**Case 14: Peptic Ulcer Disease Resulting in Gastrectomy**

Megan Beyer

KNH 413

2.11.2016

1. *List all the food items that may contribute to GG’s condition and explain why.*

* Beverages: cola, coffee, tea (either caffeinated or decaffeinated) cocoa, alcohol
* Milk and Milk Products: 2% or whole milk, cream, high-fat yogurt, chocolate milk
* Meats and Proteins Sources: Fried meat, bacon, sausage, pepperoni, salami, bologna, hot dogs
* Desserts: High fat or fried desserts such as pastries and doughnuts
* Spices: Pepper including black and red

In the past it was through that milk and cream were used to treat PUD, but know we know that their consumption increases both gastrin and pepsin secretion (Nelms, 366). It is recommended that foods that may increase acid secretions or cause direct irritation to gastric mucosa from reduction in prostaglandins, which should be restricted (Nelms, 366). These foods include pepper, caffeine, coffee (decaffeinated and regular), and alcohol. Foods with that are high in fat, and have irritating ingredients possibly like acidic juices or strong flavors are not recommended since they will increase acid secretions, increase the rate of gastric emptying and result in increase production of gastrin secretions. Based on GG’s diet she is consuming fast food, frozen dinners, fried food, strong black coffee throughout the day, rum, coke milk, and chocolate. All of these items are ones that she should not be consuming and make her symptoms worse (Nelms, 367).

1. *List an additional oral intake that may have contributed to GG’s condition and explain why.*

The additional oral intake that GG is consuming which are contributing to her condition include taking antacids (TUMS) for the stomach pain she is experiencing, aspirin for her headaches and smoking cigarettes. Antacids such as TUMS only partially solve the symptoms of a peptic ulcer. When an antacid is taken partial neutralization of the gastric acid is followed by gastrin release, which causes additional stimulation of HCL, therefore resulting in more pain for the patient (Nelms, 363). The regular use of aspirin or ibuprofen for her headaches causes excessive glucocorticoid secretion which decreases the blood supply. When there is more glucocorticoid secretions this results in rapid gastric emptying, more gastric secretions and developed symptoms of PUD (Nelms, 365). Lastly GG has recently started smoking cigarettes which have been found to have many effects on the upper gastrointestinal function which include inference with the action of histamine-2 antagonists, increasing the rate of gastric emptying and reduction of mucosal blood flow. Although it was found that smoking affects the upper gastrointestinal tract more than the lower, the effects from the beginning will still result in making GG symptoms worse (NIH, 1988).

1. *List the non-oral stimulants (physical or psychological stress) that could contribute to GG’s condition and what she could do to change them.*

GG has many areas of stress in her life, which is making her peptic ulcer condition worse. First she is a single mother who has to raise and support her and her son. She is stressed financially because she does not receive any financial support from her family or ex-husband. She is working part-time on campus where she decided to go to school and earn a degree in accounting. She is stressed with school because she has been out of school for such a long time, and she has the pressure of having to keep her GPA up to be able to keep her loan. She has a very demanding job of being a single mother, going to school, working part time, having a son with ADHD. All of these are the current factors of her life that she has to deal with, but there are ways that she can cope with them and better manage and handle her stress.

GG has been found to be drinking alcohol and smoking cigarettes which are two negative health behaviors, but also are expensive. She could save the money she is spending on alcohol and cigarettes and spend it on more nutritious food. Also GG’s drinking alcohol and smoking cigarettes is how she is choosing to manage her stress, but she can turn this negative health behavior into a positive one by spending time outside and go on a walk with her son. She could go with him to the playground or to the park so they are able to spend mother-son time together. I think also GG may want to take time on a Sunday afternoon for example to plan out her week. If she does not have a calendar, she may want to get one to organize herself day by day, so she can think ahead about possibly planning a meal or purchasing food that week for the upcoming busy week. Lastly, it is evident how busy GG is, but it is also important for her to take time for herself and not let her school, job, son and financial stress allow her to be at her maximum cracking point.

1. *List the symptoms of GG’s gastritis.*

The symptoms that GG is experiencing include burning stomach which has been recently increasing, along with severe stomach pain in the lower right-hand quadrant of her stomach, and burning sensation in her stomach.

