

NUT 116BL  
Winter 2013

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Section: 10 AM

Case Study #2  
Due 2/11/13  
50 points

Case A

Present illness: Ms. J is a 24 yo female who previously had a partial colectomy (rectum was preserved) due to ulcerative colitis. She visited her MD one week ago with c/o increasing fatigue, diarrhea, rectal bleeding, abdominal pain and weight loss symptoms over the past six months. She was diagnosed with exacerbation of ulcerative colitis and started on methylprednisone. Ms. J's diarrhea and bleeding continued without improvement and the MD now plans to do surgery to remove the ulcerated descending colon and rectum with the formation of a colostomy. It is anticipated that Ms. J will have ileus and the GI tract will need to be bypassed for 7-9 days following surgery.

Nutrition Consult: MD has requested an RD consult for the initiation of parenteral nutrition. Ht: 67" Wt (UBW)

166 lbs (1/23) 152 lbs (2/01) 142 lbs

Labs 2/01/2013  
Albumin 2.2 g/dL Prealbumin  
12 mg/dL Hs-CRP 10 mg/dL  
BUN 24 mg/dL  
Cr 1.4 mg/dL  
Osm 310  
Ca 7.8 mg/dL K 5.2  
mEq/L Na 149  
mEq/L  
HCO3 19 mEq/L  
CO2 32 mmHg Cl  
108 mEq/L Hgb 10  
g/dL Hct 34 %  
pH 7.4

1. Provide an assessment of Ms. J's nutrition status and risk factors. Be sure to include all components required in the "A" portion of an ADIME note. (4 points)

A: J. 24 y/o female. Complaints of fatigue, diarrhea, rectal bleeding, abdominal pain, and weight loss over past 6 mos. Dx exacerbation of Ulcerative Colitis- taking methylprednisone. In prep for ileus. Parenteral nutrition req.

Assessment	Lab Values			Requirements
J, female				
24 y/o	Albumin	2.2g/dl	Low, inflammation, malnutrition, chronic bowel disease	Energy: 1800 kcal/day * IF: 1.0-1.3
Height: 67 in., 170.18 cm, 1.70m	Prealb	12 mg/dl	Low- inflammation, Protein and kcal malnutrition, infection, illness	Fluids: 1800 mL/day
CBW, 142#, 64.54kg	HS-CRP	10 mg/dl	High -Indicative of inflammation or disease	Protein: 71g/day
UBW: 166#, 75.45kg	BUN	24mg/dl	High-High protein breakdown/ dehydration	* Used Mifflin- St. Jeor: most accurate for obese and overweight individuals(NPR online pg. 3)
%UBW: 84.54%	Cr	1.4mg/dl	High- Possibly indicative of muscle wasting	* Used IBW to calculate needs
IBW: 135# (61.36kg)	Osm	310	High- dehydration, hyperglycemia, hypervolemia	* Used AF 1.2 (Confined to bed post surgery) (NPR online pg. 9)
IBW range: 127.59 - 142.41#, (64.73-58.00kg)	Ca	7.8 mg/dl	Low- hyperalbumina	* Used IF 1.0-1.3 based on post-op surgery
UBW BMI: 26.01 (overweight)	K	5.2 mEq/L	High- electrolyte imbalance	* Protein requirements based on post-operative amounts (1.0-1.1) -NPR online pg. 10
Current BMI: 22.33 (normal)	Na	149 mEq/L	High- electrolyte imbalance	* NTP pg. 40, A-90
Current %IBW: 105%	HCO3	19 mEq/L	Low- acid base imbalance	
Usual % IBW: 123% IBW	CO2	32 mmHg	High- metabolic alkalosis	
	Cl	108 mEq/L	High- metabolic alkalosis	
	Hgb	10 g/dL	Low- anemia, blood loss, low protein in diet	
	Hct	34%	Low- anemia, blood loss, low diet protein	

2. Provide one complete nutrition diagnostic statement (a PES statement) for Ms. J at this point in time. (3 points)

Altered GI function (NC-3.2) R/T alteration in GI tract structure secondary to partial colectomy and complications from ulcerative colitis AEB abnormal anemia lab reports (Hgb 10g/dL, Hct 34%), patient report diarrhea and fatigue, and weight loss of 6.5% in 9 days.

