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KNH 411: GI Case Study #11
Inflammatory Bowel Disease: Crohn's Disease

1. What is inflammatory bowel disease? What does current medical literature indicate regarding its etiology?

    A. Inflammatory bowel disease (IBD) is an autoimmune disease characterized as a chronic inflammatory condition of the gastrointestinal tract. Although both the diagnoses of ulcerative colitis (UC) and Crohn's disease fall under the general category of IBD, each has very distinct differences. There is no complete etiology for IBD at this time, however multiple factors play a role in UC and Crohn's disease. Some of these factors include smoking, infectious agents, intestinal flora, and physiological changes in the small intestine from which an abnormal inflammatory response is triggered. There is also a strong genetic association for IBD, which is supported by positive family history in 5-15% of patients with IBD. (Nelms, Sucher, Lacey & Roth, 2011, p. 415-416)

2. Mr. Sims was initially diagnosed with ulcerative colitis and then diagnosed with Crohn's. How could this happen? What are the similarities and differences between Crohn's disease and ulcerative colitis?

    A. Ulcerative colitis and Crohn's disease are both categorized under the general term of inflammatory bowel disease. The diagnoses are very similar, but have distinct differences. Both sexes are affected equally in UC and Crohn's disease, however the peak age of onset for UC is 20-30 years, with a secondary peak in middle age, where as the onset peak of Crohn's disease is typically in an individual's teens to twenties. Both conditions are characterized by exacerbations of the disease process interspersed with periods of intermission. Damage to intestinal mucosa in UC usually involves the first two layers of tissue within the colon and rectum while Crohn's can damage all layers of the gastrointestinal mucosa. If UC becomes chronic, then the intestinal wall can become so thin that the mucosa is ulcerated (toxic megacolon). Another difference between UC and Crohn's disease is that UC tends to affect only one section of the gastrointestinal (GI) tract at a time, while Crohn's often presents with a "skipping" pattern affecting multiple portions of the tract, but most commonly the ileum and colon. While patients with UC or Crohn's both experience signs and symptoms such as abdominal pain, diarrhea, and tenesmus (urgency for defecation), UC patients are more likely to have blood in their stool and experience less abdominal pain and cramping compared to Crohn's patients. Weight loss is very common in Crohn's due to increased requirements and decreased oral intake. Crohn's can also be insidious, presenting with only mild symptoms or only those

that are extraintestinal in nature. Serological markers that include antibody testing have been used to distinguish between UC and Crohn's disease. Anti-saccharomyces cerevisiae antibodies (ASCA) are more specific for Crohn's, while perinuclear antineutrophil cytoplasmic antibodies (pANCA) are more specific for ulcerative colitis. The treatment for UC and Crohn's are similar and include antibiotics, immunosuppressive medications, immunomodulators, and biologic therapies, as well as surgical intervention. Surgery is required in both UC and Crohn's disease in over 60% of patients. Crohn's is rarely cured but characterized by intermittent exacerbations, while UC is chronic with repeated exacerbations and remissions. (Nelms, Sucher, Lacey & Roth, 2011, p. 417-419)

3. A CT scan indicated bowel obstruction and Crohn's disease was classified as severe-fulminant disease. CDAI score of 400. What does a CDAI score of 400 indicate? What does a classification of severe-fulminant disease indicate?

    A. CDAI or Crohn's Disease Activity Index is used to describe Crohn's disease. A CDAI score between 220 and 450 indicates a patient to be in the moderate-severe stage of Crohn's. Individuals in the moderate-severe stage have failed to respond to treatment for mild-moderate disease or have experienced more major symptoms of fevers, significant weight loss, abdominal pain or tenderness, intermittent nausea or vomiting (without obstructive findings), or significant anemia. (Nelms, Sucher, Lacey & Roth, 2011, p. 419)

