

1. A 42yo, 148 lb, 5' 6.5" female is admitted with nausea, vomiting, dehydration, and inability to eat secondary to chemotherapy for breast cancer. She is to be placed on TPN. Labs are:

sodium	133 mEq/L	normal range 135 – 150 mEq/L
potassium	3.8 mEq/L	normal range 3.5 – 5.0 mEq/L
chloride	99 mEq/L	normal range 100 – 106 mEq/L
bicarbonate	32 mEq/L	normal range 24 – 30 mEq/L
BUN	4 mg/dL	normal range 8 – 20 mg/dL
creatinine	0.5 mg/dL	normal range 0.6 – 1.2 mg/dL
glucose	113 mg/dL	normal range 70 – 110 mg/dL, fasting
calcium	7.9 mEq/L	normal range 8.5 – 10 mEq/L
phosphate	2.5 mg/dL	normal range 2.6 – 4.5 mg/dL
magnesium	2.0 mEq/L	normal range 1.8 – 2.5 mEq/L
prealbumin	< 7.0 mg/dL	normal range 16 – 40 mg/dL (acute nutritional status)
albumin	2.3 g/dL	normal range 3.5 – 5 g/dL (long-term nutritional status)
triglycerides	111 mg/dL	desired range < 200 mg/dL (if these are high need to limit fat calories)

Calculate her nutritional needs using both the pre-set volume and the pump methods.

Analysis of patient situation:

- She is hospitalized, weak, and dehydrated, but otherwise unstressed, so probably needs no or low (1.1) stress adjustment.
- Her ABW = 67 kg and IBW = 60 kg, so a feed weight could be anything from 60 – 67 kg. Many pharmacists would probably go for something in between, but anything within this range is quite acceptable.
- Her calculated creatinine clearance is anywhere from 69 – 138 ml/min/ depending upon whether you correct the serum creatinine to 1.0 $[(140-42)(60)/(85)(1.0) = 69 \text{ ml/min}]$ or you leave it as it is $[(140-42)(60)/(85)(0.5) = 138 \text{ ml/min}]$. Either method has adherents but in this case it doesn't matter because you know that her kidneys are probably in good shape and so you don't need to fluid restrict because of kidney disease.
- Her albumin is low so her calcium needs to be corrected to reflect this and determine whether she needs extra calcium or is probably fine to receive the recommended daily amount. Her corrected calcium is $(4.0 - 2.3)(0.8) + 7.9 = 9.2 \text{ mEq/L}$, which is in the normal range. You will thus not need to give her extra (in the future you will learn to evaluate other disease states and risk for low bone mass but at this point it is fine to stay simple).
- Her phosphate is a bit low so may choose a phosphate amount in the higher end of the recommended range.
- Her chloride is low and her bicarb is high, so she is somewhat alkalotic (not uncommon in someone who has been vomiting and thus losing H^+ and Cl^- ions from the stomach). You will therefore want to give sodium as the chloride salt, rather than the acetate salt.
- Her triglycerides are OK, so don't need to restrict fat amount at this time. Sodium, potassium, and magnesium are all reasonable as well (she will probably be rehydrated with NS upon admission before they put the central line in for her TPN so the sodium level will rise) so target the middle of the recommended range for amounts of these cations.

TPN Worksheet using pre-set volumesage: 42 sex: Fheight: 169 cmABW: 67 kgIBW: 60 kgfeed weight: 63 kg*anything 60-67 would be fine here***Targets:****1. Daily fluid needs.**

>20 kg: 1500ml + (20 ml)(W - 20 kg) 2360

calculated target: 1900 – 2300 ml/day

30 - 35 ml/kg/day 1890 - 2205

2. Protein requirements.

normal, unstressed individual: 0.8g/kg/day

calculated target: 63 – 75 g protein/dayhospitalized patient: 1-1.2g/kg/day

stressed patient: 1.5-2g/kg/day

3. Non-protein calories $BEE_{men} = 66.67 + 13.75(W) + 5.0(H) - 6.76(A)$ calculated target: 1800 kcals/day $BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ 1385activity factors: confined to bed: 1.2, out of bed: 1.3stress factors: surgery: 1.2; infection: 1.4; trauma: 1.5; burns: 1.7 *1.0 – 1.1*

TDE = (BEE) (activity factor) (stress factor) (1385)(1.2)(1.0 – 1.1) = 1660 – 1830 kcals/day

Amounts:**4. Total TPN volume** 2000 ml/day; volume for each TPN: 1000 ml/bag; # bags/day: 2**5. Protein Volume** choose one:

27.5g in 500ml 5.5% AA

42.5g in 500ml 8.5% AA

50g in 500ml 10% AA or

55 g/day

85 g/day

either outside recommendations – will go high

10% AA calculated volume: _____ ml

*could consider alternating 5.5% with 8.5%***6. Dextrose volume** (3.4 kcals/g) choose one3.5 mg/kg/min = 317 g/day = 159 g/bag100g in D20W 500ml

250g in D50W 500ml

350g in D70W 500ml or

have to do 20% since 50% would be too high. (100 g/bag)(2 bags/day)(3.4 kcals/g) = 680 kcals CHO

D70W calculated volume: _____ ml

*1800 kcals – 680 kcals CHO = 1120 kcals to give as fat***7. Fat volume** (9 kcals/g) choose one:550kcal/500ml 10% lipid

