Nutrition Support Calculations
WINTER 2013
Rachel Crawford

*See the calculations section at the end of this document for the full calculations *

1. Determine the following for Ensure at 68 ml/hour (Note: when working with volumes of formula for enteral formula, it is expressed in total volume/ml not as cans or ounces. For example: 1200 ml's, not 5 cans)
   a. Total volume: 1632 mL
   b. Total calories: 1730 Kcal
   c. Protein (grams): 62 g
2. Determine the following for Jevity1.2 at 120 ml/hour:
   a. Total volume (ml): 2880 mL
   b. Total calories: 3456 Kcal
   c. Total protein (g): 160 g
   d. Free water (ml): 2324 mL
   e. Fiber (g): 52 g
3. How much Perative would need to be delivered to provide about 2,500 calories and about 130 protein?
   Total volume in ml's: 1932 mL
4. Calculate the following for Procalamine at 100 ml x 24 hours.
   a. Protein (grams): 72 g
   b. Total calories: 598 Kcal
   c. Total non-protein calories (NPC): 310 Kcal
5. Calculate how much Impact is necessary to provide 80 grams of protein. What is the total volume, calories and free fluid that it would provide?
   a. Total volume (ml): 1429 mL
   b. Total calories: 1429 Kcal
   c. Free fluid (water) (ml): 1219 mL
6. How many cans of Nutren 2.0 are necessary to provide 1250 calories? How much protein does it provide ? How much free fluid? (when supplements are consumed PO, they are usually expressed in cans/day)
   a. # of cans: 2.5 cans
   b. Protein (g): 50 g
   c. Free Fluid: 438 mL
7. Determine the following for someone who consumed 3 and one-half cans of Boost.
   a. Calories: 840 Kcals
   b. Protein (g): 35 g
8. How much of the following nutrients would be provided in 2 Glucerna meals bars?
   a. Kcals: 420 Kcal
   b. Protein: 20 g
   c. Overall % of DV: 30%

9. For the following Standard TPN solution, calculate the requested information: 2800 ml of 50% CHO and 8.5% AA.
    a. Protein (grams): 119 g
    b. Total NPC: 2380 Kcal
    c. Total calories: 2856 Kcal
10. Calculate the nutritional provisions in a standard solution of 2,450 ml 50% CHO, 10% protein, and 10% lipids (500ml's) QOD
    a. Protein (grams): 123 g
    b. Total NPC: 2358 Kcal
    c. Total calories: 2848 Kcal
11. Calculate the following: 1,200 ml of 70% CHO; 1,000 ml of 8.5 % protein; and 20% lipids (in 500 ml bag) given QOD to a 74 kg person.
    a. Protein (grams): 85 g
    b. Total NPC (average/day): 3356 Kcal
    c. Total calories: 3696 Kcal
    d. Fat load: 0.76 g/kg
    e. CHO load: 7.9 mg/kg/min
    f. What is the max amount of CHO for this person: 746 g
12. MC is starting on TPN (wt. 61 kg). You determined his needs to be 2,650 kcals/day and protein needs at 91 grams. He will get 10% lipids 3 times/week. Write a TPN order using 60% dextrose and 8.5% AA (include protein calories) to meet his needs:
    a. Volume CHO (60%): 1005 mL
    b. Volume Pro (8.5%): 1071 mL
    c. Average daily lipid calories: 236 Kcal
    d. Fat load: 0.35 g/kg
    e. CHO load: 6.9 mg/kg/min
13. Design a TPN formula to provide 1840 calories and 65 grams of protein for a 59 kg person. Remember the minimum lipid requirements. Make sure the person receives adequate fluid.

	%	Volume (ml)	
CHO	D_{40} (40%)	850 mL	
Protein	8.5%	764 mL	
Fat	10%	Volume: 385 mL	Frequency: 2 bags 3 times a week
Fat load	0.7 g/kg		
CHO load	3 mg/kg/min		

14. JT is receiving both Procalamine and Jevity 1.0. He is tolerating Jevity at only 40 ml/hour which doesn't meet his protein needs of 90 grams. How much Procalamine does he need and at what rate over 24 hours to meet his total protein needs?
    a. Procalamine (grams protein): 47 g
    b. Procalamine (volume): 1621 mL
    c. Rate of Procalamine: 68 mL/hour
    d. Kcals provided by Jevity: 1018 Kcal
15. Find a product that will provide 1,200 calories and >60 grams pro in less than 1,000 ml and osmolality less than 600 mOsm. How much must be delivered?
    Diabetisource AC: 1,000 mL
16. Calculate the following for Jevity1.5 half strength (diluted in equal water—i.e. ½ of the total volume is added water) at 83 ml/hour over 22 hours.
    a. Calories: 1370 Kcal
    b. Protein: 58 g
    c. Total volume: 913 mL Jevity, 1826 mL total
    d. Free fluid from Jevity 1.5: 694 mL
    e. Total free fluid provided (added water plus Jevity free fluid): 1607 mL
17. Design a tailor-made formula providing 112 grams protein, 2,875 total calories, and 3,100 ml's total fluid (± 100 ml's) for an 89 kg person. Complete the table below.