IDNT pg. 149

3. The MD has requested an RD consult for the initiation of parenteral nutrition. Please provide a complete recommendation for the final PN prescription. Hint: Consider location of venous access and check that your recommendations do not exceed the maximum oxidation rates for CHO or lipids. (10 points)

PN monitored via central access (superior vena cava) to provide 71g protein, 288g dextrose and 49g of 3% lipid with 65mEq K, 65 mEq Na, 30 mmol Phosphorus, 18 mg Mg and 10mEq calcium with bicarbonate and acetate to balance with 1 vial of multiple vitamin infusion and 1 vial multiple trace element infusion in a volume of 1800 mL/day to run at 75mL/hr x 24 hrs. Provide 1L parenteral formula to run over 24 hours with an advancement to goal rate of 1.8L on day 2.

4. Describe the metabolic complications that may occur when PN is initiated for Ms. J and explain how these complications can be prevented and/or managed. (2 points)

Refeeding syndrome is a severe issue that can occur when Ms. J is re-fed. This term describes the metabolic alterations that occur during the nutritional repletion of a patient. When a patient is re-fed too rapidly with carbohydrates, this results in a shift from ketones to glucose as the primary source of energy. The glucose metabolism that occurs requires large amounts of particularly phosphorus, and also magnesium, potassium, and thiamin requirements as the patient shifts from catabolic to anabolic. If these needs are unmet, a significant drop in serum levels of phosphorus occurs, which result in impaired cardiac function and if severe, death. Cardiac abnormalities are associated with hypomagnesemia and hypokalemia as well. Fluid retention and hypovolemia also may occur. Thus, in order to avoid the refeeding syndrome and its associated complications, it is imperative to start feedings slowly and avoid overfeeding (1L 1<sup>st</sup> day, 2L 2<sup>nd</sup> day). Additionally, it is necessary to monitor serum levels of phosphorus, magnesium, and potassium, and to provide supplementation as needed until Ms. J receives goal feedings.

To manage and monitor Ms. J's medical stability, testing for hyperglycemia should occur 3-4 times per day, and measurements of phosphorus, BUN, creatine, and magnesium should occur daily. At the baseline, draw serum triglycerides should assess lipid tolerance, and they may be drawn weekly thereafter if abnormal levels present. It is also imperative to monitor electrolyte levels by taking lab values of potassium and sodium. Additionally, there may be elevations in liver enzymes due to extensive parenteral nutrition feedings. These can be monitored by adjustments in the lipid to dextrose ratio, and reduction in kcals.

Infection/sepsis is another primary issue that Ms. J can suffer from when starting on Parenteral Nutrition Support. In order to avoid infection, it is important that we very carefully monitor the PN solution, because infections could be caused by solutions that are not prepared correctly. Additionally, it is imperative to very closely monitor in times of increased risk for infection- while the access site is being placed or while dressing around a line is being changed. Prevention of infection/sepsis is particularly important for Ms. J because she already has HS C-reactive protein levels that may indicate inflammation and possible infection. Additionally, because she is taking methylprednisone, which suppresses her immunity, and is getting PN through a central catheter and will be on prolonged support, it is necessary to constantly take precautions in monitoring her PN feeding.

5. What is the appropriate dietary progression when Ms. J is ready to transition to an oral diet? (2 points)

The key to avoiding complications so Ms. J can comfortably and smoothly transition to an oral diet is by stopping Parenteral Nutrition in a gradual, stepwise fashion. It is important to reduce the rate by half every 1-2 hours, or switch to a dextrose IV. After Ms. J has returned bowel sounds and gut functioning, she can then transition to enteral feeding and/or oral feeding. She should progress from Clear liquid → Full liquid → Soft → Regular. The diet should be low-residue with 4-6 small feedings each day, to avoid discomfort and gastric pain. For the first 6-8 weeks after recovery foods such as nuts and seeds as well as skins of fruits, tough fibrous meats, and vegetables such as spinach, corn, and peas should be avoided. To ease her discomfort, Ms. J may want to try yogurt with live active cultures, parsley, buttermilk to minimize odor and applesauce, pasta, and cheese to thicken stool. As she eats by mouth, it is important that she thoroughly chews her food thoroughly and takes in adequate fluids to aid with the digestion process.

NTP pg. 423-424

### Case B

You are the RD in the burn unit of your hospital. You have just been consulted for an initial nutrition assessment of Mr. R, and you will be responsible for follow-up assessments, planning, and monitoring throughout his hospitalization.

*Initial admission information available from the medical chart:*

Mr. R, a 32 yo firefighter, was severely burned over much of his trunk, arms, back and legs. After emergency first aid, he was transported by ambulance to the university hospital burn center. Mr. R was in shock when he was admitted.

Physical exam: Pt experiencing severe pain but no respiratory distress. Unburned skin is pale and cool. BP: 90/60; P 110 and weak; RR 22 and regular, T 99.5 degrees F;  $V_e$  7.5 L/min; Ht: 5'10"; pre-injury wt: 174#

Laboratory: The following tests were ordered: CBC, blood type and cross-match, Chem 20 screening panel, ABG's, and UA.

