurgical methods
- *Recommended* as an option to treat T2DM for screened surgical candidates with:
  - BMI ≥ 40 kg/m^2
  - BMI 35 - 39.9 kg/m^2 for those who don't achieve wt. loss w/ nonsurgical methods

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC634
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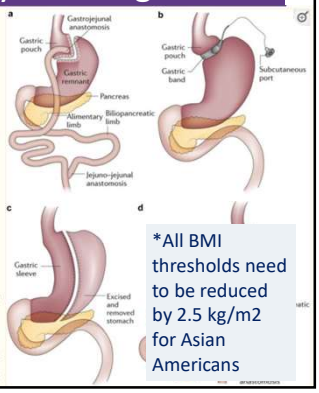


*All BMI thresholds need to be reduced by 2.5 kg/m2 for Asian Americans

Metabolic Surgery for Weight Loss

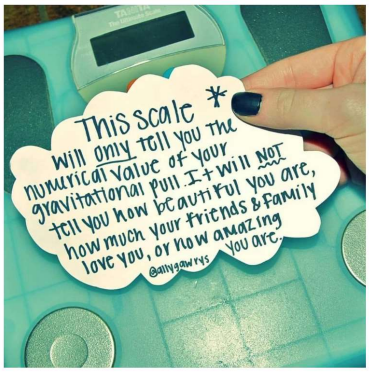
Advantages in T2DM

- Diabetes remission in 30-63% of those with RYGB.
  - 35-50% of those who go into remission experience recurrence, but median disease-free period is 8.3 years.
- Many with diabetes will sustain glycemic improvement for 5-15 years.
- Additional health benefits

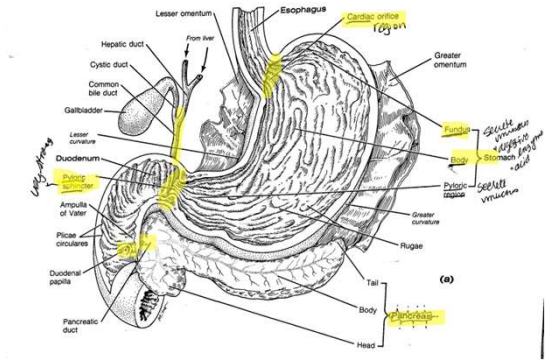
Disadvantages

- Costly (but likely cost effective)
- Long-term concerns: dumping syndrome, anemia, osteoporosis, severe hypoglycemia, nutrient deficiency.
- Increased risk of substance use, new-onset depression/anxiety

Weight is a Heavy Issue

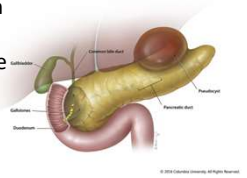


Duodenum, gallbladder, pancreas



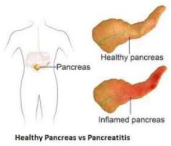
Pancreatitis

- Pancreatitis caused by digestion of the organ from pancreatic enzymes normally carried to the SI through pancreatic duct.
- Detected through elevated Amylase levels & pain
- Causes:
  - HIV meds and other meds
  - Alcohol ingestion
  - Gallstones blocking pancreatic enzyme flow to SI
  - Elevated triglycerides
  - Cancer, injury and other



Pancreatitis

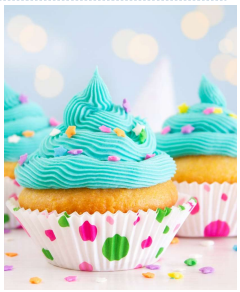
- People with diabetes 2xs risk of acute pancreatitis
- After episode of pancreatitis, one third of people will get prediabetes or diabetes
- Pancreatitis is an exocrine dysfunction:
  - Disrupts global architecture or physiology of pancreas
  - Results in both exocrine and endocrine dysfunction



Healthy Pancreas vs Pancreatitis

Exocrine Pancreatic Insufficiency

- Fatty stools
- Abdominal pain especially after high fat meals
- Can happen with both type 1 & 2 diabetes
- May need to take fat soluble vitamins
- Avoid smoking, excess alcohol to protect pancreas.
- Cystic fibrosis



The American Cancer Society's estimates for pancreatic cancer in U.S. for 2023 are:
• About 64,050 people will be diagnosed with pancreatic cancer.
• About 50,550 people will die of pancreatic cancer.
• Pancreatic cancer accounts for about 3% of all cancers in the US and about 7% of all cancer deaths.

https://pancan.org/

Type 1 and Cancer – Risk compared to general population

Increased Risk

- Stomach
- Liver
- Kidney
- Pancreatic
- Endometrial

Decreased Risk

- Breast
- Prostate

Due to hormone levels
More frequent doctor visits?