	Initial Stock concentration	**Total grams**	**Total volume**
Amino acids	7.0%	112	1600 mL
Dextrose	D_{60} (60%)	513	855 mL
Fat	10%	62	621 mL
CHO load	4 mg/kg/min		
Fat load	0.69 g/kg		
Final AA concentration	3.6%		
Final dextrose concentration	16.7%		
Total final volume	3076 mL		

Calculations:

Nutrition Support Calculations

1. Ensure 68 mL/hour
   a) Total volume: $\frac{68\ mL}{hour} \mid 24\ hours = \boxed{1632\ mL}$
   b) Total Calories: $1632\ mL \mid \frac{1.06\ kcal}{mL} = \boxed{1730\ KCal}$
   c) Protein (g): $\frac{1632\ mL}{237\ mL/can} = 6.886\ cans \times 9\ g\ Protein/can = \boxed{62\ g}$
2. Jevity 120 mL/hour
   a) Total volume (mL): $\frac{120\ mL}{hour} \mid 24\ hours = \boxed{2880\ mL}$
   b) Total Calories: $2880\ mL \mid \frac{1.2\ kcal}{mL} = \boxed{3456\ KCal}$
   c) Total Protein (g): $2880\ mL \mid \frac{can}{237\ mL} = 12.152\ cans \times 13.2\ g/can = \boxed{160\ g}$
   d) Free water (mL): $2880\ mL \mid \frac{807\ g/mL/cc}{1000} = \boxed{2324\ g/mL/cc}$
   e) Fiber: $2880\ mL \mid \frac{1\ can}{237\ mL} = 12.152\ cans \times 4.3\ g/can = \boxed{52\ g}$
3. 2,500 calories w/ 130 g protein - Perative
   $2{,}500\ kcal \mid \frac{can}{1300\ kcal} = 1.92 \times 1000\ mL/can = \boxed{1923\ mL}$
   $1.92\ cans \times 66.7\ g\ Protein/can = 128\ g\ protein$ ✓
4. Procalamine at 100 mL x 24 hours
   a) Protein (g): $100\ mL \times 24\ hours = 2400\ mL$
   $\frac{2400}{1000} = 2.4\ L \times 30\ g\ Protein/L = \boxed{72\ g}$
   b) total Calories: $72\ g\ protein \times 4\ kcal = 288\ kcal\ from\ protein$
   $\frac{x}{2400\ mL} = 3\%$
   $x = 72\ g\ glycerol$ $72\ g\ glycerol \times 4.3\ g/kcal = \boxed{309.6\ kcal\ NPC}$
   $288 + 309.6 = \boxed{598\ KCal}$
   c) total Non-Protein calories (NPC):
5. 80 g protein from Impact
   a) $80\ g \mid \frac{1000\ mL}{56\ g} = \boxed{1428.6\ mL}$ = total volume (mL)
   b) Total Calories: $1.428\ L \times 1000\ kcal/L = \boxed{1428.6\ kcal}$
   c) Free water (mL): $1428\ mL \mid \frac{853\ mL}{1000\ mL} = \boxed{1219\ mL}$

6. Nutren 2.0 to provide 1250 Kcal. protein, free fluid

a) # of cans: $\frac{1250\ \text{Kcal}}{1500\ \text{Kcal}} \times \frac{1\ \text{can}}{} = \boxed{2.5\ \text{cans}}$

b) protein (g): $2.5\ \text{cans} \times \frac{20\ \text{g protein}}{\text{can}} = \boxed{50\ \text{g protein}}$

c) $2.5\ \text{cans} \times \frac{250\ \text{mL}}{\text{can}} = 625\ \text{mL} \times \frac{175\ \text{mL free water}}{250\ \text{mL}} = \boxed{438\ \text{mL}}$

7. 3½ cans Boost

a) total calories: $3.5\ \text{cans} \times \frac{240\ \text{kcal}}{\text{can}} = \boxed{420\ \text{kcal}}$

b) protein (g): $3.5\ \text{cans} \times \frac{10\ \text{g}}{\text{can}} = \boxed{35\ \text{g}}$

