Parenteral Nutrition

Susan McDonald

1. The first reasons that parenteral nutrition is appropriate for this patient is that the patient's body rejected enteral nutrition and the patient is unconscious so is unable to receive nutrition orally. Once the patient's WBC, electrolyte, HR, fluid and other nutrition levels are normal and not fluctuating; the patient can remain on PN and be started slowly on EN. It is also imperative that the patient is having bowel sounds and movements, that way it is known that the patient's digestive system is working properly. The patient must tolerate about 75% of nutrient needs by the enteral route before PN is completely discontinued. (1)

2. Energy Needs: To determine DJ's energy needs, I will use the Harris-Benedict equation but I will then increase this value by an injury factor since this patient is suffering from traumatic injuries from a car accident. (Lee pages 236-237). The injury factor(ambulatory factor) for a patient that underwent major surgery is 1.1-1.3 (I will use 1.2 for this equation). For the stress factor, I will use 1.1
BEE = 66.5 + 13.8W + 5.0H – 6.8A
BEE = 66.5 + (13.8 x 76) + (5 x 185) – (6.8 x 39)
BEE = 2040.3 – 265.2
BEE = 1775.1

TEE = BEE x stress factor x ambulatory factor
TEE = 1775.1 x 1.1 x 1.2
TEE = 2343.1

Protein Needs:
Weight (kg) x 1.5g protein per kg
76kg x 1.5g =114g

3. After calculating 4% amino acid mix, DJ will not be receiving enough protein per day (only about 65g protein) so I would write a PN order of 8% amino acid instead of the standard hospital PN solution. The corrected calculations with the 8% solution used are in red.
a) dextrose (25%):
1000mL x 0.25 = 250g
250g x 3.4kcal/g = 850
Amino acids (4%):
1000ml x .04 = 40g
40g x 4kcal/g = 160
Total kcals = 1010kcal/1000ml
Amino Acids (8%):
1000ml x .08 = 80g
80g x 4kcal/g = 320
Total kcals= 850 + 320 = 1170kcal/1000ml

b) lipid (20%):
500ml x 2.0kcal/ml = 1000kcal
1000kcal/2343kcal = 43%

Therefore this amount (one bag) accounts for too high of a percent of the calories.
350ml x 2.0kcal/ml = 700kcal
700kcal/2343kcal = 30%

2343kcals-700kcal lipid = 1643kcals left for dex/AA
1643kcal/1010kcal/1L = 1627mL dex/AA
1643kcal/1170kcal/1L = 1404mL dex/AA
Fluid: 1ml/kcal = 2343ml – 1627ml = 716ml more fluid needed to meet patient needs
Fluid: 1ml/kcal = 2343ml – 1404ml = 939ml More needed.

c)dex/AA: 1627mL/24hrs = 68 mL/hr D/AA
Since DJ must start at 30mL/hr and progress 15ml/hour every four hours…
15ml/hr / 4 = 3.75mL/hour
So if our goal is 68mL/hour subtract the starting 30mL
=38mL/ hour divided by 3.75mL
=10 hours
Dex/AA: 1404ml/24hrs = 58.5mL/hr D/AA
Since DJ must start at 30mL/hr and progress 15ml/hour every four hours…
15ml/hr / 4 = 3.75mL/hour
So if our goal is 58.5mL/hour subtract the starting 30mL
28.5ml/hr divided by 3.75ml
=7.6hours

4. Dextrose (25%): 1627mL x .25 = 406.75g CHO
Amino Acid/protein (4%): 1627mL x .04 = 65g protein
Lipid (20%): 350mL x .2 = 70g lipid
Dextrose (25%): 1404mL x .25 = 351g CHO
Amino Acid/protein (4%): 1404mL x .04 = 112g protein
Lipid (20%): 350mL x .2 = 70g lipid

5. 250g CHO/L x 5 = 1250mOsm/L
40g protein/L x 10 = 400mOsm/L
30g lipid/L x 1.5 = 45mOsm/L
[add 300 mOsm for additional minerals]
1250 + 400 + 45 + 300 = 1995 mOsm/L

250g CHO/L x 5 = 1250mOsm/L
80g protein/L x 10 = 800mOsm/L
30g lipid/L x 1.5 = 45mOsm/L
[add 300 mOsm for additional minerals]

1250 + 800 + 45 + 300 = 2395 mOsm/L

Yes, a central catheter will be needed because the osmolarity of the PN solution is very great (and high calorie) and the veins used via peripheral IVs would be too small to handle the large amount of fluid that will be administered and the concentration of nutrients can damage the smaller veins. Also, with a central catheter, blood can be drawn which will be important in order to monitor the patient's condition. (2)

6. The primary complication associated with PN is infection. Monitoring the patient for the signs of infection such as chills, fever, and white blood cell count is crucial and should be done on a daily basis (1).
To monitor DJ's nutritional status, "Weight, CBC, electrolytes, and BUN should be monitored often (daily for inpatients). Fluid intake and output should be monitored continuously." (3)
The patient's albumin, prealbumin, transferrin, retinol binding proteins, and electrolytes should also be closely monitored.
Also, since DJ was only consuming about 45% of his estimated protein and kcalorie needs for about a week, it is possible and likely that he is suffering from refeeding syndrome and electrolyte fluctuation, and fluid overload should be monitored closely. (1)

Sources

(1) L. Kathleen Mahan, Sylvia Escott-Stump, Janice L. Raymond. *Krause's Food and the Nutrition Care Process*. St. Louis: El Sevier Saunders, 2012. Print.

(2) Truven Health Analytic 2012. *Heart and Circulatry System.* http://www.sharecare.com/question/central-venous-access-catheter

(3) Thomas, David R. *Merck Manual; Total Parenteral Nutrition*. 2009 http://www.merckmanuals.com/professional/nutritional_disorders/nutritional_support/total_parenteral_nutrition_tpn.html