4. What did you find in Mr. Sims' history and physical that is consistent with his diagnosis of Crohn's? Explain.

    A. In Mr. Sims' history it reports that the initial diagnostic workup indicated acute disease within last 5-7 cm of jejunum and first 5 cm of the ileum. This is consistent with the diagnosis of Crohn's, which often presents with a "skipping" pattern affecting multiple portions of the GI tract. Crohn's patients usually experience more abdominal pain and cramping than patients with UC and are also less likely to have blood in their stool. Mr. Sims' history/physical indicates that he is experiencing unbearable abdominal pain along with diarrhea, not indicating the presence of blood. Also consistent with Mr. Sims' diagnosis of moderate-severe Crohn's disease is his physical results. His temperature was recorded to be 101.5^0F, he weighed in at 140lbs., and it was expressed that he had a soft palpation of his abdomen with severe pain. Major fevers, significant weight loss, and abdominal pain or tenderness, all define the moderate-severe stage of Crohn's disease. (Nelms, Sucher, Lacey & Roth, 2011, p. 417-419; Nelms & Roth, 2013, p. 116-117)

5. Crohn's patients often have extraintestinal symptoms of the disease. What are some examples of these symptoms? Is there evidence of these in his history and physical?

    A. Extraintestinal symptoms or disease manifestations occur outside of the GI tract and include osteopenia and osteoporosis, dermatitis, rheumatological conditions such as ankylosing spondylitis, ocular symptoms, and hepatobiliary complications. Mr. Sims' history and physical does not indicate he has experienced any extraintestinal symptoms. (Nelms, Sucher, Lacey & Roth, 2011, p. 418).

6. Mr. Sims has been treated previously with corticosteroids and mesalamine. His physician has planned to start Humira prior to this admission. Explain the mechanism for each of these medications in the treatment of Crohn's.

    A. Mesalamine is a generic aminosalicylates medication that works as an anti-inflammatory agent in the colon and may also act as an immune suppressant. Corticosteroids are also anti-inflammatory medications that mimic the action of cortisol. They redistribute white blood cells, reducing lymphocytes. Corticosteroids also increase neutrophils and decrease production of prostaglandins. (Nelms, Sucher, Lacey & Roth, 2011, p. 389-390) Humira belongs to a class of biologics known as tumor necrosis factor (TNF) blockers. Patients with Crohn's disease produce too much TNF, which attacks the intestines and other parts of the GI tract, resulting in inflammation. TNF blockers bind to the excess TNF to help reduce the inflammation that can lead to Crohn's symptoms. ("Crohn's disease," 2013)

7. Which laboratory values are consistent with an exacerbation of his Crohn's disease? Identify and explain these values.

    A. According to Mr. Sims' laboratory results, his albumin, hemoglobin, and hematocrit levels were depressed, and his C-reactive protein and ASCA levels were elevated. In severe exacerbations, low albumin levels are common and low biochemical hemoglobin and hematocrit levels confirm significant anemia. ASCA and C-reactive protein are acute-phase reactants and have been found to be indicative of exacerbations for Crohn's disease. (Nelms, Sucher, Lacey & Roth, 2011, p. 417-418; Nelms & Roth, 2013, p. 120)

8. Mr. Sims is currently on several vitamin and mineral supplements. Explain why he may be at risk for vitamin and mineral deficiencies.

    A. For individuals with Crohn's disease, protein-calorie malnutrition and other nutrient deficiencies can be caused by decreased nutrient intake, malabsorption, drug-nutrient interactions, anorexia, and protein losing

enteropathy. Increased motility that results from diarrhea decreases the success of digestion and absorption. Symptoms such as severe diarrhea and abdominal pain can also result in a patient's reduced oral intake. Mr. Sims' history/physical indicates that he has been experiencing severe diarrhea and abdominal pain, which puts him at a higher risk for vitamin and mineral deficiencies. (Nelms, Sucher, Lacey & Roth, 2011, p. 420)

9. Is Mr. Sims a likely candidate for short bowel syndrome? Define *short bowel syndrome*, and provide a rationale for your answer.