8. 2 Glucerna meals bars

a) $2\ \text{bars} \times \frac{210\ \text{kcal}}{\text{bar}} = \boxed{420\ \text{kcal}}$ = total kcal

b) Protein (g): $2\ \text{bars} \times \frac{10\ \text{g}}{\text{bar}} = \boxed{20\ \text{g}}$

c) Overall % DV: average of all % DV on bar = $\boxed{30\%}$

9. 2800 mL of 50% CHO, 8.5% AA

a) Protein (g): 2800 mL / 2 = 1400 mL

1400 mL × 0.085 AA = $\boxed{119\ \text{g protein}}$

b) Total NPC: 1400 mL × 0.5 CHO = 700

700 × 3.4 = $\boxed{2380\ \text{NPC}}$

c) Total kcal: 119 g protein × 4 kcal/g = 476 kcal

476 + 2380 = $\boxed{2856\ \text{kcal}}$

10. 2,450 mL, 50% CHO, ~~30%~~ 10% Protein, 10% lipids (500 ml's) QOD

a) Protein (g): 2,450 ÷ 2 = 1225 mL

1225 mL × 0.10 AA = $\boxed{122.5\ \text{g protein}}$

b) total NPC: 1225 mL × 0.5 CHO = 612.5 g

612.5 × 3.4 kcal/g = 2082.5 kcal from CHO

7 days / 2 = 3.5 550 kcal fat × 3.5 = 1925 kcal/week

1925 kcal/week ÷ 7 = 275 kcal/day from fat

2082.5 + 275 = $\boxed{2358\ \text{NPC}}$

c) Total kcal: $\frac{1225\text{ g protein} \mid 4\text{ kcal}}{\text{g}} = 490$ kcal

490 + 2358 NPC = **2848 kcal**

11. 1,200 mL, 70% CHO; 1,000 mL 8.5% Protein; 20% lipids QOD

Patient = 74 kg

a) Protein (g): 1000 mL × 0.085 = **85 g**

b) total NPC: 1200 × 0.7 = 840 g CHO × 3.4 kcal/g = 2856 kcal from CHO

1000 kcal from fat × 3.5 = 3500 / 7 = 500 kcal

2856 + 500 = **3356 NPC**

c) total kcal: 85 g protein × 4 kcal/g = 340 + 3356 = **3696 kcal**

d) fat load: = $\frac{\text{g}}{\text{kg}}$

112 g × 3.5 = 392 g ÷ 7 = 56 g/day

fat load = $\frac{56\text{ g}}{74\text{ kg}}$ = **0.76 g/kg**

e) CHO load: 840 g CHO/day × 1,000 = 840,000 mg CHO

CHO load = mg CHO/Kg/min = 7 mg/Kg/min = max

840,000 / 74 / 1440 = 7.88 = **7.9 mg/Kg/min**

f) max CHO load: 7 / 74 / 1440 = 745.9 = **746 mg/Kg/min**

12. MC = 61 kg. Needs 2,650 kcal/day w/ 91 g protein. 10% lipids 3 x/week. Use 60% dextrose, 8.5% AA

a) Volume CHO (60%): fat / 550 kcal from fat × 3 = 1650 kcal/week ÷ 7 = 236 kcal/day

2650 − 236 = 2414 kcal

91 g protein × 4 kcal/g = 364 kcal

2414 kcal − 364 kcal = 2050 kcal

X (3.4) = 2050 kcal

X = 603 g CHO / 0.6 = **1005 mL CHO**

b) Volume protein: $\frac{91\text{ g}}{0.085}$ = **1071 mL Protein solution**

c) 550 kcal from fat × 3 = 1650 kcal/week ÷ 7 = **236 kcal/day**

d) fat load: $\frac{g}{kg}$ 50 g fat × 3 = 150 ÷ 7 = 21.4

$\frac{21.4}{61\ kg} = \boxed{0.35}$

e) CHO load: mg/kg/min

603 g CHO × 1,000 = 603,000 / 61 kg / 1440 = 6.86 = **6.9 mg/kg/min**

13. Patient = 59 kg. Needs 1840 kcal, 65 g protein

*I Chose a 8.5% AA Solution and D40 Solution with a CHO load of 4 mg/kg/min and a 10% lipid solution

fluid

~~65~~ 59 × 30-35 ml/kg = 1950-2275 mL/day

Protein

$\frac{65}{0.085} = \boxed{764\ mL\ 8.5\%\ AA}$ 65 g protein × 4 kcal/g = 260 kcal from protein