1. *Was a bland diet necessary? Explain and list the principles of the diet plan that you think GG should follow.*

A bland diet is not necessary for GG. The food that GG is currently eating is making her symptoms worse and therefore these foods should be cut out. There is no evidence to prove that a diet is a causative factor for the peptic ulcer (Nelms, 366). It has only been shown that a bland diet is necessary after stomach surgery and a bland diet is known to be ineffective for treating or avoiding ulcers. There has not proven to be a particular diet that is helpful for most peptic ulcer patients, but if a patient finds certain foods to be irritating they should avoid consuming them (Johns Hopkins Medicine, 2015). Based upon current research, it is best to make lifestyle changes which may include diet, and exercise. Also it is important to being taking the proper combination of medications such as antibiotics, H2 blockers, acid pump inhibitors, or mucosal protective agents depending what the doctor has prescribed. Since there is no specific diet that GG should follow she should be restricting and avoiding foods that will increase acid secretions or cause direct irritation to her stomach will result in pain. As stated previously GG should avoid caffeinated beverages, dairy products, high fat meats, fried foods, soda, alcohol, high fat foods and desserts (Nelms, 367). It is suggested that she should avoid eating large meals, and especially ones that are close to bedtime. Also she should avoid laying down after she has just eaten, which again will trigger the same symptoms she has been having (Nelms, 366).

1. *What is the mechanism of action of the following medications GG is receiving: Carafate, AlternaGel, and Pepcid?*

Carafate is the specific brand name for the generic drug sucralfate. Sucralfate is sucrose with sulfate and aluminum. The drug is minimally absorbed into the body and instead works on the lining of the stomach and duodenum. The way in which the drug works is not completely understood there is a general understanding of the mechanism of its actions. Sucralfate binds to the surface of the ulcer by attaching to the exposed proteins and coats the ulcer, which results in protecting the ulcer from further damage from acid or pepsin that is in the high acidic environment of the stomach. Sucralfate is able to directly inhibit pepsin when in the presence of stomach acid. Also sucralfate is able to bind bile salts which come from the liver and protect the stomach lining from injury from the bile acids. Lastly, sucralfate is able to increase the production of prostaglandin production which results in the protection of the lining of the stomach (Medicine Net, 2015).

AlternaGel is the specific brand name for the generic drug aluminum hydroxide. Aluminum hydroxide is an inorganic salt that works as an antacid that works quickly to lower the level of acid in the stomach. This drug does not prevent the production of stomach acid but it lessens the production to create a less acidic environment in the stomach. It works by reacting with hydrocholoric acid to then create aluminum chloride and water. Aluminum hydroxide is able to inhibit pepsin which then increases the pH and ultimately increases absorption of the stomach (Medicine Net, 2015).

Pepcid is the specific brand name for the generic drug famotidine. Famotidine is a type H2 blocker. This medication works in a way to block the histamine receptors that are a component of one of the stimulatory paths for acid secretion (Nelms, 356). By blocking the pathways for histamine on the cell this reduces the production of acid (Medicine Net, 2015). The famotidine binds to the H2 receptors is located on the basolateral membrane which blocks the histamine affects. This therefore reduces the basal and nocturnal gastric acid secretions and reduces the volume of the gastric volume, along with the acidity of the stomach environment and the amount of gastric acid released (Medicine Net, 2015).

1. *List the nutrient-drug interactions that are associated with these medications.*

The nutrient-drug interactions associated with Carafate are reducing the absorption of phosphate because it has phosphate- binding properties. It is recommended to avoid consumption of alcohol. Also there is an interaction between calcium, aluminum, magnesium and iron, so do not take these within two hours of taking Carafate (Drug Bank, 2013).

The nutrient-drug interactions associated with AlternaGel- aluminum hydroxide is that the aluminum and magnesium that is present in the drug can form a complex in it’s interaction and deplete the phosphate levels in the body. Also there is a loss of calcium from the bones and it is important to not consume during meals (Drug Bank, 2013).

The nutrient-drug interactions associated with Pepcid- famotidine should be taken with a balanced diet and with plenty of water. When taking the drug, it should be taken two hours before an iron or antacid supplement because it may cause an interaction with iron and B12 and therefore decrease its absorption. Also lastly caffeine and alcohol should both be avoided when taking Pepcid- famotidine (Drug Bank, 2015).

1. *What are GG’s IBW and percent IBW (Appendix A, Tables 7 and 8)?*

IDB = 100 lbs. + (5 lbs. x inch. over 5 ft.)

IDB = 100 lbs. + (5 lbs. x 2 in.)