    A. Short bowel syndrome (SBS) is decreased digestion and absorption that results from a large resection of the small intestine. The prevalence for SBS is about four cases per million individuals per year and is most commonly caused by Crohn's disease with resulting multiple resections that leave only 3-5 feet of intact bowel. Mr. Sims has not undergone any GI tract resections, and although his records indicate that his Crohn's has exacerbated and he is experiencing severe diarrhea, I would not consider him a likely candidate for short bowl syndrome. (Nelms, Sucher, Lacey & Roth, 2011, p. 424-425, G-23; Mahan & Escott-Stump, 2004, pg. 730)

10. What type of adaptation can the small intestine make after resection?

    A. After resection, the small intestine undergoes a three-phase adaptation process. Seven to ten days post resection is characterized by extensive fluid and electrolyte losses within large volumes of diarrhea. Fluid and electrolyte balances of the patient are managed and the patient's required nutrient intake is dependent on parenteral nutrition. During phase two, which may last for several months, diarrhea volumes are reduced with the initial stages of adaptation of the remaining bowel. Enteral nutrition can be introduced with a gradual transition to an oral diet. Adaptation of the remaining bowel is continued during phase three and includes increased blood flow, secretions, and mucosal cell growth. The inner lumen of the remaining small intestine increases in both length and diameter with additional increase in villous height. The time frame of the third phase can vary, but may range from one to two years. Successful adaptation is supported by enteral feeding, particularly early exposure to enteral nutrition, and is affected by the health of the remaining bowel and whether the colon is present. (Nelms, Sucher, Lacey & Roth, 2011, p. 425)

11. For what classic symptoms of short bowel syndrome should Mr. Sims' health care team monitor?

    A. A classic symptom of short bowel syndrome (SBS) is diarrhea. Mr. Sims' health care team needs to monitor his nutrient, fluid, and electrolyte losses, which are significant in individuals with SBS. They also need to monitor his B_{12} absorption along with his reabsorption of bile salts. A reduction in

bile salts can further contribute to fat malabsorption, which contributes to an inability to absorb adequate amounts of vitamins A, D, E, and K. Other nutrients often deficient include sodium, magnesium, iron, zinc, selenium, and calcium, because they are lost in large volumes of diarrhea. (Nelms, Sucher, Lacey & Roth, 2011, p. 425)

12. Mr. Sims is being evaluated for participation in a clinical trial using high-dose immunosuppression and autologous peripheral blood stem cell transplantation (autoPBSCT). How might this treatment help Mr. Sims?

    A. Although there is still controversy regarding the safety and efficacy of this approach, after limited trials, it has been show that using high-dose immunosuppression and autologous peripheral blood stem cell transplantation is safe and effective to induce remission of refractory Crohn's disease. (Hasselblatt, Drognitz, Potthoff, Bertz, Kruis, Schmidt & Kreisel, pg. 725).

13. What are the potential nutritional consequences of Crohn's disease?

    A. Crohn's disease affects normal digestion and absorption, creating many potential nutritional consequences for those with the disease. These consequences include malnutrition, inadequate energy intake, inadequate oral food/beverage intake, increased nutrient needs, inadequate vitamin/mineral intake, impaired nutrient utilization, food-medication interaction, and altered nutrition-related laboratory values. Insufficient intake, anorexia, increased energy requirements, and fear of abdominal pain and diarrhea after eating can lead to a caloric deficiency. Protein deficiency is also common in Crohn's patients due to an increased protein need as a result of losses from the GI tract caused by inflammation, catabolism, and healing from surgery. If a patient develops SBS or has severe diarrhea, fluid and electrolyte deficiencies, as well as magnesium and zinc deficiencies are likely. Iron deficiency results from blood loss and malabsorption due to Crohn's and vitamin B_{12} along with other water-soluble vitamins are commonly deficient following surgical resections of the stomach and/or terminal ileum. Steatorrhea can cause deficiency of fat-soluble vitamins while medications used to treat Crohn's may lead to a folate deficiency. (Nelms, Sucher, Lacey & Roth, 2011, p. 420)

14. Mr. Sims underwent resection of 200 cm of jejunum and proximal ileum with placement of jejunostomy. The ileocecal valve was preserved. Mr. Sims did not have an ileostomy, and his entire colon remains intact. How long is the small intestine, and how significant is this resection?

