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FND 430-001
Parenteral Nutrition Worksheet
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1. HP needs TPN because he has short bowel syndrome and his GI tract is not functional. His entire jejunum was and proximal three-fourths of his ileum were resected. Leaving about 21 inches of his small bowel left. HP will be on TPN for at least 3-6 months because his GI tract will not be functional at all, and he will probably not be able to absorb anything. After 3-6 months the weaning process from TPN to EN will begin. EN and TPN may be used in combination to get HP back on EN.

2.
a) BMI

Height- 6'2 or 187.96cm Weight- 249lbs or 113.18kg

113.18kg/1.8796m^2 = 32.04

b) Ireton-Jones Equation:

S=629-11(age in years) + 25(weight in kg) - 609(1 if obese, 0 if not)
=629-11(27) + 25(113.18kg) -609(1)
=2552.5kcal/day

c) Kcal/kg

3982kcal/113.18kg = 35kcal/kg

d) Permissive underfeeding is for critically ill patients with a BMI greater than 30. There energy intake for the day should not exceed 60%-70% of target energy requirements or 11-14kcal/kg ABW or 22-25kcal/kg of IBW. Protein needs should be 2.0g/kg of the patients IBW if there BMI is between 30-40. Permissive underfeeding is necessary in obese patients because these patients are usually prone to co-morbidities. By having a small degree of weight loss has been proven to increase the patients insulin sensitivity, improve nursing care and decrease that risk for co-morbidities. By providing the patient with 2.0g/kg of IBW, estimates protein needs and provides a neutral nitrogen balance and allows for wound healing.

e) kcal per day with permissive underfeeding

IBW = 106 + 14(6) = 190 or 86.7kg

2009 Nutrition Support Therapy guidelines say that patient should be fed 22-25kcal/kg of IBW or 11-14kcal/kg of actual body weight. Or 60-70% of target kcal. Below will be shown calculations for all three.

- Ex: 22-25kcal/kg of IBW

86.7kg x 22kcal = 1907kcal 86.7kg x 25kcal = 2168kcal

According to this calculation HP should be fed between 1907-2168kcal/day

- Ex: 11-14kcal/kg ABW

113.18kg x 11kcal = 1245kcal 113.18kg x 14kcal = 1585kcal

According to this calculation HP should be fed between 1245-1585kcal/day

- Ex: 60-70% of target kcal

3982kcal x .60 = 2390kcal 3982kcal x .70 = 2788kcal

According to this calculation HP should be fed between 2390-2788kcal/day

- We are going to use the 22-25kcal/kg of IBW to be consistent, I am going to use the upper limit to be consistent and to ensure he is meeting all of his needs.

If using 25kcal/kg IBW HP needs 2168kcal per day

f) Protein and fluid needs

Protein needs: 2.0g/kg of IBW

2.0g protein x 86.7kg = 174g protein per day

Fluid needs: 1ml/1kcal

2168kcal = 2168ml per day = 2.168 L per day

3. Total kcal and grams of protein in 1L of solution

Total kcal
$D_{20}W$ (20% dextrose)
1000mL x .20 = 200g dextrose
200g dextrose x 3.4kcal/g = 680kcal dextrose

7% AA
1000mL x .07 = 70g AA/protein
70g AA x4kcal/g = 280kcal protein
Total kcal from 1L AA and Dextrose Solution = 960kcal
Total grams of Protein in 1 L of solution = 70 g protein

4. Total volume of TPN solution including 500mL of 20% lipid

500mL of 20% lipid
500kcal x 2.0kcal/mL = 1000kcal/day

Now subtract HP's needs minus the lipid he is getting to find the remaining calories he needs
2168 - 1000 = 1168remaining kcal

Now we need to see how many liters of dex/AA solution is needed per day to meet HP's calorie needs of 1168kcal/day.

960kcal/1L = 1168kcal/xL
1168(kcal1L) = 960kcal(xL)
1168 = 960xL
1168/960 = 1.23 L of $D_{20}W$/AA 7%

We will use all 500mL of 20% lipid

5. Protein provided per day

70g protein x 1.23 L = 86 g of protein per day

HP needs 174 g of protein per day and is only receiving 86 g per day from this solution which leaves 88 g of unanswered protein that HP still needs.

I suggest to switch the final AA to a 13% solution because it is imperative that HP meets his protein needs. HP's BUN is 40mg/dL, the normal range is 10-20mg/dL. Having a high BUN in a healing state usually means the patient is catabolic and excessively breaking down protein; wasting. This is why it is imperative that HP meets his protein needs. I would also suggest to switch to a $D_{10}W$ dextrose solution. This is because HP's fasting blood glucose is 142mg/dL. Even though it is natural for one's blood glucose to go up in the body's metabolic response to stress, I would like to cut back on his sugar because of his BMI placing him as obese, and focus on the protein needs for healing.

We are currently giving HP a total of 86 g of protein in 1.23 L of solution

We need 174 g of protein per day
13% AA
1000mL x .13 = 130g protein
130g protein x 4kcal/g = 520kcal protein
$D_{10}W$
1000mL x .10 = 100g dextrose

100g x 3.4kcal/g = 340kcal

520kcal protein + 340kcal dextrose = 860kcal of $D_{10}W$ and AA 13% in 1L solution
Now we will find out how many liters of this solution we will use per day

860kcal/1L = 1168kcal/xL
1168/860 = 1.36 L of $D_{10}W$ AA 13% solution a day

Now we are providing adequate calories per day and providing adequate protein

Kcal: 860(1.36) + 1000kcal lipid = 2170kcal/day

Protein: 130g protein x 1.36 = 177 g of protein per day. This exceeds the protein needs by 3g. However this will not have a negative effect on HP.

6.Osmolarity of original solution

mOsm = (g dextrose x 5) + (g AA x 10) + 300mOsm for vitamins and electrolytes
=(200g dextrose x 5) + (70g AA x 10) + 300 mOsm
=1000 + 700 = 300 = 2000mOsm

Osmolarity of the new suggested solution

mOsm = (g dextrose x 5) + (g AA x 10) + 300mOsm for vitamins and electrolytes
=(100g dextrose x 5) + (100g AA x 10) + 300 mOsm
=500 + 1000 +300
=1800mOsm

This solution cannot be infused through a peripheral vein because it is greater than 900 mOsm. This concentration of the original is 2000 mOsm and the concentration of the new solution is 1800mOsm. Both are too high and should be infused through a central vein that is close to the heart where there is a greater concentration of blood and can be processed by the heart right away. It is too vigorous on peripheral veins at high concentrations. Peripheral Parenteral solution is for patients who are only receiving a portion of their total calorie needs. This solution should be infused through a a central vein (TPN) via central venous catheter.

7. I will suggest that this solution be administered over a 24 hour period

Lipid: 500mL/24 = 21mL hour
Old $D_{20}W$ AA 7%: 1230mL/24 =52mL/hour
New $D_{10}W$ AA 13%: 1360mL = 57mL/hour
8. PES Statement

In adequate protein intake as related to SBS and prior administration of 86g protein/day as evidenced by BUN of 40mg/dL and the need for 174g protein/day.