Major Case Study: Enteral and Parenteral Nutrition

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
	70.90 kg	75.90 kg	

1. Write 1 PES statement for this patient. (2 pts)

Inadequate oral intake (NI-1.2) related to secondary complications of MVA.

2. Is the nasogastric feeding route appropriate for this patient? Why or why not? (3 pts)

If the GI tract is functional in patients, enteral feeding is a good method of feeding. If his GI is fully functional, then nasoduodena or nasojejunal tube feedings can be better methods since there could be a chance of aspiration. There might be internal injuries that can alter his gut motility. There can be a chance due to the accident and stress the patient has problems with gastric emptying having delay. Patient has problem with consciousness, which can be dangerous.

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)

Mifflin-St. Jeor Equation for Trauma patient:
REE=10(70.9kg)+6.25(177.5cm)-4.92(35)+5=1,648.30 kcal
Total caloric needs: (REE)*(AF) * (IF)=1648 (1.2) (1.5)=2967 kcal a day

Protein requirements: 1.5-2.0 g/kg BW. Higher value is chosen for patient due to trauma.
70.9*1.5, 70.9*2.0= 106-140g protein/day

Fluid needs: 1 mL/kcal=2967 mL a day

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)

The formula should be high in protein, caloric. Osmolite 1.2 by Abbott has high protein and high calorie. (smartsite)

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)

2.47L*56 g protein/1000mL =138g protein/day (patient needs between 106-140 g/d)
2967kcal/1.2 kcal per mL =2472 mL total (2967 kcal a day is needed)

b) What would be the hourly rate for delivery of this tube feeding as a continuous 24hr infusion? Show calculations. (1 pt)

2472mL/24H=103mL round to 100 ml

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)

2967mL fluid is needed per day and he currently is getting 2472mL so additional 495mL additional fluid is required (round to 500mL). Additional fluid needs can be met by flushing BID between feeds twice with water at 150mL each and also flushing water before and after each feed at 25mL each, eight times.

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

1. Protein: due to the injury, the protein should be monitored and increased for healing process.
2. Serum electrolytes: to monitor for the electrolyte balance and any disturbance of the body and refeeding syndrome.
3. Blood glucose: Glycemic control and careful monitoring of hyperglycemia
4. Creatinine: to assess the adequacy of fluid intake and function of kidneys and their ability to filter.

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

Nitrogen level: this is for monitoring absorption of Protein in body. This is important for patient. We want to know whether the patient's body is capable of absorbing the protein or it is losing it. It asses the nitrogen balance. It can show us protein needs 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)

Malabsorption relate to acute pancreatitis evidence by diarrhea and pain (NI-5.2)

9. Which type of PN support do you recommend – central or peripheral? Justify your answer. (2 pts)

Patient was not tolerating EN well in order to give his GI tract some time to rest peripheral nutrition can be given to him for 10-14 days.

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 *20% = 520 kcal ÷ 10 kcal/gm = 52 g of 10% lipid
520 (kcal) /1.1(kcal/ml)= 520ml
Round 520 ml to 500 ml since there are no 520 ml solution bags.

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)

110g protein/2000mL*100= 5.5% of AA solution which supply the protein/day

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)

Calories from fat and proteins:
Protein: 110g*4g protein/day=440kcal
Lipid: 500mL (1.1kcal/mL)=550kcal from fat (550kcal/10kcal/g=55g lipid)
The remaining kcals to be provided as CHO
1610* 1/3.4 kcal/g dextrose= 473.52 rounded to 470 g dextrose

c) Determine the final dextrose concentration of the solution. Show calculations. (2 pts)

470g dextrose/2000mL= 23.5%

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)

500g/ 1 liter ➔500g/1000mL➔ 470g dextrose/500g *100%= 94% of the 1000mL stock solution.
➔ 94% *(1000mL)=940mL is needed.

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)

470g Dextrose/70.9kg BW= 6.6g a day *1000mg/1 g=6600mg
6600mg/1440min=4.6mg mg/kg per BW

No need for any changes to the PN solution. It is close and less than maximum amount of the original amount of dextrose.

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

Glucose: amount of glucose given to this patient is important and needs to be monitor because excess of it will cause problems of hyperglycemia and hyperlipidemia.
Lipids: important because its excess can change solubility of calcium and phosphorous. Since this patient has bone disease calcium should be provided enough for him. In addition for monitoring the calories is an important factor.
Electrolyte: this is really important to be monitored from the beginning. In fact it shows the balance of minerals on the body which is significant to be controlled for this patient. This is important to control to prevent refeeding syndrome.

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. Lower the carbohydrate (dextrose) of the solution and give more water to the patient
2. Intensive insulin therapy: to maintain normal blood glucose and also catabolic state (NTP 92).
3. More lipid and AA should be given to patient to make sure he is getting the sufficient calorie that his body needs.

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 a high risk change in fluid and electrolyte balance that may cause metabolic and neuromuscular disorders. High levels of carbohydrates can cause glucose and electrolytes shift into the cells therefore more insulin should be secreted. This will result in less excretion of water and Na and this can be very dangerous for patient. Re-feeding syndrome may occur in severely malnutrition patient during the first days or weeks of enteral or parenteral nutritional support. Malnourished patient, have low level of electrolyte. Sudden feeding causes electrolytes such as Phosphorus, magnesium or potassium to shift into the cell and cause complications for patient such as heart failure or even death.