    A. The small intestine is about 5.5-7.5m or 18-25 ft long and is divided into three parts, the duodenum, the jejunum, and the ileum. The duodenum is about .5m long, the jejunum is 2-3m long, and the ileum is 3-4m long.

Most digestion and absorption of food occurs in the first 100cm (1m) of the small intestine and major nutritional and medical complications are typically produced after distal ileum resections. Fortunately enough for Mr. Sims, no resection was made to his distal ileum, his ileocecal valve was preserved, and his entire colon remains intact. Although jejunal resections result in reduced surface area and shorter intestinal transit than normal, the ileum is able to perform the functions of the jejunum, especially after a period of adaptation. With the preservation of Mr. Sims' ileocecal valve, he should still be able to absorb vitamin B_{12} and bile acid, which can only occur at this site. (Mahan & Escott-Stump, 2004, pg. 730-731)

15. What nutrients are normally digested and absorbed in the portion of the small intestine that has been resected?

    A. Most digestion and absorption of food and nutrients occurs in the first 100 cm of the small intestine. After a jejunal resection, the ileum is able to take over the function of the jejnum, which is to digest/absorb the remaining food and nutrients. The remaining food and nutrients typically include minimal amounts of sugars, resistant starch, fiber, lipids, dietary fiber, and fluids. The ileum's primary role is to absorb vitamin B_{12} and bile salts, which only takes place at the distal ileum. Significant resection of the ileum, particularly the distal ileum, do not allow the ileum to absorb bile salts secreted into the GI tract, which can result in a significant malabsorption of fats and fat-soluble vitamins. (Mahan & Escott-Stump, 2004, pg. 730-731)

16. Evaluate Mr. Sims' % UBW and BMI.

    A. Over the past six months, Mr. Sims has lost 16% of his usual body weight, which is considered a severe weight loss. Mr. Sims' BMI was calculated to be 20.3 kg/m^2, which categorizes him at the lower end of a normal weight. (Nelms, Sucher, Lacey & Roth, 2011, p. 48)

    Percent Usual Body Weight= 83-84%

    %UBW= (current weight/usual body weight) x 100

    %UBW= (140lb/166lb) x 100= 84%

    %UBW= (140lb/168lb) x 100= 83%

    Percent Weight Change= 16-17%

    % change= 100- %UBW

    % change= 100-83= 17%

    % change= 100-84= 16%

    Body Mass Index= 20.3 kg/m^2

    BMI= weight (kg)/ [height (m)]^2

    Weight= 140 lbs/(2.2 kg/lb)= 63.6 kg

    Height= 5'9"= 69 in./ (39 in./m)= 1.77m

    BMI= 63.6 kg/ (1.77 m)^2= 20.3 kg/m^2

17. Calculate Mr. Sims' energy requirements.

    A. **Recommended Energy Requirements= 2,358 kcal**
        - Mifflin-St. Jeor REE for Men: 10(W in kg) + 6.25(H in cm)-5(age in years)+5 (Nelms, Sucher, Lacey & Roth, 2011, p. 60)
            - Weight= 140 lbs/(2.2 kg/lb)= 63.6 kg
            - Height= 5'9"= 69 in./ (39 in./m)=1.77m/ (.01m/cm)= 177cm
            - REE= 10(63.6kg) + 6.25(177cm) – 5(35) +5= 1,572 kcal
            - TEE= 1,572 x 1.5= 2,358 kcal
                - 1.5= stress factor (Nelms, Sucher, Lacey & Roth, 2011, p. 421)

