NUT 116BL
Winter 2015

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Section: A01_____

Major Case Study: Enteral and Parenteral Nutrition
Due 2/13/15
60 points

Mr. R, a 35 yo drug user, is hospitalized after a motor vehicle accident (MVA). He is currently suffering from a severe concussion and lapses of consciousness, a broken jaw, multiple broken bones, and possible internal injuries. He had not eaten anything for several days PTA because he was overdosing on drugs. Enteral feeding has been recommended in order to improve his nutritional status and given his decreased level of alertness. The patient will be bedridden until his mental status improves. A nasogastric feeding tube has been inserted and the physician has asked for your recommendation regarding the type of formula and amounts of kcal/protein needed for this patient.

Ht: 5'11" Current wt: 156 # UBW: 167 # Serum albumin: 3.0 mg/dL

1. Write 1 PES statement for this patient. (2 pts)
Biting/chewing (masticatory) difficulty (NC-1.2) r/t injuries suffered from MVA - broken jaw, not eating anything for several days, bedridden for several days aeb weight loss, nasogastirc feeding tube insertion.

2. Is the nasogastric feeding route appropriate for this patient? Why or why not? (3 pts)
The nasogastric feeding route is an enteral feeding route where the tube passes through the nose into the stomach. This is an appropriate route for this patient because he is suffering from a severe concussion and has a broken jaw and will be bedridden until his mental status improves. He will not be able to utilize his mouth for feeding but his GI function is still in working condition.

Ref: NUT 116B Ch. 5 lecture slide #9

3. What daily intake of kcals, protein, and fluids would you recommend for this patient and why? Show calculations for estimated needs, give recommendations as kcal/d, g protein/d, ml fluid/d. (6 pts)
Kcals: 10(70.76 kg) + 6.25(180.34 cm) -5(35 yo) +5 = 1664.725 kcal
1664.725 x 1.1 x 1.2/1.6 = 2380 - 2663.56 kcal/day
Protein: 70.76 x 1.2/1.6 g/kg = 85 - 113.2 g protein/day
Fluids: 2380 - 2663.56 mL fluid/day

The patient is bedridden and has skeletal trauma. (AF: 1.2, IF 1.3-1.6)
I would recommend an increased protein need because of severe stress from broken bones as well as a severe concussion. (1.2-1.6 g/kg)
Fluids are based off of daily recommendations of fluid needs (1 ml/kcal)

Detailed calculations on separate paper
Ref: Pocket Resource for Nutrition Assessment 2009 pg. 13 (Pocket Resource 2009)

4. Based on the needs of this patient, describe three desirable characteristics for the type of formula you would recommend. Give one example of an appropriate enteral formula meeting these characteristics. Use Appendix C2 in NTP text or the formulary provided on the UCD SmartSite. (4 pts)

1. Caloric density - high in density to meet daily requirements
2. Fiber needs - ~26 g/day, a high fiber load to relieve patient of constipation
3. Protein needs - higher than typical, to meet needs of healing for skeletal trauma

Jevity 1 cal is an example of an appropriate enteral formula meeting these characteristics. It has 1.06 kcal/mL, 83% water, and 44 g of protein per 1000 mL of formula.

Ref: NUT 116B ch. 5 slide #14-15
NTP text A-99, appendix J

5. a) Based on the enteral formula you selected in question 3 above, what daily total volume of formula would meet Mr. R's estimated kcal and protein needs? Show calculations. (3 pts)
kcal: ~2600 kcal/day/1.06 kcal/mL = 2452.83 mL of formula required
protein: ~100 g protein/day/0.044 g/mL = 2272.73 mL of formula required
Therefore, approximately 2450 mL of formula required.

b) What would be the hourly rate for delivery of this tube feeding as a continuous 24hr infusion? Show calculations. (1 pt)
2450 mL/24 hours = 102.08 mL/hour
Rounded to 102 mL/hour

c) Is this volume of tube feeding adequate to meet his fluid needs? If not, indicate what else is needed and how it would be added to the current tube feeding. Show calculations. (4 pts)
102 mL/hour x 24 hours = 2448 x 83% water = 2031.84 mL of water/day
Fluid needs: 2380 - 2663.56 mL fluid/day

The fluid needs are not met but are close. He would need an additional 300 - 600 mL provided in the 2800 mL of Jevity If needed, more free water could be added into the Jevity to dilute the formula. This would be adding 12 - 25 mL/hour.

6. Give 3 blood values that you would monitor for this patient and the reasons why. (6 pts)

1. Blood urea nitrogen (BUN) - to ensure the patient is meeting protein needs. The BUN indicates the end product of protein metabolism that is converted in the liver to form urea. High BUN levels may indicate liver/kidney dehydration or kidney disease. Low BUN may indicate possible liver disease as well as not enough protein in the diet, malnutrition, or over hydration.
2. Serum albumin - low serum albumin is common with enteral feeding and can affect protein-binding drugs that are administered to the patient.
3. Blood glucose - elevated blood glucose signifies the delay of gastric emptying. Tight glycemic control is important to watch for tube fed patients to help reduce mortality.