900kcal/ 500ml of 20% lipid or

x 2 bottles/day = 1100 kcals. I would only do this if she were not at risk for volume overload

20% lipid calculated volume: _____ ml

plus sterile water volume: _____ ml

Electrolytes:**8. Daily electrolyte needs** total amt of kcals/day from fat and dextrose: 680 + 1100 = 1780 kcals (62% fat)

	<u>amt/1000 calories</u>	<u>(amt)(# daily cals)/1000</u>		<u>amount/bag</u>
sodium	40-50 mEq	<u>71 – 89</u>	<i>divide</i>	<u>40</u> mEq
potassium	40mEq	<u>71</u>	<i>each</i>	<u>35</u> mEq
magnesium	8-12mEq	<u>14 - 21</u>	<i>by 2</i>	<u>8</u> mEq
calcium	2-5 mEq	<u>3 – 8</u>	<i>to get</i>	<u>2.3</u> mEq
phosphate	15-25mMol	<u>26 - 44</u>	<i>amt/bag</i>	<u>18</u> mMol

*chalk test: (18)(2) + 2.3 = 38.3 so OK***9. Calculate the volume of each electrolyte solution that you will add**

sodium chloride 23.4% (4mEq/ml)

volume to add10.0 ml

sodium acetate 16.4% (2mEq/ml)

0.0 ml

potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml

6.0 ml

potassium chloride 2mEq/ml

4.3 ml

magnesium sulfate 4mEq/ml

2.0 ml

calcium gluconate 10% (0.465mEq/ml)

5.0 ml**infusion rate:** 83 ml/hr *2000 ml ÷ 24 hrs = 83 ml/hr*

TPN Worksheet using pumpage: 42 sex: Fheight: 169 cmABW: 67 kgIBW: 60 kgfeed weight: 63 kg*anything 60-67 would be fine here***Targets:****2. Daily fluid needs.**

>20 kg: 1500ml + (20 ml)(W - 20 kg) 2360

calculated target: 1900 – 2300 ml/day

30 - 35 ml/kg/day 1890 - 2205

2. Protein requirements.

normal, unstressed individual: 0.8g/kg/day

calculated target: 63 – 75 g protein/dayhospitalized patient: 1-1.2g/kg/day*will specifically choose 70*

stressed patient: 1.5-2g/kg/day

3. Non-protein calories $BEE_{men} = 66.67 + 13.75(W) + 5.0(H) - 6.76(A)$ calculated target: 1800 kcals/day $BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ 1385activity factors: confined to bed: 1.2, out of bed: 1.3stress factors: surgery: 1.2; infection: 1.4; trauma: 1.5; burns: 1.7 *1.0 – 1.1*

TDE = (BEE) (activity factor) (stress factor) (1385)(1.2)(1.0 – 1.1) = 1660 – 1830 kcals/day

Amounts:**4. Total TPN volume** 2000 ml/day; volume for each TPN: 2000 ml/bag; # bags/day: 1**5. Protein Volume** choose one:

27.5g in 500ml 5.5% AA

42.5g in 500ml 8.5% AA

50g in 500ml 10% AA or

10% AA calculated volume: 700 ml*(70 g/day)(100 ml/10 g) = 700 ml***6. Dextrose volume** (3.4 kcals/g) choose one3.5 mg/kg/min = 317 g/day

100g in D20W 500ml

250g in D50W 500ml

350g in D70W 500ml or

D70W calculated volume: 450 ml*(317 g/day)(100 ml/70 g) = 453 ≈ 450ml**(450 ml)(70 g/100 ml)(3.4 kcals/g) = 1071 kcals from CHO***7. Fat volume** (9 kcals/g) choose one:*1800 kcals – 1071 CHO kcals = 729 kcals to give as fat*

550kcals/500ml 10% lipid

900kcals/ 500ml of 20% lipid or

*(729 kcals fat)(1 g fat/9 kcals)(100 ml/20 g fat) = 405 ml 20% fat*20% lipid calculated volume: 405 ml plus sterile water volume: 379 ml*2000ml – 700ml AA – 450 ml CHO – 405 ml fat = 445 ml remaining***Electrolytes:***66 ml given as e'lytes so 379 given as water***8. Daily electrolyte needs** total amt of kcals/day from fat and dextrose: 1071 + 729 = 1800 kcals (40% fat)

	<u>amt/1000 calories</u>	<u>(amt)(# daily cals)/1000</u>	<u>amount/bag</u>
sodium	40-50 mEq	<u>72 – 90</u>	<u>80</u> mEq
potassium	40mEq	<u>72</u>	<u>72</u> mEq
magnesium	8-12mEq	<u>14 – 21</u>	<u>16</u> mEq
calcium	2-5 mEq	<u>3 – 9</u>	<u>4.65</u> mEq
phosphate	15-25mMol	<u>27 – 45</u>	<u>36</u> mMol

*chalk test: (36)(2) + 5 = 77 ÷ 2 ≈ 39/L so OK***9. Calculate the volume of each electrolyte solution that you will add**volume to add

sodium chloride 23.4% (4mEq/ml)

20.0 ml

sodium acetate 16.4% (2mEq/ml)

0.0 ml

potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml

12.0 ml

potassium chloride 2mEq/ml

9.6 ml

magnesium sulfate 4mEq/ml

4.0 ml

calcium gluconate 10% (0.465mEq/ml)

10.0 ml

vitamins

10.0 mltotal: 66 ml**infusion rate:** 83 ml/hr