18. What would you estimate Mr. Sims' protein requirements to be?

    A. After evaluating Mr. Sims' laboratory results for protein, albumin, and prealbumin, his protein status is low and he has lost a significant amount of weight over the past 6 months. Based on Mr. Sims' protein status and body mass, I would estimate his protein needs to be **95.4-111.3 g of protein/day** (63.6 kg x 1.5g-1.75 of protein/kg). (Nelms, Sucher, Lacey & Roth, 2011, p. 421)

19. Identify any significant and/or abnormal laboratory measurements from both his hematology and his chemistry labs.

    A. Below are the significant and abnormal laboratory measurements from Mr. Sims' hematology and chemistry labs. Mr. Sims' protein markers (protein, albumin, and prealbumin) were low, suggesting that Mr. Sims' Crohn's is affecting his normal digestion and absorption, leading to protein-energy malnutrition. His C-reactive protein level was high, which can indicate an exacerbation of Crohn's disease. Mr. Sims' ASCA results were positive, which is a maker for irritable bowel syndrome, particularly Crohn's disease. His HDL-C levels are low, possibly indicating fat malabsorption. Low levels of hemoglobin and hematocrit are biological indicators of anemia while low levels of transferrin, ferritin, and ZPP (zinc protoporphyrin) indicate iron deficiency. Low vitamin D 25 hydroxy levels is an indicator of vitamin D deficiency and low free retinol and ascorbic acid levels are indicators of vitamin A and C deficiencies. (Nelms, Sucher, Lacey & Roth, 2011, p. 417-418; Nelms & Roth, 2013, p. 119-121)

	Reference Range	**2/15 1952**
Chemistry		
Protein, total (g/dL)	6-8	5.5 (low)
Albumin (g/dL)	3.5-5	3.2 (low)
Prealbumin (g/dL)	16-35	11 (low)

C-reactive protein (mg/dL)	<1.0	2.8 (high)
HDL-C (mg/dL)	>45 M	38 (low)
ASCA	Neg	+
Hematology		
Hemoglobin (Hgb, g/dL)	14-17 M	12.9 (low)
Hematocrit (Hct, %)	40-54 M	38 (low)
Transferrin (mg/dL)	215-365 M	180 (low)
Ferritin (mg/mL)	20-300 M	16 (low)
ZPP (μmol/mol)	30-80	85 (low)
Vitamin D 25 hydroxy (ng/mL)	30-100	22.7 (low)
Free retinol (vitamin A; μg/dL)	20-80	17.2 (low)
Ascorbic acid (mg/dL)	.2-2.0	<.1 (low)

20. Select two nutrition problems and complete the PES statement for each.

    A. (*Academy of Nutrition and Dietetics*, 2013, pg. 204-205, 252-253)
        - Inadequate Protein Intake (NI-5.7.1)
            - Inadequate protein intake related to increased needs and decreased ability to consume sufficient protein due to exacerbation of Crohn's disease as evidenced by low biochemical protein, albumin, and prealbumin levels, client's history of Crohn's, and his loss of appetite due to severe diarrhea and abdominal pain.
        - Unintended Weight Loss (NC-3.2)
            - Unintended weight loss related to decreased ability to consume sufficient energy due to exacerbation of Crohn's disease as evidenced by weight loss of 16% in 6 months, client's history of Crohn's, and his loss of appetite due to severe diarrhea and abdominal pain.

21. The surgeon notes Mr. Sims probably will not resume eating by mouth for at least 7-10 days. What information would the nutrition support team evaluate in deciding the route for nutrition support?

    A. The nutrition support team would need to manage Mr. Sims' fluid and electrolyte levels as well as his required nutrient intake while he is dependent on parenteral nutrition. During this 7-10 day period Mr. Sims will experience extensive fluid and electrolyte losses within large volumes of diarrhea. Several months following this period, Mr. Sims will see a reduction in diarrhea volumes as his remaining bowel adapts. Enteral nutrition can be introduced at this time with the gradual transition to an oral diet. Early enteral nutrition supports the successful adaptation of the bowel. (Nelms, Sucher, Lacey & Roth, 2011, p. 425)

22. The members of the nutrition support team note his serum phosphorus and serum magnesium are at the low end of the normal range. Why might that be of concern?