Ref: Pocket Resource 2009 pg. 39.

7. Give one urine value that you would monitor and the rationale for monitoring it. (2 pts)

I would monitor urine urea levels to check the nitrogen balance of the patient.

The patient, Mr. R, is now 5 days s/p his MVA. He did not tolerate the enteral feedings well (diarrhea and pain) and now has been diagnosed with acute pancreatitis. The MD has ordered a nutrition consult for evaluation of parenteral nutrition (PN) support. For the purposes of answering questions 7-12, assume that your current estimated kcal and protein needs for Mr. R are: 2600 kcal/day and 110 g protein/day.

8. Write a PES statement. (2 pts)
Impaired nutrient utilization (NC-2.1) r/t intolerance of enteral feeding aeb diarrhea and pain.

9. Which type of PN support do you recommend – central or peripheral? Justify your answer. (2 pts)
I recommend central parenteral nutrition support for the patient. The patient's caloric needs are high (2600 cal/day) and the TPN needs are more long term.

10. Calculate the amount of a 10% lipid emulsion that is needed to provide around 20% of Mr. R's total kcal needs. Show calculations. (2 pts)
2600 kcal x 20% = 520 kcal from fat
10% lipid = 1.1 kcal/mL x 520 mL = 752 mL of 10% lipid emulsion

11. The MD wants the dextrose and amino acid solution to be a total volume of 2 L/day. (The volume of lipid emulsion is separate from this 2 L.)
a) Determine the final amino acid concentration of this solution, which would supply 110 g protein/day. Show calculations. (2 pts)
110 g protein/2000 mL solution = 0.055 g/mL protein
5.5% amino acid concentration

b) Determine the remaining kcals to be provided as CHO. Express your answer as kcals from CHO and as grams of dextrose. Show calculations. (3 pts)
110 g protein x 4 g/kcal of protein + 520 kcal fat = 960 kcal
2600 - 960 = 1640 kcal of CHO remaining
1640 kcal CHO/3.4 kcal/g = 482 g dextrose

c) Determine the final dextrose concentration of the solution. Show calculations. (2 pts)
482 g dextrose/2000 mL = 0.241 g/mL dextrose
24.1% dextrose concentration

d) If the PN solution had to be made from a starting stock solution of $D_{50}W$ (500 g dextrose in 1 L of water), what volume of this stock $D_{50}W$ would be needed to provide the grams of dextrose that you calculated in question 9b above? Show calculations. (2 pts)
482 g of dextrose needed
482 g/500 g in 1 L = 0.964 L = 964 mL of D50W is needed to provide the g of dextrose.

e) Compare the grams of dextrose to be provided in this solution with the maximum glucose infusion rate for Mr. R of 5 mg/kg BW/min. Would you make any changes to the PN solution based on this information? Explain your rationale. If so, how would you change it? (2 pts)

482 g dextrose = 482,000 mg/70.76 kg BW/1440 minutes
6811.76 mg/1440 min = 4.73 mg/kg/min

The infusion rate for 482 g of dextrose is less than the maximum glucose infusion rate, so we do not have to make any changes.

12. List three lab values that you would monitor for this patient and the reasons why. (6 pts)

1. Blood glucose - to have a good control of patient's glycemic index, indicaor of gastric empyting.
2. Fluid electrolytes - the patient is at risk for refeeding syndrome and should be well regulated. Adequacy of the right needs are important for proper body function.
3. Liver enzymes - the patient is at a higher risk for liver disease, and monitoring enzymes would be important to ensure a healthy functioning liver.

13. Mr. R develops hyperglycemia while on PN support. Describe two actions you would recommend to help lower blood glucose and achieve metabolic control of the patient. (2 pts)

1. I would recommend optimizing the carbohydrate content of the parental nutrition formula. If the dextrose concentration of the solution can be decreased, that would help lower the amount of glucose that needs to be metabolized.
2. I would implement IV/subcutaneous insulin therapy through continuous infusion or adding insulin to nutrition bag.

14. What is refeeding syndrome? Why is it important to monitor for refeeding syndrome in a severely malnourished patient who is started on PN? (4 pts)
Refeeding syndrome is when there are dangerous fluctuations in the fluid and electrolyte levels that lead to metabolic and neuromuscular problems. This is important to monitor because a malnourished patient is likely to have imbalanced fluid and electrolyte levels that would be very suddenly re-balanced through PN. The rapid CHO infusion into cells stimulate insulin, reduces Na and water excretion, and risks fluid overload in the extracellular space. The rapid introduction of nutritional fluids may cause additional expansion of fluid volume in the extra-cellular space, causing edema. It is important to correct electrolyte abnormalities and to slowly increase the calories to a severely malnourished patient.

Ref: NUT 116B ch. 5 lecture slides #40-41