**IDB = 110 lbs.**

**IDB =** 110 lbs. / 2.2 kg = **50 kg**

%UBW = (Current Body Weight / UBW) x 100

%UBW = (98 lbs. / 110 lbs.) x 100

**%UBW = 89.1%**

1. *Estimate her daily energy needs using the Harris-Benedict equation and appropriate stress factor (Appendix A, Table 17).*

98 lbs. / 2.2 kg= 44.5 kg

62 inches x 2.54 cm = 157.48 cm

BMR= 655 + (9.56 x kg) + (1.85 x cm)- (4.68 x yrs) x PAL

BMR= 655 + (9.56 x 44.5) + (1.85 x 157.48)- (4.68 x 27) x 1.6

BMR= (665 + 425.42 + 291.34 – 126.36) x 1.6

BMR= 1255.4 x 1.6

BMR= 2008.64 kcal

**BMR= 2000-2100 kcal**

1. *What might be the cause of the LUQ pain along with her usual pain? (Hint: Consider the enzymes that are elevated)*

GG may be experiencing left upper quadrant pain along with her usual reported pain because of pancreatitis (MayoClinic, 2013). One key indicator of pancreatitis is increase amylase or lipase levels that are three times higher than the upper limit (American Association for Clinical Chemistry, 2014). Based upon GG’s lab values, her amylase is very elevated with a result of 350 U/L (reference range: 25-125 U/L). Amylase is an enzyme that is secreted in the mouth and in the pancreatic duct into the duodenum that is responsible for digesting carbohydrates. In the United States, alcohol is the most common cause of chronic pancreatitis in adults and they may experience malnutrition and weight loss, which is seen in GG’s case (Nelms, 461). The elevated levels can result because of an ulcer, reflected by GG’s unusual pain (American Association for Clinical Chemistry, 2014).

1. *In the second set of lab values, glu, BUN, Cr, ser alb, Na, K, Cl, hgb, and hct all dropped. This probably means that GG was:*

*a. Bleeding.*

*b. Eating poorly in the hospital.*

***c. dehydrated when the first labs were drawn.***

*d. over hydrated when the second set of labs was drawn.*

GG was dehydrated when her first labs were drawn because in her chart it indicated that on Friday night she was drinking alcohol and had a few too many drinks and when she woke up felt she was still under the influence of alcohol. Alcohol causes the body to become dehydrated which will affect her lab values specifically of her electrolytes, BUN, glucose, hemoglobin, hematocrit, and serum albumin (American Association of Clinical Chemistry, 2013).

*12. In the second set of lab values, serum amylase, AST, and ALT all dropped. This probably means that:*

*a. enzymes were elevated due to alcohol.*

***b. her medication caused them to drop.***

*c. GG was dehydrated when the first labs were drawn.*

*d. GG was over hydrated when the second set of labs were drawn.*

GG’s medication caused her second set of lab values to drop because GG had reported taking aspirin for a prolonged amount of time. When taking aspirin for a long time, this can cause damage to the liver. Once liver function has the opportunity to improve this will be reflected in her lab values (American Association for Clinical Chemistry, 2015).

*13. Refer to the two lab tables again, and note that two days after admission, GG’s Alk Phos and CPK remained essentially unchanged. Why?*