    A. Acute magnesium deficiency is of concern if a patient has malabsorption concerns or has experienced surgical stress. Clinical phosphate depletion and hypophosphatemia can result from TPN without sufficient phosphate. Although magnesium and phosphate deficiencies are rare, when a patient is reliant on parenteral nutrition, magnesium and phosphate levels need to be monitored. Low levels of electrolytes, such as magnesium and phosphate, are distinguishing indicators of refeeding syndrome, which Mr. Sims will be at risk for while on parenteral nutrition. (Mahan & Escott-Stump, 2004, pg. 129-131, 549)

23. What is refeeding syndrome? Is Mr. Sims at risk for this syndrome? How can it be prevented?

    A. Refeeding syndrome can result when nutrition is aggressively administered, particularly via intravenous route, when a patient who is on parenteral nutrition therapy is moderately to severely malnourished. Complications to refeeding syndrome include low serum levels of potassium, magnesium, and phosphorus with severe, potentially lethal outcome that result from the too rapid infusion of substrates, particularly carbohydrate, into the plasma with the consequent release of insulin and shift of electrolytes into the intracellular space as glucose moves into the cells for oxidation and reduction in salt and water excretion. Mr. Sims is at risk for this syndrome because he will be reliant on parenteral nutrition post-surgery. To prevent the development of refeeding syndrome in Mr. Sims, he should be monitored for electrolyte fluctuations and fluid overload. His carbohydrate intake should be conservative and he should be given adequate amounts of intracellular electrolytes. In the early phase of refeeding, nutrient prescriptions should be moderate in carbohydrate, lactose-free, and supplemented with phosphorus, potassium, and magnesium. (Mahan & Escott-Stump, 2004, pg. 549)

24. Mr. Sims was placed on parenteral nutrition support immediately postoperatively, and a nutrition support consult was ordered. Initially, he was prescribed to receive 200 g dextrose/L, 42.5 g amino acids/L, and 30 g lipid/L. His parenteral nutrition was initiated at 50 cc/hr with a goal rate of 85 cc/hr. Do you agree with the team's decision to initiate parenteral nutrition? Will this meet his estimated nutritional needs? Explain. Calculate: pro (g); CHO (g); lipid (g); and total kcal from his PN.

    A. I do agree with the team's decision to initiate parenteral nutrition. Mr. Sims' bowel needs time to adapt to the resection and his jejunostomy. Using the Mifflin-St. Jeor equation I calculated Mr. Sims' estimated energy requirements to be 2,358 kcal/day and his protein intake to be 95.4-111.3 g of protein/day. The PN will surpass his estimated energy

requirements for the day but come short of his estimated protein needs. (Nelms, Sucher, Lacey & Roth, 2011, p. 95-97)

- 50 cc/hr (24 hr)= 1,200 cc/day (1.2L/day)
  - 1.2 L (200 g dextrose/L)= **240 g dextrose/day**
    - 240g (3.4kcal/g) = 816 kcal
  - 1.2L (42.5 g amino acids/L)= **51 g amino acid/day**
    - 51g (4 kcal/g)= 204 kcal
  - 1.2L (30g lipid/L)= **36 g lipid/day**
    - 36g (9 kcal/g)= 324 kcal
  - **Total kcal/day= 1,344**
- 85cc/hr (24 hr)= 2,040 cc/day (2.04L/day)
  - 2.04L (200 g dextrose/L)= **408 g dextrose/day**
    - 480 g (3.4 kcal/g)= 1,632 kcal
  - 2.04 L (42.5 g amino acids/L)= **86.7 g amino acid/day**
    - 86.7g (4 kcal/g)= 346 kcal
  - 2.04 L (30 g lipid/L)= **61.2 g lipid/day**
    - 61.2 g (9kcal/g)= 550 kcal
  - **Total kcal/day= 2,528**

25. For each of the PES statements you have written, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).

A.