Impression: 25% TBSA, partial and full-thickness burns over lower part of face, neck, upper back, arms, hands, and upper thighs.

Plan: IV therapy was initiated with Ringer's lactate. A Foley catheter was inserted. Urinary output, P, and BP monitored hourly. NPO x 24 hrs. NG tube placed for stomach decompression. Maalox q 2 hrs through NG tube. Propofol @26ml/hr x 24 hours

Initial hospital course:

- As soon as the shock was under control, Mr. R's wounds were washed, debrided, and dressed with silver sulfadiazine using fine-mesh gauze. He was given a tetanus shot and 600,000 units of procaine penicillin were administered q 12 hrs.
- After 24 hrs, Mr. R's UO was 40-50 ml/hr and bowel peristalsis had returned.
- By 36 hrs, a nasoduodenal tube was placed and position of the tip verified to be past the ligament of Trietz. Continuous tube feeding was initiated using Osmolite® 1 Cal at a rate of 40 ml/hr. The rate was increased to 60 ml/hr over the next 12 hrs.
- At 48 hrs after injury and hospital admission, the current diet order is: Osmolite® 1 Cal @ 60 ml/hr, plus PO as tolerated.

## Initial Assessment

Using the above information, assess the patient's nutritional needs at the time of the initial consult, on day 2 of admission.

1. The metabolic stress response has three phases: ebb, flow, and recovery. Define these phases and describe how they correspond to Mr. R's hospital course in terms of nutrient metabolism and energy requirements. (6 points)

The ebb phase is the body's initial reaction to stress and occurs 2-48 hours after the burn, where Mr. R is feeling the initial shock, which results in hypervolemia, as evidenced by Mr. R's BP of 90/60 when he first came in. In this phase there is also decreased oxygen available to the tissues as well as decreased urinary output, and decreased cardiac output, as evidenced by his increased pulse of 100. There is a decrease in metabolic rate at this time due to the body's reaction to the increased endocrine hormones, cortisol, catecholamines, and glucagon. The overall nutritional goals in the ebb phase for Mr. R are to minimize damage that could potentially result in organ failure by meeting his fluid and nutritional needs as tolerated by the patient.

In the flow phase, which occurs over 0-5 days following the initial injury, cardiac output and blood pressure rates increase, enabling the patient to recover from the hypovolemic shock that occurred in the ebb phase. Mr. R had increased urinary output and bowel peristalsis after 24 hours, which demonstrates that he has begun to overcome the hypovolemic shock. Additionally, Metabolic rate also increases from the increase in catecholamines, cortisol and glucagon endocrine hormones, resulting in hypermetabolism and catabolism. There is rapid weight loss in this phase as the patient loses muscle and becomes hyperglycemic and hypertriglyceridemic. Gluconeogenesis occurs rapidly in this phase. During the flow phase, it is essential that the dietitian provide Mr. R with adequate kcals, proteins, and micronutrients to limit/minimize catabolism. Adequate nutrition support will attempt to reverse the repercussions of the ebb phase and counteract Mr. R's catabolism and hypermetabolism so he can move on to the recovery phase. **Mr. R, as evidenced by his time past initial injury and his lab values, has just reached the flow phase and, when on adequate nutrition support, will proceed to the recovery phase.**

During the recovery phase, which occurs 6-10 days after the initial trauma, Mr. R will begin to return to nutritional repletion and medical stability. As proper nutrition care is implemented in the form of adequate energy and micro and macronutrients, the patient will return to an anabolic state and his lean body mass will be restored. His blood glucose levels will also return to the normal range. Due to the counter regulatory hormones stabilizing back to normal rates, Mr. R's metabolism will also normalize.

2. Calculate Mr. R's estimated energy needs on day 2 of hospitalization, using the following methods. Show your work. (3 points)

a. Curreri formula :

Energy needs:  $(25 \times \text{Body weight in kg}) + (40 \times \text{TBSAB})$   
 $(25 \text{ kcal} \times 75.54\text{kg}) + (40 \times 25)$

**2889 kcals/day**

b. Penn State 2003 equation

$\text{RMR} = 0.85(\text{BMR}) + 33(\text{Ve}) + 175 (\text{Tmax}) - 6433$   
 $\text{RMR} = 1511.45 + 247.5 + 6562.5 - 6433$