*a. These enzymes are not affected by alcohol of hydration*

*b. Her medications caused them to drop*

***c. Dehydrated when the first labs were drawn***

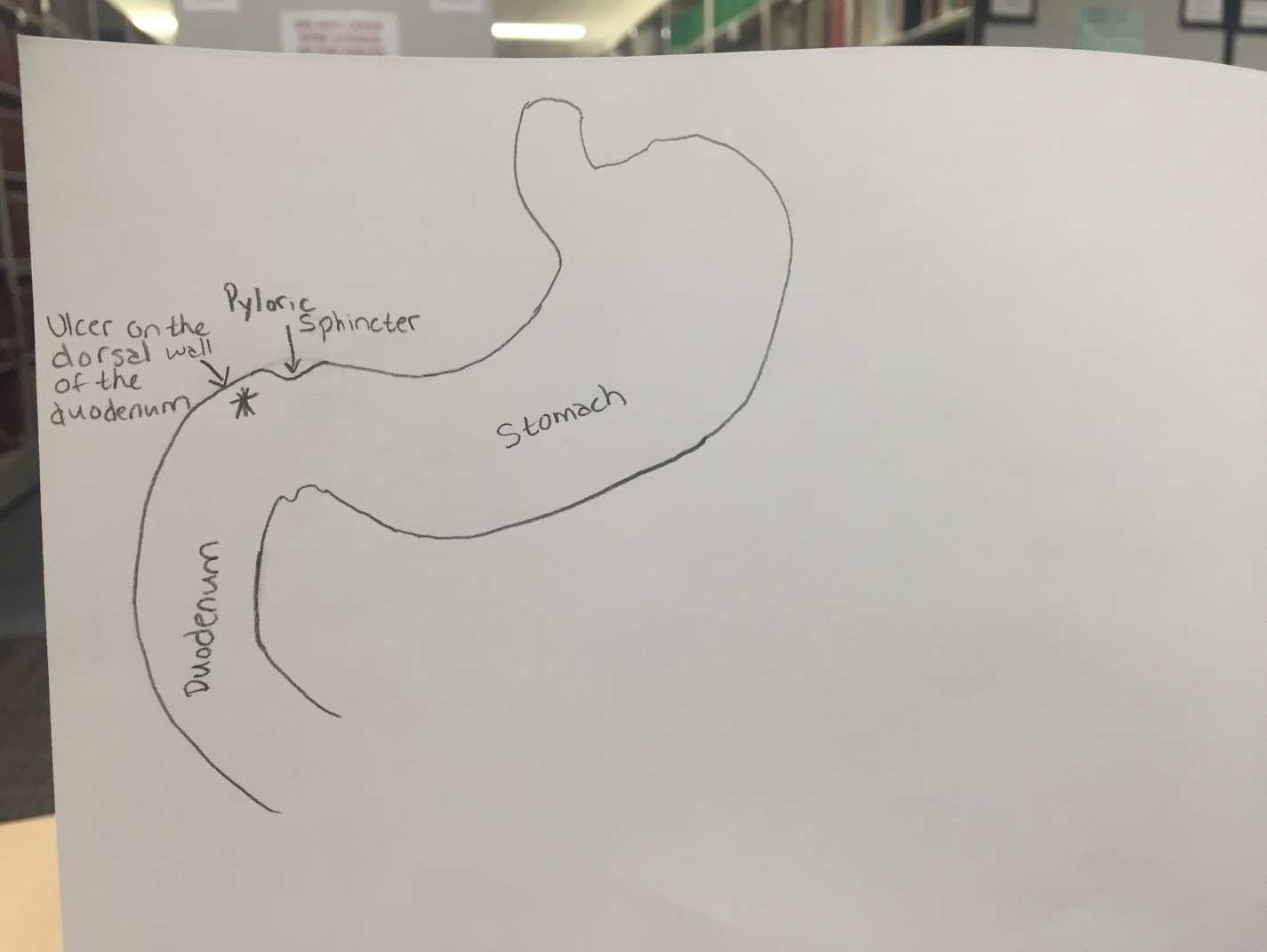
*d. Over hydrated when the second set of labs was drawn*

GG’s Alk, Phos and CPK (creatine phosphokinase test) were all remained essentially unchanged because she was dehydrated when the first labs were drawn. Alk is part of the alkaline phosphatase test (ALP) that was completed. For a condition that affects the liver the damaged cells will increase the ALP into the blood and affects the Alk, Phos and CPK levels (American Association for Clinical Chemistry, 2013).

*14. What diagnostic test(s) (not lab values) indicate(s) that GG has an ulcer?*

A diagnostic test that was done on GG was a stool occult test, which resulted in a positive for blood. This tests indicate there is a presence of blood and not necessarily the cause of the blood (MayoClinic, 2014). Additionally, an esophagogastroduodenoscopy (EGD) was completed which is test that examines the lining of the esophagus, stomach and the first part of the small intestine (NIH, 2015). The results of the exam indicated gastritis superior to the pyloric sphincter with an ulcer on the dorsal wall of the duodenum, just below the pyloric sphincter. The physician also completed a biopsy which indicated there was hypersecretion of HCl. There was a backup biopsy ordered to the *H. pylori* biopsy with a blood test to detect serum IgG antibody to *H. pylori*. The biopsy for carcinoma which was negative but it showed positive for *H. Pylori.* The ELISA was also positive for the serum IgG antibody.