- Goal: based on the patient's abnormally low protein laboratory results and his estimated protein needs of 95.4-111.3 g/day compared to his current intake through PN of 86.7 g/day, the goal is to increase the patient's protein intake to 86.7 g/day through PN until he is able to consume orally. To monitor his protein status, I would reevaluate his protein, albumin, and prealbumin laboratory results to see if they are within a normal range.
- Goal: based on the patient's severe weight loss of 16% his usual body weight of 166lbs. over the course of 6 months, the goal is to promote a healthy weight gain in the patient. To promote a 1lb. weight gain per week I would have the patient consume 500kcal more than his estimated energy needs of 2,358 kcal/day, once he begins oral nutrient intake.

26. Indirect calorimetry revealed the following information:

Measure	Mr. Sims' data
Oxygen consumption (mL/min)	295
CO_2 production (mL/min)	261
RQ	.88
RMR	2022

What does this information tell you about Mr. Sims?

A. RMR measurements from an indirect calorimeter provide information regarding a patient's energy expenditure in 24 hours. Based on Mr. Sims' indirect calorimetery data, he needs an intake 2,022 kcal to meet his body's energy needs. Taking Mr. Sims' oxygen consumption of 295 mL/min and dividing it by his CO_2 production of 261 mL/min, his respiratory quotient (RQ) was calculated to be .88. A RQ value of .88 indicates that Mr. Sims is primarily burning protein during metabolism. (Mahan & Escott-Stump, 2004, pg. 26)

27. Would you make any changes to his prescribed nutrition support? What should be monitored to ensure adequacy of his nutrition support? Explain.

    A. After calculating Mr. Sims' estimated energy requirements and protein needs to be 2,358 kcal/day and 95.4-111.3 g protein/day, I would decrease the total energy intake Mr. Sims is receiving from parenteral nutrition from 2,528 kcal/day to 2,358 kcal/day. I would also decrease his intake of dextrose and increase his intake of amino acids so that he was receiving at least 95 g of protein/day. To ensure the adequacy of his nutrition support, Mr. Sims' intake/output should be monitored along with his weight, hydration/fluid status, and nitrogen balance. Other parameters to monitor include magnesium, phosphorus, and calcium levels, liver function, triglycerides, vital signs, bowel function, and blood glucose. (Nelms, Sucher, Lacey & Roth, 2011, p. 91, 91)

28. What should the nutrition support team monitor daily? What should be monitored weekly? Explain your answers.

    A. The nutrition support team needs to test hyperglyceimia laboratory levels 3-4 times per day and monitor measurements of serum, electrolytes, BUN and creatinine, magnesium, and phosphorus daily. In the beginning, serum triglycerides are drawn to assess lipid tolerance, and if abnormal, they may be drawn weekly thereafter. Weight, hydration/fluid status, bowel function, and intake/output should be monitored daily. Nitrogen balance should be monitored when necessary. Complications that can arise from parenteral nutrition (PN) include cholestasis and increased permeability to bacteria. A patient should be monitored to prevent such complications. If PN is administered continuously for several weeks, transient elevations in liver enzymes may be noted. The nutrition support team needs to rigorously monitor the preparation of PN solution to minimize the risk of infection. (Nelms, Sucher, Lacey & Roth, 2011, p. 91, 101)

29. Mr. Sims' serum glucose increased to 145 mg/dL. Why do you think this level is now abnormal? What should be done about it?

    A. Increased serum glucose can result from metabolic stress, dehydration, or parenteral nutrition overfeeding. ("Adult enteral," 2011, pg. 42) Patients

receiving PN are at significant risk for hyperglycemia. In order to bring Mr. Sims' serum glucose levels back to normal, I would decrease the concentration of dextrose he is receiving via PN until the impact of the parenteral nutrition infusion can be evaluated and blood sugars stabilized. ("Parenteral nutrition," n.d.)

