

Major Case Study: Critical Illness & Nutrition Support

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

Initial admission information available from the medical chart:

Mr. G, a 32 yo industrial chemist, was severely burned over much of his trunk, arms, and back in an accident at the chemical plant where he works. After emergency first aid at the plant, he was transported by ambulance to the university hospital burn center. Mr. G was in shock when he was admitted.

Physical exam: Pt experiencing severe pain, moderate respiratory distress. Unburned skin is pale and cool. BP: 90/60; P 110 and weak; RR 22 and regular; Ht: 5'10"; pre-injury wt: 165#

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

Impression: 30% 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 12 hrs or until hemodynamic stability achieved. NG tube placed for stomach decompression. Maalox q 2 hrs through NG tube and IV Famotidine.

Initial hospital course:

- As soon as the shock was under control, Mr. G'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 18 hrs, Mr. G's UO was 40-50 ml/hr and bowel peristalsis had returned; patient is responsive to pain, but limited alertness; breathing & respiration normal
- By 24 hrs, a nasoduodenal tube was placed and position of the tip verified by radiology to be past the ligament of Trietz.
- On morning of second day (~ 30 hours), a Nutrition Consult was ordered for feeding recommendation

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. Which of the following statements best describes your nutrition screening of Mr. G's risk level? (1 pt)

_____ Minimal risk (patient is at or above IBW, no weight loss prior to admission); no specialized nutrition therapy over the first week of hospitalization is required.

_____ Moderate risk (patient is at or above IBW, no weight loss prior to admission); limited alertness duration likely > 72 hours; trophic feeds recommended to be started within 48 hours of admission and continued through first week of hospitalization.

_____ **High risk (patient is at or above IBW, no weight loss prior to admission) with high injury severity; enteral feeds recommended to be started within 48 hours of admission; enteral nutrition support recommended to provide >80% of goal energy & protein needs.**

_____ High risk (patient is at or above IBW, no weight loss prior to admission) with high injury severity; trophic feeds recommended to be started within 48 hours of admission; parenteral nutrition support recommended to provide >80% of goal energy & protein needs.

2. Calculate Mr. G's estimated energy needs on day 2 of hospitalization, using the following methods. Show your work.
- Quick shortcut per the ASPEN Critical Care Guidelines [25-35 kcal/kg BW] (2 pts)

25 kcal/kg x 75 kg BW= 1875 kcal
35 kcal/kg x 75 kg BW= 2625 kcal
kcal/day= 1875-2625 kcal

- TEE using Mifflin St-Jeor formula with appropriate AF and IF (2 pts)

MSJ= $10 \times \text{kg} + 6.25 \times \text{height (cm)} - 5 \times \text{age} + 5 \times \text{AF} \times \text{IF}$
MSJ= $10 \times 75 + 6.25 \times 177.8 - 5 \times 32 + 5 \times (1.1) \times (1.5-1.85)$
MSJ= 2815-3472 kcal/day

(MNT page 3, 5)

- Comment on whether these two estimates differ or are similar, and what you would use as your actual energy recommendation for this patient. Provide justification for why you selected this energy recommendation. (2 pts)

These two estimates are very different; the shortcut per ASPEN does not include AF nor IF, which decreases the amount of kcal needed per day dramatically. Since the MSJ equation is not typically ideal for critically ill patients, the ASPEN recommendation would be substantial. However, since the pt has such bad burn wounds, I would recommend about 3100 kcal a day for Mr. G, as that is the average of the range from the MSJ equation.

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3. Calculate Mr. G's estimated protein needs on day 2 of hospitalization. Show your work and provide a goal range. (2 pts)

1.50-2.0 g pro/kg BW: post surgical PTs/Burns/Cancer/BMT

1.50 g pro/kg x 75 kg = 112.5 pro

2.0 g pro/kg x 75 kg = 150 gram pro

Overall range: 113-150 grams protein/day

(MNT page 5)

4. Based on the patient's needs, consider the enteral formula to recommend
- Describe two desirable features or characteristics of the type of formula you would select and recommend. (refer to the UCD TF lecture) (2 pt)

- High protein concentration
- Indicated for wound healing; adequate micronutrients and caloric load with glycemic control

- Give one example of an appropriate enteral formula meeting these characteristics, using the UCDMC formulary provided on the course web site.(2pt)

1. Nepro with Carb Steady: consists of a high protein blend (81 g pro/L), CHO blend for glycemic control (161 g CHO/L), as well as higher caloric concentration to water ratio (EN Support Slide 31, 39; UCDMC Formulary)

5. Mr. G is on IV Famotidine (Pepcid). What type of medication is this & why is it being used? Why do you think this was used instead of the alternative Cimetidine liquid to be put down the feeding tube? (Use the FMI text for this question) (2 pts)

Famotidine (Pepcid), is essentially an antacid. Famotidine is used to treat and prevent ulcers in the stomach and intestines, as well as GERD. Mr. G is on an IV of Famotidine to prevent Curling's Ulcer- ulceration of gastric or duodenal tissue as a result of burn or trauma. This was probably used instead of Cimetidine, although an antiulcer, because Cimetidine precipitates tube feedings.