Diabetologia, published online Feb. 29, 2016

Type 2 Diabetes and Cancer

- People with prediabetes and type 2 Two fold higher risk for cancers of
  - Liver
  - Pancreas
  - Endometrium
- 1.2 to 1.5 fold risk of cancers of
  - Colon
  - Breast
  - Bladder.
- Lower risk of prostate cancer

Diabetes and Cancer: A Consensus Report Cancer J Clinic 2010
Joint statement American Cancer Society and American Diabetes Assoc

Colorectal Cancer Screening Recommendations – Am Cancer Soc

- All people at age 45 need screening for colon cancer
- Blacks and higher risk individuals need earlier screening
- Prostate cancer screening discussion at age 45 for Blacks
- Chadwick Bozeman died at age 43 after a 4 year battle with colon cancer

Cancer Screenings and a Commitment to Health Saves Lives

Non-Alcoholic Fatty Liver Disease

NAFLD is when fat reaches 5% to 10% of the liver's weight

Without consumption of significant amounts of alcohol defined as:

- Ingestion of less than 21 standard drinks per week in men and
- Less than 14 standard drinks per week in women

over a 2-year period preceding evaluation) or the presence of other secondary causes of fatty liver disease.

Non-Alcoholic Fatty Liver Disease (NAFLD)

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2023*

Fatty Liver Disease & Steatohepatitis

Adults with type 2 diabetes.

- NAFLD is prevalent in >70%
  - Of those 50% have NASH*
- 12-20% have fibrosis
- Need evaluation for nonalcoholic steatohepatitis and liver fibrosis for those:
  - At high risk: type 2 or prediabetes with cardiometabolic risk factors plus
  - Elevated liver enzymes (ALT) or
  - Fatty liver on imaging or ultrasound

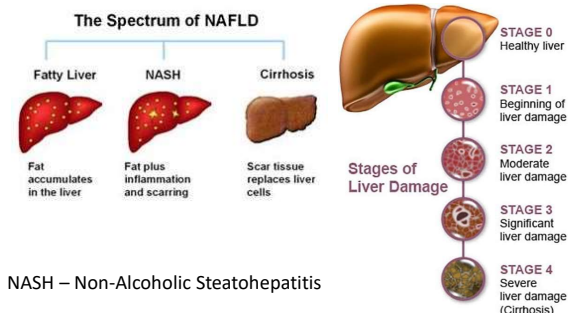
Associated with :

- Increased BMI (30+)
- Cardiometabolic risk factors
- Over 50 yrs
- ALT & AST 30 units/L +

*Non-Alcoholic Steatohepatitis (NASH)

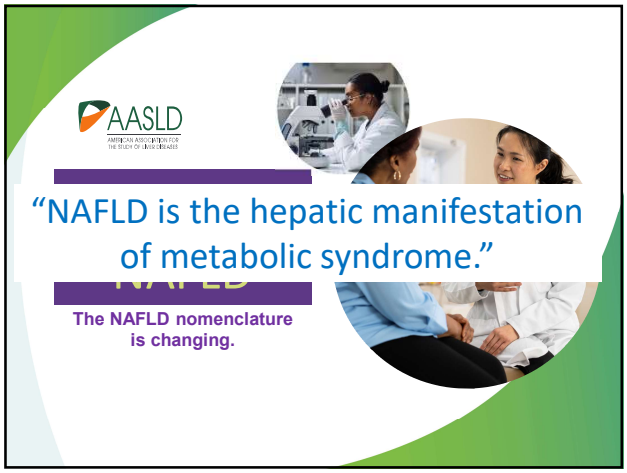
4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2023*

Natural History of NAFLD to NASH



NASH – Non-Alcoholic Steatohepatitis

https://liverfoundation.org/wp-content/uploads/2020/11/StagesFibrosis.jpg



Liver Nomenclature Update

AASLD

Old Terms	New Terms
Fatty Liver Disease	Steatotic Liver Disease
Non-Alcoholic Steatohepatitis (NASH)	Metabolic Dysfunction-Associated Steatohepatitis (MASH)
Non-Alcoholic Fatty Liver Disease (NAFLD)	Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD)