30. Evaluating the following 24-hour urine data: 24-hour urinary nitrogen for 12/20: 18.4 grams. By using the daily input/output record for 12/20 that records the amount of PN received, calculate Mr. Sims' nitrogen balance on postoperative day 4. How would you interpret this information? Should you be concerned? Are there problems with the accuracy of nitrogen balance studies? Explain.

    A. Mr. Sims' nitrogen balance was calculated to be -8.5g, indicating that he currently has a negative nitrogen balance. A negative nitrogen balance indicates that the individual is excreting more nitrogen than what they are ingesting, which is commonly associated in patients with traumatic injury or illness. I would be concerned with Mr. Sims' negative nitrogen balance, which may indicate inadequate protein consumption, malnutrition, and/or an infection. Problems associated with the measurement of nitrogen balance include the inherent error of 24-hour urine collection, failure to account for renal impairment, and inability to measure nitrogen losses from some wounds, burns, diarrhea, and vomiting. Nitrogen intake is also hard to account for and oral protein intake can be difficult to measure except when the patient is exclusively on enteral or parenteral nutrition support. (Nelms, Sucher, Lacey & Roth, 2011, p. 54; Mahan & Escott-Stump, 2004, pg. 67)
        - N_2 balance= (dietary protein intake/ 6.25)- urine urea nitrogen-4
        - N_2 balance= (86.7g/6.25)- 18.4g-4= -8.5g

31. On post-op day 10, Mr. Sims' team notes he has had bowel sounds for the previous 48 hours and had his first bowel movement. The nutrition support team recommends consideration of an oral diet. What should Mr. Sims be allowed to try first? What would you monitor for tolerance? If successful, when can the parenteral nutrition be weaned?
    A. Once oral intake is initiated, Mr. Sims should follow a low-residue, lactose-free diet with small, frequent meals. If steatorrhea is present, then fat should be reduced with added medium chained triglycerides. As Mr. Sims begins to tolerate the initiated oral intake diet, small amount of fiber and then lactose can be added. Along with initially restricting fiber, spicy foods, fried foods, caffeinated beverages, and gas-producing foods may be limited if the patient identifies them as problematic. The addition and advancement of an oral diet will be based on how Mr. Sims tolerates the initiated oral diet. (Nelms, Sucher, Lacey & Roth, 2011, p. 421)

32. What would be the primary nutrition concerns as Mr. Sims prepares for rehabilitation after his discharge? Be sure to address his need for supplementation

of any vitamins and minerals. Identify two nutritional outcomes with specific measures for evaluation.

A. Some primary nutrition concerns for Mr. Sims would be protein energy malnutrition, vitamin B_{12} and iron deficiencies, along with zinc, calcium, magnesium, and copper deficiencies. I would recommend to Mr. Sims a multivitamin that meets his RDA or AI for all nutrients. Lower serum levels of antioxidants have been shown in patients with Crohn's disease and with this in mind I would strongly encourage Mr. Sims to consume a variety of fruits and vegetables as he can tolerate them. Foods high in oxalate should be consumed in small amounts or avoided to decrease the risk for kidney stones. Some of these foods include cocoa, tea, wheat germ, strawberries, nuts, and high doses of vitamin C (>2g/day). Consuming foods and supplements with probiotics and prebiotics may help decrease some of Mr. Sims' symptoms related to Crohn's and have a positive change in his anti-inflammatory markers. My primary nutritional outcomes for Mr. Sims are to maximize his energy and protein intakes to facilitate rehabilitation. In order to measure his energy intake, I would have Mr. Sims keep a food log to monitor his daily consumption. I would also reevaluate his weight and BMI measurement to see if he was gaining weight back to his normal range of 166-168lb. To measure Mr. Sims' protein intake, I would reevaluate his total protein, albumin, and prealbumin lab results, to see if they are within the reference range. (Nelms, Sucher, Lacey & Roth, 2011, p. 421)

References

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