*15. Briefly sketch the anatomical position where GG’s ulcer can be found.*



*16. Define*

*H2 antagonist:* medications that interrupt the production of acid in the stomach by blocking histamine receptors that are a component of one of the stimulatory paths for acid secretion (Nelms, 218 & 356)

*Proton pump inhibitor:* drugs that reduce acid secretion in the stomach that block H+, K+, -ATPase enzyme which is a component in HCl production (Nelms, 218 & 356)

*17. What is the mechanism of action of the following medications GG is receiving: Nexium, amoxicillin, and clarithromycin?*

Nexium is known as esomeprazole magnesium which is a proton pump working by blocking H+, K+, -ATPase enzyme which is a component in HCl production (Nelms, 366). By acting as an inhibitor that decreases the amount of acid produced in the stomach, and decreased the pH of the stomach (Nelms, 356). By acting specifically on the proton pump, esomeprazole magnesium blocks the final step in acid production and therefore this reduces the gastric acidity (MediLexicon, 2016).

Amoxicillin is a broad-spectrum antibiotic that is used to treat peptic ulcer disease because it is resistance to gastric acid. Amoxicillin binds to penicillin-binding protein 1A (PBP-1A) located inside the bacteria cell wall. Penicillin acylated the penicillin-sensitive transpeptidase C-terminal domain which prevents the formation of a cross-link of two linear peptidoglycan stands ultimately inhibiting the last stage of bacterial cell wall synthesis (DrugBank, 2016).

Clarithromycin is a type of antibiotic derived from erythromycin that is used to treat peptic ulcer disease by inhibiting bacterial protein synthesis by binding the bacterial 50S subunit. Clarithromycin is metabolized to 14-OH clarithromycin, which is active and works with it’s parent compound. It then penetrates the bacterial cell wall and binds to the domain of the 50S bacterial ribosome which blocks the translocation of aminoacyl transfer-RNA and polypeptide synthesis (DrugBank, 2016).

*18. GG was not receiving counsel at the time the major bleeding started. If you had the opportunity to counsel GG just before the bleeding, in what areas would you feel competent to counsel her and in what areas would you refer her to someone else? Investigate the agencies in your area that are available to provide assistance to someone like GG.*

As a professional in the area of nutrition, I would first address GG’s nutritional concerns. I would have her complete a 24-hour diet recall to address what she is eating and drinking including coffee and smoking cigarettes. She reported that she was losing weight, and was feeling very weak and tired indicating that she is malnourished and may not be eating enough since she did not have time. Although my special training is in nutrition, I would also explore other concerning areas she as her drinking. I do not believe that I would be able to address this properly, so I would refer her to social worker. I think a social worker would be able to help her with finding assistance to have her son looked after since his ADHD was worsening. I would look into other help that GG may be able to get within her local community such as a group of women who are going through a divorce and need help coping and talking about their problems. Although GG may say that she does not have time to attend a class like this, I think it would be helpful for her as it provides social support.

*19. What is the significance of the dark stool?*

Dark or black stool is significant as it indicates there is bleeding from the lining of the upper portion of the gastrointestinal tract (MayoClinic, 2012). As GG’s chart indicated she had a perforated ulcer, this is where the blood was coming from.

*20. Give the pathophysiology for the cause of the following abnormal values: BUN, NH3 and WBC.*

The white blood cell count (WBC) is 11.5 x 103 / μ which is outside of the normal range. The WBC would be increased due to the infection of the ulcer would cause there to be inflammation and the amount of fluid to increase and result in a high WBC count.

BUN is the blood urea nitrogen which is used to determine renal function. In this case the blood from the ulcer is being absorbed into the GI tract. Lastly NH3 is used to measure the ammonia in the blood. This level would be increased because of the presence of H. Pylori which releases ammonia to ensure the bacteria survives in the acidic environment of the stomach (Krause, 602).

*21. GG was probably dehydrated on admission since she has been drinking. This means that some of her lab values were probably higher/* ***lower*** *(circle one) than indicated.*

*22. After admission GG received packed cells and IV fluids. How would that affect the next set of lab values?*

When packed cells and IV fluids are administered to GG this causes her hematocrit and hemoglobin to increase more than usual. Since GG was dehydrated when she was admitted, IV fluids were administered. As the volume of fluid in the blood drops, the red blood cell per volume of fluid temporarily rises, but with enough fluid intake then hematocrit and hemoglobin levels will return to normal (American Association for Clinical Chemistry, 2015).

*23. Define the following terms:*

*Packed cells:* a concentrated preparation of red blood cells that is obtained from whole blood by removing the plasma with a centrifuge to be used in transfusion (Webster’s Dictionary, 2016)

*Abdominal tap:* used to remove fluid from the area between the belly wall and the spine, which is called the abdominal cavity (Medline, 2014).

