

5. A 41yo, 134 lb, 5' 5" female is admitted for surgical removal of a large adrenal tumour. She is to be placed on TPN in anticipation of a prolonged NPO post-operative course. Labs are:

sodium	139 mEq/L	normal range 135 – 150 mEq/L
potassium	3.7 mEq/L	normal range 3.5 – 5.0 mEq/L
chloride	102 mEq/L	normal range 100 – 106 mEq/L
bicarbonate	28 mEq/L	normal range 24 – 30 mEq/L
BUN	12 mg/dL	normal range 8 – 20 mg/dL
creatinine	0.6 mg/dL	normal range 0.6 – 1.2 mg/dL
glucose	157 mg/dL	normal range 70 – 110 mg/dL, fasting
calcium	10.1 mEq/L	normal range 8.5 – 10 mEq/L
phosphate	1.6 mg/dL	normal range 2.6 – 4.5 mg/dL
magnesium	1.7 mEq/L	normal range 1.8 – 2.5 mEq/L
albumin	3.1 g/dL	normal range 3.5 – 5 g/dL (long-term nutritional status)

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

Analysis of patient situation:

- She is post-surgical and the surgery was more than minor surgery but probably not at the level of trauma, so probably needs a stress adjustment of 1.2 – 1.4.
- Her ABW = 61 kg and IBW = 57 kg, so a feed weight could be anything at either end or between these numbers. In this case I will use her IBW as her feed weight.
- Her calculated creatinine clearance is anywhere from 66 – 110 ml/min/ depending upon whether you correct the serum creatinine to 1.0 or leave it as it is. Either number indicates that her kidneys are in good shape and as far as you know she doesn't have any concomitant volume-sensitive disease states so you don't need to worry about volume overload.
- Her albumin is a little low. Her calcium corrects to a number that is high. Hypercalcemia (high serum calcium concentrations) is relatively common with some malignancies. We hope that removal of the tumour will allow normalization of her serum calcium, but will go on the low end of the calcium recommendations; some pharmacists may choose to omit the calcium entirely until normalization occurs and this is also an option.
- Her phosphate is a bit low so may choose a phosphate amount in the higher end of the recommended range.
- Her chloride and her bicarb are fine, so there is no need to worry about acidosis or alkalosis. Can give sodium as the chloride salt.

TPN Worksheet using pre-set volumesage: 41 sex: Fheight: 165 cmABW: 60 kgIBW: 57 kgfeed weight: 57 kg*anything 57-60 would be fine here***Targets:****1. Daily fluid needs.**

>20 kg: 1500ml + (20 ml)(W - 20 kg) 2240

calculated target: 1700 – 2200 ml/day

30 - 35 ml/kg/day 1710 - 1995

2. Protein requirements.

normal, unstressed individual: 0.8g/kg/day

calculated target: 68 – 80 g protein/day

hospitalized patient: 1-1.2g/kg/day

stressed patient: 1.5-2g/kg/day *1.2 – 1.4 since she's between hospitalized and stressed***3. Non-protein calories** $BEE_{men} = 66.67 + 13.75(W) + 5.0(H) - 6.76(A)$ calculated target: 2000 kcals/day $BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ 1325activity 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)(1.2 – 1.4) = 1900 – 2200 kcals/day

Amounts:**4. Total TPN volume** 1700 ml/day; volume for each TPN: 1000 ml/bag; # bags/day: 1.7*she'll be getting fat separately, so went with lower end of volume target***5. Protein Volume** choose one:

27.5g in 500ml 5.5% AA

42.5g in 500ml 8.5% AA
72 g/day

50g in 500ml 10% AA or

6. Dextrose volume (3.4 kcals/g) choose one3.5 mg/kg/min = 287 g/day = 143 g/bag

100g in D20W 500ml

250g in D50W 500ml

350g in D70W 500ml or

*50% is theoretically too high, but if we go with 20%, she would have to get 71% of her calories from fat, which is too high. In this case, then, we'll use the higher sugar amount (5.2 mg/kg/minute) and watch her chloride/bicarb concentrations to see if she becomes acidotic. (250 g/bag)(1.7 bags/day)(3.4 kcals/g) = 1445 kcals CHO**2000 kcals – 1445 kcals CHO = 555 kcals to give as fat***7. Fat volume** (9 kcals/g) choose one:550kcals/500ml 10% lipid

900kcals/ 500ml of 20% lipid

Electrolytes:**8. Daily electrolyte needs** total amt of kcals/day from fat and dextrose: 1445 + 550 = 1995 kcals (28% fat)

	<u>amt/1000 calories</u>	<u>(amt)(# daily cals)/1000</u>		<u>amount/bag</u>
sodium	40-50 mEq	<u>80 - 100</u>	divide	<u>52</u> mEq
potassium	40mEq	<u>80</u>	each	<u>47</u> mEq
magnesium	8-12mEq	<u>16 - 24</u>	by 1.7	<u>12</u> mEq
calcium	2-5 mEq	<u>4 - 10</u>	to get	<u>2.3</u> mEq
phosphate	15-25mMol	<u>30 - 45</u>	amt/bag	<u>21</u> mMol