Diabetes Education Services

Updated Liver Nomenclature List

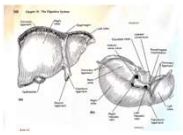
1. Say goodbye to "Fatty Liver Disease". The new overarching term to encompass the various presentations of liver steatosis is **Steatotic Liver Disease (SLD)**
2. Instead of "Fatty Liver" use the term **Hepatic Steatosis.** This is a more technical and less stigmatizing term that simply means that the liver has excessive fat.
3. The term NASH is now **MASH** – MASH stands for Metabolic Dysfunction-Associated Steatohepatitis. This name emphasizes that the condition is a metabolic condition not related to alcohol consumption.
4. No more NAFLD. The updated term is **MASLD** (pronunciation: Ma-zuld), which stands for Metabolic Dysfunction-Associated Steatotic Liver Disease. This term recognizes the various risk factors beyond alcohol consumption, such as body weight, insulin resistance, and other cardiometabolic risk factors.
5. Someone can have MASLD and it can be due to metabolic factors (MASLD) or it can be considered **MetALD** (pronunciation: Met A-L-D) predominant if they meet the alcohol intake threshold.
6. The alcohol intake threshold for Alcohol-related Liver Disease **ALD** starts with a weekly intake of 140 g (10 drinks) for females and 210 g (15 drinks) for males.
7. There are other factors that can cause Steatotic Liver Disease (SLD), including drug-induced, genetic conditions and other unknown reasons.

See summary chart from AADSL that reflects these changes

Quick Question: Detecting Fatty Liver Disease

EV is 58 years old with type 2 diabetes and a BMI of 33. In addition, EV has hypertension and hyperlipidemia, with elevated liver enzymes (ALT and AST). To determine if EV is at risk for liver fibrosis and cirrhosis, which of the following would provide a risk calculation?

A. UACR
B. FIB-4
C. GAD or ICA
D. Weight in (kg) divided by the square of height in meters (m2)



Screening for NASH – FIB-4

Fibrosis-4 (FIB-4) Calculator

The Fibrosis-4 score helps to estimate the amount of scarring in the liver. Enter the required va
It will appear in the oval on the far right (highlighted in yellow).

$$\text{FIB-4} = \frac{\text{Age (years)}\ 58 \times \text{AST Level (U/L)}\ 90}{\text{Platelet Count (}10^9\text{/L)}\ 217 \times \sqrt{\text{ALT (U/L)}\ 85}} = 2.61$$

- The American College of Gastroenterology considers Upper limit of normal ALT levels:
- 29–33 units/L for males
- 19–25 units/L for female individuals

(mdcalc.com/calc/2200/fibrosis-4-fib-4-index-liver-fibrosis).

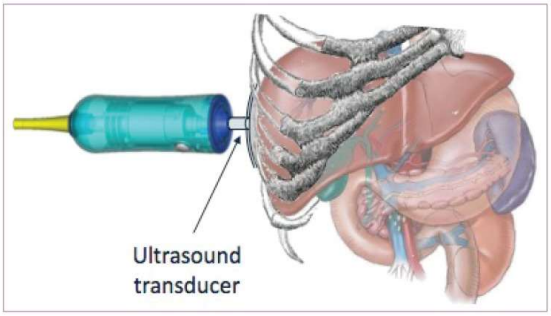
FIB-4 estimates risk of hepatic cirrhosis (age 35+):

- Calculated by imputing:
  - Age
  - plasma aminotransferases (AST and ALT)
  - and platelet count
- FIB-4 Risk Levels
  - Lower risk is <1.3
  - Intermediate 1.3 to 2.67
  - High risk >2.67
    - considered as having a high probability of advanced fibrosis (F3–F4).