*Perforated ulcer:* an ulcer extending through the wall of an organ (MediLexicon, 2006)

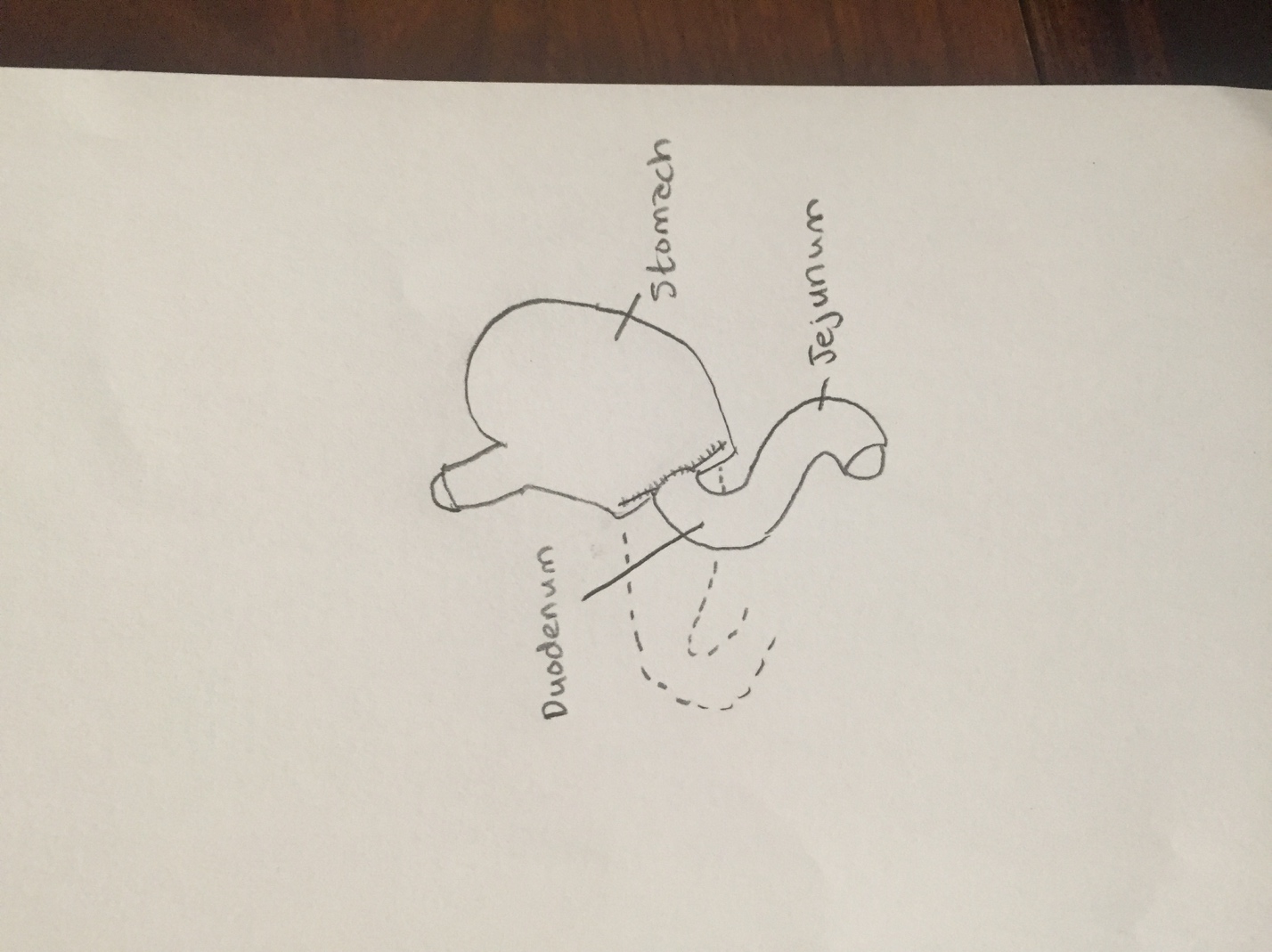
*Fistula:* an abnormal opening or passage between two internal organs or from an internal organ to the surface of the body (Nelms, G-9)

*Exploratory Laparotomy:* procedure completed under general anesthesia where a cut is made into the abdomen to examine the abdominal organs and a camera is placed in the abdomen to provide accurate diagnosis (Medline, 2014)

*Billroth I:* partial gastrectomy that removes where the remnant stomach may be reattached to the duodenum (Krause, 605)