*chalk test: (21)(2) + 2.3 = 44.3 so OK***9. Calculate the volume of each electrolyte solution that you will add**

	<u>volume to add</u>
sodium chloride 23.4% (4mEq/ml)	<u>13.0</u> ml
sodium acetate 16.4% (2mEq/ml)	<u>0.0</u> ml
potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml	<u>7.0</u> ml
potassium chloride 2mEq/ml	<u>8.0</u> ml
magnesium sulfate 4mEq/ml	<u>3.0</u> ml
calcium gluconate 10% (0.465mEq/ml)	<u>5.0</u> ml

infusion rate: 71 ml/hr *1700 ml ÷ 24 hrs = 71 ml/hr*

TPN Worksheet using pumpage: 41 sex: Fheight: 165 cmABW: 60 kgIBW: 57 kgfeed weight: 57 kg*anything 57-60 would be fine here***Targets:****1. Daily fluid needs.**

>20 kg: 1500ml + (20 ml)(W - 20 kg) 2240

calculated target: 1700 – 2200 ml/day

30 - 35 ml/kg/day 1710 - 1995

2. Protein requirements.

normal, unstressed individual: 0.8g/kg/day

calculated target: 75 g protein/day

hospitalized patient: 1-1.2g/kg/day

stressed patient: 1.5-2g/kg/day $1.2 - 1.4 = 68 - 80$ g/day**3. Non-protein calories** $BEE_{men} = 66.67 + 13.75(W) + 5.0(H) - 6.76(A)$ calculated target: 2000 kcals/day $BEE_{women} = 665.1 + 9.56(W) + 1.86(H) - 4.68(A)$ 1325activity 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)(1.2 - 1.4) = 1900 - 2200 kcals/day

Amounts:**4. Total TPN volume** 2000 ml/day; volume for each TPN: 2000 ml/bag; # bags/day: 1*I will use a larger amount here since fats will be included in TPN volume***5. Protein Volume**10% AA calculated volume: 750 ml $(75 \text{ g/day})(100 \text{ ml}/10 \text{ g}) = 750 \text{ ml}$ **6. Dextrose volume** (3.4 kcals/g)3.5 mg/kg/min = 287 g/day; 4 mg/kg/day = 328 g/dayD70W calculated volume: 460 ml $(320 \text{ g/day})(100 \text{ ml}/70 \text{ g}) = 457 \approx 460 \text{ ml}$ $(460 \text{ ml})(70 \text{ g}/100 \text{ ml})(3.4 \text{ kcals/g}) = 1095 \text{ kcals from CHO}$ $2000 \text{ kcals} - 1095 \text{ CHO kcals} = 905 \text{ kcals to give as fat}$ **7. Fat volume** (9 kcals/g) $(905 \text{ kcals fat})(1 \text{ g fat}/9 \text{ kcals})(100 \text{ ml}/20 \text{ g fat}) = 500 \text{ ml } 20\% \text{ fat}$ 20% lipid calculated volume: 500 ml plus sterile water volume: 210 ml $2000 \text{ ml} - 750 \text{ ml AA} - 460 \text{ ml CHO} - 500 \text{ ml fat} = 290 \text{ ml remaining}; 77 \text{ ml given as e'lytes so } 210 \text{ given as water}$ **Electrolytes:****8. Daily electrolyte needs** total amt of kcals/day from fat and dextrose: $1095 + 900 = 1995 \text{ kcals}$ (45% fat)

	amt/1000 calories	(amt)(# daily cals)/1000	amount/bag
sodium	40-50 mEq	<u>80 - 100</u>	<u>92</u> mEq
potassium	40mEq	<u>80</u>	<u>80</u> mEq
magnesium	8-12mEq	<u>16 - 24</u>	<u>20</u> mEq
calcium	2-5 mEq	<u>4 - 10</u>	<u>4.65</u> mEq
phosphate	15-25mMol	<u>30 - 50</u>	<u>39</u> mMol

*chalk test: $(39)(2) + 5 = 83 \div 2 = 41.5/L$ so OK***9. Calculate the volume of each electrolyte solution that you will add**

	volume to add
sodium chloride 23.4% (4mEq/ml)	<u>23.0</u> ml
sodium acetate 16.4% (2mEq/ml)	<u>0.0</u> ml
potassium phosphate: 3mMol phosphate/ml, 4.4 mEq potassium/ml	<u>13.0</u> ml
potassium chloride 2mEq/ml	<u>11.4</u> ml
magnesium sulfate 4mEq/ml	<u>5.0</u> ml
calcium gluconate 10% (0.465mEq/ml)	<u>10.0</u> ml
vitamins, other additives	<u>15.0</u> ml
total:	<u>77</u> ml

infusion rate: 83 ml/hr