**1889 kcals/day**

c. Mifflin-St. Jeor equation

AF= 1.2 (confined to bed) IF = 1.5-1.85 (20-40% TBSAB) \*NPR online pg. 10

Estimated Energy Needs:  $(9.99 \times \text{weight (kg)}) + (6.25 \times \text{ht (cm)}) - (4.92 \times \text{age}) + 5 \times \text{AF} \times \text{IF}$   
 $(9.99 \times 75.45) + (6.25 \times 177.8) - (4.92 \times 32) + 5 \times \text{AF} \times \text{IF}$

$1712 \times 1.2 \times 1.5 = 3082$

$1712 \times 1.2 \times 1.85 = 3800$

**3082 – 3800 kcals/day**

d. Comment on whether these three estimates differ or are similar. How do they compare to the 22-25 kcal/kg ASPEN guidelines? Which would you use as your actual energy recommendation for this patient? Explain your choice (2 points).

These three estimates are very different. The MSJ takes into account activity and injury factor, and is generally most accurate for overweight and obese patients, giving us a high total caloric intake of 3440kcal. The Penn State Formula takes into account his ventilator dependency and is best for overweight patients who are critically ill. Penn state formula gives us 1889kcal/day. The Curreri formula, however, is best for critically-ill burn patients and gives us a reasonable estimate that is between the MSJ and Penn state averages. **With Curreri, we take into account TBSAB and get 2890 kcal/day. This is best for Mr. R who is a burn patient with 25% burn, and this is what I am using as my actual energy recommendation.**

ASPEN guidelines of 22-25kcal/kg/day, when used with his ideal body weight, would only give us an average of 1645 kcal/day. When used with his CBW as is standard (NTP pg. 688), he would be at an even greater deficit. Given that the standard ASPEN formula does not take into account the fact that Mr. R has had exogenous protein loss and his 25% TBSAB, it is imperative that we bring him back to an anabolic state. With critical thinking, it is clear that anything less than 2000 kcal will not suffice for a 6'10 man in a catabolic state and 25% TBSAB.

3. Does his current enteral nutrition prescription meet his estimated needs? Would you recommend any changes to the current order? If so, how would you change it? (4 points)

Mr. R's current recommendations **do not** meet his needs. With the Osmolite formula 1 kcal @ 60 ml/hr x 24 hours, Mr. R is getting ~1530 kcal from formula as well as 690 kcal from Propofol- for a total of ~2200 kcal and 2200ml fluid. With the Osmolite formula he is getting 44.3g protein/L for a total of 64g protein. Thus, **he is receiving only ~12% of his calories from protein.** As a 25% TBSAB patient, Mr. R should be receiving 20-25% of his calories as protein (NTP 686). Thus, Mr. R's total energy needs are ~2300 kcal with ~150g of protein for 20-25% of his caloric intake. He is not getting sufficient protein or fluids with his current formula, so **I would switch to a different formula that would give him 20-25% of his calories from protein and add additional water in flushes to meet his fluid needs .**

**At this point, in order for Mr. R to meet his needs, I would give him Crucial 1.5kcal @60ml x 24 hrs and provide 7 additional 160ml water flushes throughout the course of the day (every 3-4 hours).**

### Ongoing Assessments

It is now day 10 post-injury and you have the following additional information available:

- Some wounds are still open (new estimate: 15% TBSAB). More surgery for skin grafting is scheduled in the next week. No longer receiving propofol.
- Diet order EN (from above) plus PO intake as tolerated.
- You have conducted kcal counts for the past 3 days. They show that pt is taking 150-200 kcal/day by oral intake, in addition to TF. Nursing I/O's indicate that the full TF volume is being delivered each day.
- The patient tells you it is difficult for him to eat by mouth due to pain, and that he doesn't have much of an appetite.
- Current BW: 70 kg, no significant edema
- Current labs: albumin 2.7 g/dL, prealbumin 8 mg/dL, UUN 23 g/24 hr

4. Calculate Mr. R's nitrogen balance at day 10 and interpret the results. (2 points)

$$1.06 \text{ kcal/mL} \times 60\text{mL} = 63.6\text{g}$$

$$60 \text{ mL Osmolite} \times 24 \text{ hrs} = 1440\text{mL} = 1.44\text{L}$$

$$1.44\text{L} \times 44.3\text{g} = 64\text{g Protein}$$

$$\text{N balance} = \text{protein intake (g)} / 6.25 - (\text{UUN} + 4)$$

$$\text{N balance} = 64 / 6.25 - (23 + 4) = 10.24 - 27$$

$$\text{N balance} = -16.76 = \sim -17$$

**\* Mr. R is in a catabolic state and is deficient by 17g protein each day. Thus, he is losing protein and muscle mass each day he is on this incorrect formula for his needs.**

5. Complete an ADIME note for your day 10 follow-up assessment of Mr. R.  
 Hints: Be sure to evaluate his current anthropometrics, current kcal/pro needs, adequacy of the current diet order (including both the TF and PO intake), and current labs. What do the anthropometric and biochemical data reveal? Is the current diet order adequate and realistic for the patient? Include *specific* nutrition support and monitoring recommendations for this patient at this point in time. (12 points)

A: Mr. R, 32 y/o Male dx 15% TBSA Burn. 10 day's post-injury, on Enteral Feeding with limited PO intake of 150-200kcal/day Patient reports difficulty eating by mouth due to pain and lack of appetite.