*Vagotomy:* severing of the vagus nerve; often a component of gastric surgery (Nelms, G-23)

*24. Sketch a Billroth I.*

**

*25. Compare a Billroth I to a Billroth II as to anatomical changes as well as dietary changes, if any. (text book around 364)*

After a pyloroplasty or gastric resection there will use one of three procedures include Billroth I, Billroth II, or a Roux-en-Y procedure. A Billroth I procedure there is a partial gastrectomy with a reconstruction that consists of an anastomosis of the proximal end of the duodenum to the distal end of the stomach. In a Billroth II this is a partial gastrectomy with a reconstruction that consists of an anastomosis of the proximal end of the jejunum to the distal end of the stomach. In a Billroth II a blind loop of the duodenum is created (Nelms, 368). The nutritional recommendations for Billroth I and Billroth II follow the same criteria for the nutrition intervention after gastric sugary. It is recommended that proteins and fats are better tolerated than carbohydrates because they are hydrolyzed more slowly and the consumption of simple carbohydrates should be minimized. Also some patients have trouble tolerating liquids during a meal, so this may want to be avoided. Also the use of a fiber supplement can be beneficial in managing dumping syndrome because of the ability to form gels with carbohydrates which will delay the transit time through the GI tract. It is important for the patient to understand carbohydrate control and know how to use the exchange list. Also some patients are sensitive to lactose and therefore this may want to be avoided (Krause, 606).

*26. Calculate GG’s energy and protein needs.*

EER= 10 x wt (kg) + 6.25 x ht (cm) – 5 x age (yrs) + 5

EER= 10 x 44.5 + 6.25 x 157 – 5 (27) + 5

EER= 445 + 981.25 – 135 + 5

EER= 1296.25

EER = 1296. 25 x PAL

EER = 1296.25 x 1.6

EER= 2074

**EER Range= 2000-2100 kcal**

Protein needs- 1.5 g/kg

1.5 g/kg x 45.45= 68.18 grams of protein

**68 grams of protein daily**

68.18 grams of protein x 4 g/kcal= 273 kcal of protein

*27. List the principles of a postgastrectomy diet and briefly describe the scientific basis for each principle.*

Nutritional risk is due to reduced capacity of the stomach and potential changes in gastric emptying and transit time when the normal pathways for digestion and absorption is interrupted. When portions of the stomach are resected, valuable component of digestion and absorption or nutrients are compromised. There are nutritional concerns for vitamin and mineral deficiencies including thiamin, vitamin B12, vitamin D, iron and copper. Also because of the changes in the anatomy of the gastrointestinal tract the intrinsic factors may be altered. There is also malabsorption due to the decrease in HCl (Nelms, 368). To prevent one of the most common complications of surgery, it is important to have a slow progression of solid foods. The most common complication of surgery is dumping syndrome which is when there is increased osmolar load enters the stomach too quickly. To prevent dumping one should have a well balanced diet that is higher in protein and fat. Also simple sugars should be avoided and possibly lactose if that causes issues for the individual. Liquids should be consumed between meals and not during meals to prevent them from contributing to the dumping syndrome. The patient should have liquids 30 minutes to 1 hours after solid food is consumed. Also the patient should have five to six small meals a day and lay down after eating (Nelms, 369).

*28. Is it possible that GG’s diet will ever change or do you believe she will be on a postgastrectomy diet for the rest of her life? Explain your answer.*

GG will not remain on this diet for the remainder of her life but she will be on a similar diet. It is necessary for GG to follow the diet that she is given since her GI tract was reconstructed. It is important that GG does not return to the diet that she was consuming when she first got a peptic ulcer. She will be able to progress her diet as her stomach heals and add in more protein, along vegetables and fiber depending on her progress (Nelms, 369).

*29. If GG were to be hospitalized for an extended period of time and required a tube feeding via duodenum of jejunum, what characteristics would be appropriate for the tube feeding you would use?*

The characteristics that would be appropriate for a tube feed would be one that follows the postgastrostomy diet. The enteral formula should be low in simple carbohydrates and high in protein and fat as previously stated. A product that is high in dextrose is not recommended since she should be avoiding simple sugars. It would be recommended to have smaller frequent feedings which matches the nutrition recommendations (Nelms, 369). A jejunostomy could be used to deliver the feed through the abdominal wall to the jejunum (Nelms, 93).