(NTP page 666, 669)

(FMI page 166, 167)

6. Describe 3 ways you could determine the adequacy of your recommendations for energy and protein intake for this burn patient. (In other words, what will you monitor to decide if your recommendations are adequate, and why?) (3 points)

1. Changes in body weight: is Mr. G losing weight, gaining or maintaining? We want to ensure that the TF is providing enough energy to sustain the pts weight.
2. Wound size/healing: does it seem like Mr.G's burns are starting to close and heal? If the wound sizes are staying the same and not closing, we can assume that the energy provided by the TF is unsubstantial.
3. Biochemical Labs: albumin, prealbumin, N-balance. These labs will tell us the pts overall protein status. Protein status is essential in wound healing and if these labs are low, we can attest to say that the patient is not receiving enough protein. If pts N-balance remains <0, he is still in a catabolic phase.

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% TBSA). More surgery for skin grafting is scheduled in the next week.
- Diet order during the past week has been changed by MD to: Jevity 1.2 @ 60 ml/hr, plus PO intake as tolerated.
- You have conducted kcal counts for the past 3 days. They show that pt is taking 100 kcals/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, he refuses to try eating for now.
- Current BW: 70 kg, no significant edema
- Current labs: albumin 2.7 g/dL, prealbumin 8 mg/dL, UUN 23 g/24 hr

7. Re-assess Mr. G's estimated energy, protein, and fluid needs using the current information available.

a. Energy: (2 pt)

$$\begin{aligned} \text{MSJ} &= 10 \times \text{kg} + 6.25 \times \text{height (cm)} - 5 \times \text{age} + 5 \times \text{AF} \times \text{IF} \\ \text{MSJ} &= 10 \times 70 + 6.25 \times 177.8 - 5 \times 32 + 5 \times (1.1) \times (1.0-1.50) \\ \text{MSJ} &= 700 + 1111.25 - 160 + 5 \times (1.1) \times (1.0-1.50) \\ \text{TEE} &= 1822 - 2733 \text{ kcal/day} = \sim 2300 \text{ kcal} \end{aligned}$$

ASPEN

$$\begin{aligned} 25 \text{ kcal/kg} \times 70 \text{ kg BW} &= 1750 \text{ kcal} \\ 35 \text{ kcal/kg} \times 70 \text{ kg BW} &= 2450 \text{ kcal} \\ \text{kcal/day} &= 1750-2450 \text{ kcal} \end{aligned}$$

(MNT page 5)

(Nut 116BL Nutrition Care Crit Illness Slide 18)

b. Protein: (2 pt)

$$1.5-2.0 \text{ g pro/kg BW}$$

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1.5 x 70 kg = 105 g pro
2.0 x 70 kg = 140 g pro
~ 105-140 g pro total

c. Fluid: (2 pt)

1 mL fluid/kcal
1 mL fluid/ 1822- 2733 kcal/day = 1822- 2733 ml/day

8. Calculate the energy, protein, and fluid provided by the **current** TF regimen.

Show your work

a. Energy: (2 pt)

Jevity 1.2 at 60 mL x 24 hours
60 ml x 24 hours = 1440 ml Jevity 1.2

b. Protein: (2 pt)

1440 mL = 1.44 L
55.5 gm protein/L
55.5 gm protein/L x 1.44 L = 79.92 = 80 grams protein

c. Fluid: (2 pt)

Jevity 1.2 = 80.7% water
1 liter = 80.7% water = 807 ml water/L
1440 mL = 1.44 L
807 ml fluid/L x 1.44 L = 1162.08 ml = 1165 ml fluid/d

(Nut 116 BL: Enteral Nutrition Support Slides 22-24)
(UCDMC Adult Enteral Nutrition Formulary)

9. You calculate Mr. G's nitrogen balance at day 10, using the formula and values given below.

$$\text{N balance} = \frac{\text{g protein}}{6.25} - (\text{UUN} + 4) = \frac{92 \text{ g pro}}{6.25} - (23 \text{ g} + 4) = - 12.3 \text{ g N/d}$$

Interpret the results of the nitrogen balance study above. Is the current TF order adequate to meet estimated protein needs? (2 points)

Being in a negative nitrogen balance develops when nitrogen excretion is greater than nitrogen intake leading to catabolism. Nitrogen balance is a consistent marker of metabolic stress with major burns; there is substantial nitrogen loss that comes with complications of muscle catabolism. In this catabolic system, muscle catabolism is occurring leading to glutamine, antioxidant and micronutrient depletion, along with total protein loss. The

current TF order is not adequate to meet the estimated protein needs. The formula should be changed to a higher protein concentration, if the patient is unable to orally intake high protein foods. A high protein intake will help to decrease N losses. Without a high protein intake, the N losses are even greater and continue to be unchanged, which will result in even greater loss of LBM. A high protein diet can help to preserve the LBM during the acute flow phase, until the metabolic state returns to anabolism and true LBM rebuilding can occur.