CHO CHO load = **4 mg/kg/min**

4 × 59 kg × 1440 = 339706 mg ÷ 1,000 = 340 g

340 g × 3.5 kcal/g = 1155 kcal from CHO

$\frac{340\ g}{0.4} = \boxed{850\ mL\ 40\%\ dextrose\ solution}$

1840 kcal − 1155 kcal from CHO − 260 kcal from protein = 425 kcal

Fat

$\frac{425\ kcal}{550\ kcal/bag} = 0.77\ bags/day \times 500\ mL/bag = \boxed{385\ mL/day}$

425 kcal/day × 7 = 2975 kcal/week = 6 bags/week or **2 bags 3 x a week**

fat load = $\frac{g}{kg}$ /day

$0.77 \times 50\ g = \frac{39\ g\ fat}{59\ kg} = 0.66 = \boxed{0.7\ g/kg}$

fluid 764 mL + 850 mL + 385 mL = **1999 mL**

14. Jeuity 1.0 at 40 mL/hour. needs 90 g protein w/ Procalamine

a) Protein (g) from Procalamine:

40 mL Jeuity / hour × 24 hours = 960 mL/day

$\frac{960\ mL}{1000\ mL} \mid \frac{44.3\ g\ Protein}{} = 43\ g$ protein from Jeuity

90 − 43 g = **47 g protein from Procalamine**

b) 90 − 43 g = 47 g protein needed $\mid \frac{1000\ mL}{29\ g} = \boxed{1621\ mL\ Procalamine}$

c) Rate of Procalamine: $\frac{1621\ mL}{24\ hours} = \boxed{68\ mL/hour}$

d) Kcal from Jevity: $\frac{960\ mL}{} \left| \frac{1.06\ kcal}{mL} \right. = \boxed{1018\ kcal}$

15. needs 1,200 Calories, 60 g protein in less than 1,000 mL with Osmolality less than 600 mOsm.

Diabetisource AC = Osmo = 450 ✓

$\frac{1,200\ kcal}{} \left| \frac{mL}{1.2\ kcal} \right. = 1000\ mL$ $\qquad$ $\frac{1000\ mL}{} \left| \frac{60\ g}{1000\ mL} \right. = 60\ g\ protein$ ✓

1,000 mL must be delivered ✓

16. Jevity 1.5 half strength at 83 mL/hour for 22 hours

a) Calories: 83mL × 22 hours = 1826 mL ÷ 2 = 913 mL Jevity 1.5

$\frac{913\ mL}{} \left| \frac{1.5\ kcal}{mL} \right. = \boxed{1370\ kcal}$

b) Protein (g): $\frac{913\ mL}{} \left| \frac{63.8}{mL\ 1,000} \right. = \boxed{58g}$

c) total volume: 83 mL × 22 hours = 1826 mL ÷ 2 = 913mL Jevity 1.5

d) free fluid: $\frac{913\ mL}{} \left| \frac{760\ mL}{1000\ mL} \right. = \boxed{694\ mL\ free\ water}$

e) total free fluid: 694 mL + 913 mL water = 1607 mL

17. 112 g protein, 2,875 kcal, 3,100 mL total fluid ± 100 for 89 kg patient.

* I Chose a 7.0% AA Solution, D_{60} Solution with CHO load 4 mg/kg/min, and a 10% fat Solution

protein

$\frac{112\ g}{0.07} = \boxed{1600\ mL\ AA\ 7.0\%}$ $\qquad$ $112g \times 4\ kcal/g = 448\ kcal$

CHO

$4 \times 89 \times 1440 = 512640 \div 1,000 = \boxed{513\ g\ CHO}$

$\frac{513\ g\ CHO}{0.6} = \boxed{855\ mL\ D_{60}}$ $\qquad$ $513 \times 3.4\ kcal/g = 1744\ kcal$

2,875 total kcal − 448 kcal from protein − 1744 kcal from CHO = 683 kcal left

Fat

$\frac{683\ kcal}{550} = 1.24\ bags/day \times 500\ mL/bag = \boxed{621\ mL\ from\ 10\%\ fat\ solution/day}$

1.24 × 50g = 62g/day

Fat load: $\frac{62g}{kg} = \frac{62g}{89kg} = \boxed{0.69\ g/kg}$

total Volume: 1600 mL 70% AA + 855 mL D_{40} + 621 mL 10% Fat = **3076 mL**

final AA [ ] = $\frac{112\ g}{3076\ mL}$ = **3.6%**

final CHO [ ] = $\frac{513\ g}{3076\ mL}$ = **16.7%**