*30. Using the table below, compare several of the enternal nutrition supplements that would be appropriate for GG.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Product* | *Producer* | *Form* | *Cal/ml* | *Non-pro cal/g N* | *Pro g/L* | *CHO g/L* | *Fat g/L* | *Na mg* | *K mg* | *mOsm/kg water* | *Vol to meet RDA in ml* | *G of fiber/L* | *Free H2O/L in ml* |
| *Isocal HN* | *Nestle* | *liquid* | *1.06* | *70.2* | *44* | *124* | *45* | *1120* | *96* | *270* | *1180* | *18* | *808* |
| *Isocal HN plus* | *Nestle* | *liquid* | *1.20* | *73.9* | *54* | *156* | *40* | *700* | *85* | *400* | *1000* | *14* | *826* |
| *Promote* | *Abbott* | *liquid* | *1.00* | *75.1* | *63* | *130* | *26* | *240* | *80* | *340* | *1000* | *10* | *839* |
| *Peptamen* | *Nestle* | *liquid* | *1.00* | *71.6* | *40* | *127* | *39* | *560* | *80* | *270* | *1500* | *16* | *848* |

Resources

American Association for Clinical Chemistry (2013). Alcoholism. <https://labtestsonline.org/understanding/conditions/alcoholism/start/1/>

American Association for Clinical Chemistry (2013). ALP. <https://labtestsonline.org/understanding/analytes/alp/tab/test/>

American Association for Clinical Chemistry (2015). Hematocrit. <https://labtestsonline.org/understanding/analytes/hematocrit/tab/test/>

American Association for Clinical Chemistry (2014). Pancreatitis.

<https://labtestsonline.org/understanding/conditions/pancreatitis/start/2/>

American Association for Clinical Chemistry (2015). Platelet Function Test. <https://labtestsonline.org/understanding/analytes/platelet-function/tab/test/>

DrugBank (2016). Amoxicillin. <http://www.medilexicon.com/drugs/nexium.php>

DrugBank (2016). Clarithromycin. <http://www.drugbank.ca/drugs/DB01211>

Drug Bank (2013). Sucralfate. <http://www.drugbank.ca/drugs/DB00364>

John Hopkins Medicine (2015). Stomach and Dodenal Ulcers (Peptic Ulcers). <http://www.hopkinsmedicine.org/healthlibrary/conditions/digestive_disorders/stomach_and_duodenal_ulcers_peptic_ulcers_85,P00394/>

MayoClinic (2013). Abdominal Pain. <http://www.mayoclinic.org/symptoms/abdominal-pain/basics/causes/sym-20050728>

MayoClinic (2015). Fecal Occult Blood Test. <http://www.mayoclinic.org/tests-procedures/fecal-occult-blood-test/basics/definition/prc-20014429>

MayoClinic (2012). Stool Color: When to worry. <http://www.mayoclinic.org/stool-color/expert-answers/faq-20058080>

Medicine Net (2015). Aluminum Hydroxide. <http://www.medicinenet.com/aluminum_hydroxide_suspension-oral/article.htm>

Medicine Net (2015). Famotidine. <http://www.medicinenet.com/famotidine/article.htm>

Medicine Net (2015). Sucralfate. <http://www.medicinenet.com/sucralfate/article.htm>

MediLexicon (2016). Nexium (esomeprazole magnesium). <http://www.medilexicon.com/drugs/nexium.php>

Medline Plus (2014). Abdominal tap. <https://www.nlm.nih.gov/medlineplus/ency/article/003896.htm>

MediLexicon (2006). Perforated Ulcer. <http://www.medilexicon.com/medicaldictionary.php?s=Perforated+ulcer+&search=&channel=7201801445&client=pub-1971793357249522&forid=1&sig=vptscazCworEUP7D&cof=GALT%3A%2300A12A%3BGL%3A1%3BDIV%3A%23FFFFFF%3BVLC%3A800080%3BAH%3Acenter%3BBGC%3AFFFFFF%3B>

Medline Plus (2014). Abdominal Exploration. <https://www.nlm.nih.gov/medlineplus/ency/article/002928.htm>

Medline Plus (2015). EGD – esophagogastroduodenoscopy. <https://www.nlm.nih.gov/medlineplus/ency/article/003888.htm>

US National Library of Medicine (2016). The Role of Smoking in Peptic Ulcer Disease. <http://www.ncbi.nlm.nih.gov/pubmed/3053883>

Webster’s Medical Dictionary (2016). Packed Red Blood Cells. [http://www.merriam-webster.com/medical/packed red blood cells](http://www.merriam-webster.com/medical/packed%20red%20blood%20cells)