(NTP page 57, 668-669)

10. Write an ADIME note for your day 10 follow-up assessment of Mr. G. (22 points)
Hints: Follow the ADIME note guidelines provided on the course web site. Use subheadings. Be sure to evaluate his current anthropometrics (and any trends seen), 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? Write a PES statement that reflects your assessment and include it in your note. In the Plan section, make *very specific* nutrition support and monitoring recommendations for this patient at this point in time.

*REMEMBER to turn in hard copy of your typed ADIME note & attach a calculations sheet to your note; remainder of the assignment is to be submitted online

Assessment:

Patient Hx:

32 yo M- industrial chemist- severely burned over much of his trunk, arms, and back in an accident at the chemical plant. Pt experiencing severe pain, moderate respiratory distress. Unburned skin is pale and cool. 30% TBSA when admitted, with partial and full-thickness burns over lower part of face, neck, upper back, arms, hands, and upper thighs.

MD Diet Order:

NPO x 12 hrs or until hemodynamic stability achieved.

MD ordered diet consult for EN: Jevity 1.2 @ 60 ml/hr, plus PO intake as tolerated: Jevity 1.2 at this rate is inadequate for pts current needs

Anthropometrics & Wt hx:

Ht: 5'10"; pre-injury wt: 75kg (165#)

CBW: 70kg

%IBW: 93%

Initial BMI: 23.7 (wnl)

Current BMI: 22.1 (wnl)

% wt change: -6.7%

Nutrition focused phsy exam:

At admission: 30% TBSA, partial and full-thickness burns over lower part of face, neck, upper back, arms, hands, and upper thighs.

Currently: 15% TBSA and no noticeable edema

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Biochem labs pertinent:

albumin 2.7 g/dL (nl 3.5-5.0 g/dL): low
prealbumin 8 mg/dL (nl 15-36 mg/dL): low
N Balance: - 12.3 g N/d (nl 0 gN/d): low

Meds Pertinent:

Maalox q 2 hrs through NG tube.
IV Famotidine (Pepcid)

Est Current Nutrient Needs:

- energy: 2300 kcal/day
- protein: 105-140 g/day
- fluid: 2300 mL/day

Food & Nutrition Hx:

100 kcals/day by oral intake, in addition to TF. Nursing I/O's indicate that the full TF volume is being delivered each day- although inadequate to meet caloric demands. Pt reports that it is difficult for him to eat by mouth due to pain, and that he doesn't have much of an appetite, he refuses to try eating for now.

Diagnosis:

(NI-2.9) Limited food acceptance r/t inadequate food intake AEB pt report claiming difficulty eating PO due to pain, no appetite, and refusing to eat.

(NI-2.3) Inadequate enteral nutrition infusion r/t low protein intake AEB negative nitrogen balance of -12.3 N/d, albumin 2.7 g/dL, and prealbumin 8 mg/dL.

Intervention:

Overall MNT goal:

Preserve LBM, prevent further wt loss and promote wound healing with high protein and calorie dense formula.

Specific Recommendations:

- Achieve through early nutrition support (enteral nutrition), using appropriate macro and micronutrient delivery along with good glycemic control, avoid overfeeding, and eventually wean from nutrition support.
- Preserve LBM by increasing protein kcal by switching from Jevity 1.2, and choosing a different high protein formula along with providing supplemental calories Mr. G can eat PO.
- Provide assistance by incorporating food intake PO that pt can tolerate.

(Nut 116BL Nutr Care Crit Ill slide 15, 22).

Dt instrux/education given:

Instruct pt on importance of correct caloric and protein needs. Educate pt on correct eating habits and what he can do to become more interested in food.

Behavioral Goals: Slowly wean from nutrition support by incorporating more oral food intake. Help pt. become interested in eating.

Compliance:

Compliance will be good if pt understands instructions and is motivated to heal quickly. Compliance will be better if pt attempts to eat more foods PO and becomes more interested in the food he is eating.

Monitoring & Evaluation:

1. Follow up with biochem labs for albumin, prealbumin and N-balance, look at anthropometrics to see any wt change, and address pts interest in food. Ask for food records to see what pt is eating on his own besides EN to see how we can start weaning from EN.
2. Follow up within two weeks via in person apt.

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11. It is now 3 weeks since admission and Mr. G is now in a transitional care unit. Mr. G's wounds are closed and healing well. He is finally interested in trying to eat more foods orally and his appetite is returning. How could his current continuous TF regimen (the one recommended in your note above) be modified to provide a total of approximately 1000 kcal/day and not interfere with his intake at meal times? Make recommendations for an appropriate transitional TF plan/order and how to monitor. Make a specific recommendation for both the TF plan and monitoring. (6 points total)

(4 pts) Recommended transitional feeding plan

TF during the night time that way he is hungry during the day and can continue to try to eat more foods with his returning appetite. Transition his TF by supplying pt EN support from after dinner hours to a few hours before breakfast time, that way he is hungry and ready to eat by breakfast and for the rest of the day. TF can be initiated to be given continuous for 8 hours at night.

(2 pts) Monitoring plan

Monitor pt body weight changes along with kcal counts of the food he is eating during the day. Make sure pt is eating adequate amount of calories with oral food to make sure he is getting sufficient formula through his TF at night. Do so by having pt provide food records and/or have care staff do calorie counts at every meal.