4. Comprehensive Medical Evaluation and Assessment of Comorbidities: *Standards of Care in Diabetes—2023*

www.DiabetesEd.net

Liver Elastography or FibroScan



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3594956/

FibroScan or Elastography

FibroScan Results

- CAP & kPa
- CAP Fat Score S0 - S3
- kPa Fibrous Score F0 – F4

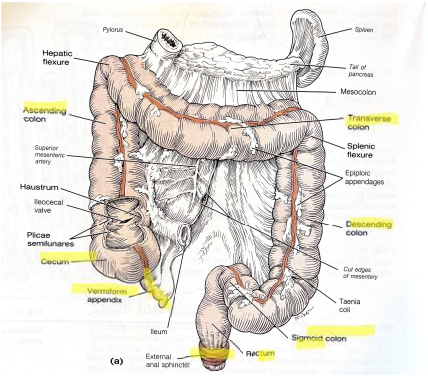
CAP Score	Steatosis grade	Portion of your liver affected by fatty change
238 to 260 dB/m	S1	Less than ⅓ (11% to 33%)
260 to 290 dB/m	S2	Between ⅓ and ⅔ (34% to 66%)
290 to 400 dB/m	S3	More than ⅔ (67%)

Non-alcoholic Fatty Liver Disease (NAFLD or NASH)	2 to 7 kPa	F0 to F1	Is normal.
	7.5 to 10 kPa	F2	Has moderate scarring.
	10 to 14 kPa	F3	Has severe scarring.
	14 kPa or higher	F4	Has cirrhosis.

Actions To Decrease Fatty Liver

- Increase activity
  - Strength training
  - Yoga or Thai Chi
  - Walking & aerobics
- Thoughtful eating
  - More fiber
  - Less processed foods & less added sugar
  - Avoid alcohol
- Treatment
  - Actos
  - GLP-1
  - Statin
- Prevention
  - Cancer Screenings
  - Decrease inflammation

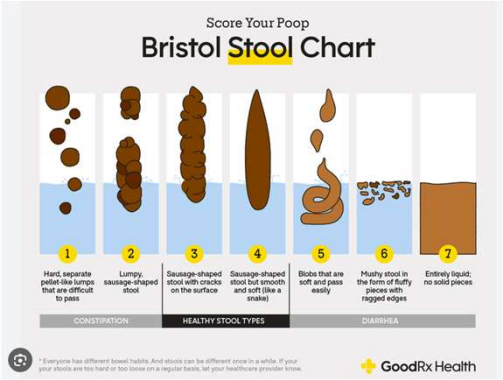
Almost There – Ileum to Anus



Ileum to Anus

- Ileum last 2 meters of intestine. To move from the ileum to the cecum (first part of large intestine), food passes through the ileocecal valve.
- The appendix hangs out near this juncture. It traps harmful bacteria and contains lymphoid cells similar to tonsils. If appendix gets blocked with bacteria and white blood cells, can lead to appendicitis
- Large intestine – The bacterial party center of your GI Tract
  - Ascending
  - Transverse
  - Descending
  - Sigmoid colon makes and Sideway S as it enters the iliac fossa
  - Then the rectum
  - Anus – 2 sphincters internal and external
  - External sphincter anal skeletal muscle under voluntary control and internal anal muscle not

Look at your Poop – Stool Chart



Bowel Issues - Diarrhea

Defined and Treatment

- 3 or more bowel movements a day
- **Treat & Determine Cause**
  - Improve glucose levels
  - Eat whole foods — including whole grains and fiber.
  - Drink plenty of water.
  - Get regular exercise.
  - Quit smoking and using tobacco products.
  - Limit alcohol.
  - Take medications as necessary.

- **Possible Causes**
  - Elevated glucose
  - Autonomic neuropathy
  - Metformin
  - GLP-1 RA's
  - Celiac disease
  - Bacterial /yeast infection
  - Exocrine pancreatic insufficiency
  - Irritable bowel syndrome
  - Sugar free foods
  - Other

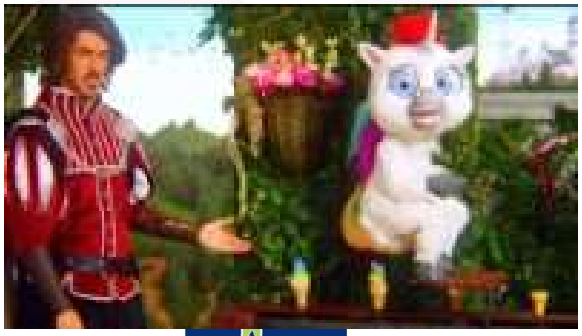
Bowel Issues

Constipation

- Defined as less than 3 bowel movements a week.
- More common in diabetes
- GLP-1 RA can contribute
- Treatment
  - Get glucose to target
  - Increase fiber, activity, H2O
  - Bulking agents (psyllium)
  - Laxatives or other agents
  - Bathroom habits review