Assessment	Lab Values	Current Intake										
Mr. R, male  32 y/o  Height: 70 in., 177.80 cm, 1.78m CBW, 154#, 70kg UBW: 174#, 79.09kg %UBW: 88.50%  IBW: 166# (75.50kg) IBW range: 149.40-182.60#, (67.95-83.05 kg)  UBW BMI: 25.02 (normal) Current BMI: 22.10  Current %IBW: 92.72% Usual % IBW: 105%	<table border="1"> <tr> <td>TBSAB: 15%</td> <td>IF: 1.0-1.5</td> </tr> <tr> <td>Albumin: 2.7g/dl</td> <td>Low- inflammation, depleted protein stores</td> </tr> <tr> <td>Prealb: 8mg/dl</td> <td>Low- burns, protein energy malnutrition, inflammation</td> </tr> <tr> <td>UUN: 23g/24hr</td> <td>High- inadequate protein intake</td> </tr> <tr> <td>N balance: -17g</td> <td>Catabolic state</td> </tr> </table>	TBSAB: 15%	IF: 1.0-1.5	Albumin: 2.7g/dl	Low- inflammation, depleted protein stores	Prealb: 8mg/dl	Low- burns, protein energy malnutrition, inflammation	UUN: 23g/24hr	High- inadequate protein intake	N balance: -17g	Catabolic state	Osmolite 1 Cal @ 60ml/hr x 24 hrs TF: 1440 kcals/day PO: 150-200 kcals/day  Total Energy: 1590 - 1640 kcal/day Total Fluids: 1590 – 1640 mL/day Protein: 64g/day (~16% kcals)* CHO: 207g/day (~52% kcals)* Lipids: 50g/day (~28% kcals)*  * Percentage of kcals variable because we do not know nutritional content of PO intake. Because patient reports difficulty eating, we will assume the extra 4% kcals are CHO (liquids, soft foods- oatmeal).
TBSAB: 15%	IF: 1.0-1.5											
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N balance: -17g	Catabolic state											

Requirement	
Energy: 2500 kcal/day * IF: 1.0-1.5 * AF: 1.2  Fluids: 2500 ml/day  Protein: 145g/day	* Used Curreri formula- most accurate for burn patients * MSJ IF: Based on %TBSAB, AF (confined to bed) NTP pg .9 * Used IBW to calculate needs * Protein requirements based on 20-25% kcal needs NTP 685 * NTP pg. 40, A-90

D: Inadequate Protein Intake (NI-5.7.1) R/T increased protein needs due to 15% TBSAB and prolonged catabolism AEB current formula Osmolite 1 cal @60ml/hr x 24 hr w/protein intake 64g/day insufficient to meet estimated protein needs of 145g/day and negative nitrogen balance of -17 and UUN of 23g/24hrs.

I: **Recommendations:** Starting now, continue NG tube, change formula to Crucial 1.5kcal @ 70ml x 24 hr. Provide 6 additional water flushes of 200ml/day every 4 hours starting today. **Goals:** Mr. R will intake his required protein needs starting tomorrow. Within next 24 hours patient will be in anabolic state. In 3-days re-evaluate formula for EN based on new caloric needs as % TBSAB changes and PO intake increases. Within 6-weeks, patient will meet needs through PO alone.

M/E: **Monitor:** BUN, creatine, electrolytes, anemia lab values, Ins and Outs, weight, hydration, fluid status, vital signs, blood pressure, respirations and pulse, bowel function, and nitrogen balance. Measure Glucose levels, Liver function tests and triglyceride levels. Patient report of comfort with PO intake. **Follow up/Evaluation:** Within next 24 hrs, and daily thereafter evaluate BUN, creatine, electrolytes, anemia lab values, Ins and Outs, weight, hydration, fluid status, vital signs, blood pressure, respirations and pulse, bowel function, and nitrogen balance. Measure Glucose levels 3x/day until stable, Liver function tests and triglycerides evaluated weekly. Daily observation and monitoring to reassess nutrient needs and PO tolerance.