Japanese Style Toilets – Past to Present

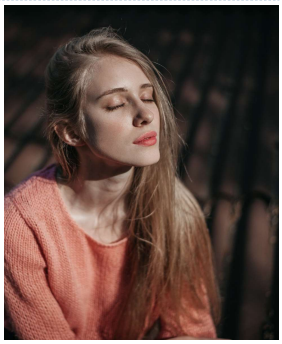
Pooping Position Matters



www.squattypotty.com

Promoting Colon Health

- Nourish gut bacteria
- Get enough sleep
- Keep active
- Drinking enough fluids
- Consider alcohol intake
- Quit smoking
- Go outside
- Thoughtful antibiotic use
- Meditation enhances helpful gut bacteria



Fiber – the New "F" Word

- Goal:
  - 14 gms / 1000 calories ~ 30 gms a day
- How?
  - Whole, intact grains, beans, fruits, veggies, nuts, avocados
- Why?
  - Associated with lower mortality for people with type 2.
  - Fiber intake inversely associated with type 2 diabetes
- Avoid highly processed foods
  - If label says 0-2gms of fiber per serving, low fiber food.

Nutrition Facts

99% Fat Free Vegetarian Chili with Beans

Serving Size 1.00 cup(247g)

Serving Per Container about 2

Amount Per Serving	
Calories	190
Calories from Fat	10
	%DV
Total Fat 1g	2%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 780mg	33%
Total Carbohydrate 35g	12%
Dietary Fiber 10g	40%
Sugars 6g	
Protein 11g	
Vitamin A 25%	Vitamin C 0%
Calcium 6%	Iron 15%

*Percentage Daily values are based on a 2,000 calorie diet.Your Daily values may be higher or lower depending on your calorie needs

Getting to Better Gut Bacterial Health

Eat more PREbiotics

- Foods with indigestible fibers that nourish the good bacteria:
  - High fiber foods like, whole grains, fruits, veggies, nuts
  - High in prebiotic fibers include: Jerusalem artichokes, onions, kale, Brussels sprouts, bananas, dandelion greens & more

PRObiotics

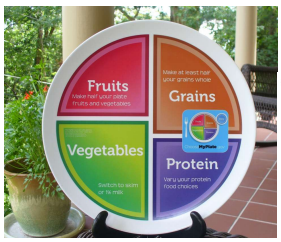
- These foods contain healthy bacteria like *Bifidobacterium* and *lactobacillus.*
  - Yogurt, Kefir – look for "live or active cultures"
  - Fermented foods like: Sauerkraut, Kimchi, Miso soup, kombucha

Kefir – Fermented Milk

From the Turkish word *keyif*, which means "feeling good" after eating

GET Lots of Diverse Fiber Foods Goal is 25 – 30 gms day

American Food Project



Full Plate Diet

- Helps increase fiber in usual meals

Fiber is suddenly hip. Grandma, It turns out, was just ahead of her time.

—*Health & Nutrition Letter*
Tufts University
February 2009

Take Home Messages

- Get Dirty
- Limit Unnecessary C-Sections
- Breastfeed if possible
- Limit early antibiotics
- Eat a wide variety of fiber foods

100 Trillion Friends to Call Your Own

From way back when, to current time
man and bacteria have been intertwined.

Start with your head, it's a happening place,
there's staphylococcus all over your face.

Next up is gums, teeth and mouth,
You'll find streptococcus inside and out!

Now to your stomach, to keep the pH,
H. pylori is on the case!

Inside the intestines, 30 feet of tube,
3 pounds of bacteria digesting your food.

From Bacteroidetes to keep you lean,
to Firmicutes, a junk food digesting machine!

Prevotella another bug on the scene,
breaks down fiber, veggies and beans!

Lactobacillus is a newborn's friend,
lining birth canal from tip to end.

Down to your feet, in-between the toes,
that's where lots of pseudomonas grows!

Short chain fatty acids, you wanna keep them around
Protects gut mucous lining from breakin' down

So here's my message, always nourish your gut
With fresh fruit, grains, veggies, beans and nuts

More kefir, miso, sauerkraut, kimchi
Less sugar and fast foods to keep away disease

Breast feed, get dirty, limit antibiotic use
Let newborns come out through the natural shoot

Be reassured that you're never alone
You've got 100 trillion friends to call your own!

100 Trillion Friends to Call Your Own by Beverly Thomassian, RN, MPH, CDE, BC-ADM to the tune "Yeah" in the style of Usher.

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Thank You

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