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Major Case Study: Critical Illness & Nutrition Support
(11 questions; 60 points total)

Due Friday 2/16/18 by Midnight
Submit Case Study online; Part 1 (19 points); Part 2 (35 points); Part 3 (6 points)

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(pulse) 110 and weak; RR(respiratory rate) 22 and regular; Ht: 5'10"; pre-injury wt: 165#

Laboratory: The following tests were ordered: CBC (complete blood count), blood type and cross-match, Chem 20 screening panel, ABG's (arterial blood gas), and UA (urinalysis).

Impression: 30% TBSA (total body surface area), 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.
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Initial hospital course:

- As soon as the shock was under control, Mr. G's wounds were washed, debrided, and dressed with silver sufadiazine (anti-biotic cream) 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

Part 1 (19 points total) -- Initial Assessment [Day 2]

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

1. Which of the following statements best describes your nutrition screening of Mr. G's risk level? (2 pts)

   _____ 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. Do not round the numbers

   a. Quick shortcut per the ASPEN Critical Care Guidelines [25-35 kcal/kg BW] (2 pts)

      74.91 kg x 25 kcal/kg = 1872.75
      74.91 kg x 35 kcal/kg = 2621.85

      1872.75 – 2621.85 kcals

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

      (10 x 74.91 kg) + (6.25 x 177.8cm) – (5 x 32) + 5 =
      749.1 + 1111.25 – 160 + 5 = 1705.35 kcals

      1705.35 kcal x 1.1 AF = 1875.885 kcal
      1875.885 kcal x 1.50 IF = 75 kcal
      1875.885 kcal x 1.85 IF = 3470.38725 kcal

      2813.8275 – 3470.38725 kcals

c. 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)

The estimated energy needs calculated using the Mifflin St-Jeor method are much higher than the estimated energy needs calculated using the ASPEN Critical Care method. I would use the values calculated using the Mifflin St-Jeor method because it takes many more factors, such as IF, into consideration when compared to the ASPEN method. The higher calories are needed in order to compensate for Mr. G's hyper-metabolism, catabolism, and altered immune and hormone response.

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

74.91 kg x 1.5 g/kg/d = 112.4 g/d
74.91 kg x 2.0 g/kg/d = 149.8 g/d

112.4 – 149.8 g/d

4. Based on the patient's needs, consider the enteral formula to recommend

a. Describe two desirable features or characteristics of the type of formula you would select and recommend. (refer to the UCD TF lecture) (2 pt)

- The selected formula for Mr. G's would meet his caloric needs, since he now has an increased energy expenditure, and should be high in protein in order to minimize protein loss and promote healing.

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

- TwoCal HN provides some the highest kcals and protein when compared to the other TF formulas (2 kcals/mL; 83.5 g Pro/L). Although it is a good source of kcals and pro, I would be concerned about providing sufficient fluid as it has the lowest fluid percentage at 70%. (An overall more appropriate formula that might be able to meet all needs more effectively is Vital AF 1.2 Cal, which provides 1.2 kcal/mL, 75 g Pro/L, and 81.1% water.)

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 Cimetodine liquid to be put down the feeding tube? (Use the FMI text for this question) (2 pts)

Medication: It is a histamine H2 Receptor Antagonist. Works as an antiulcer, anti-gerd, anti-secretory. Used to prevent Curling's ulcers.

Reason for use of IV Famotidine instead of Cimetodine: Cimetodine precipitates in TF.

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)

- Pt's weight to ensure he is getting sufficient nutrition support to compensate for metabolic stress.
- Nitrogen balance to ensure that nitrogen output is not exceeding nitrogen input, indicating proper protein intake.
- Wound closure/ acceptance of engraftments to make sure nutrition support provided is promoting healing.

Part 2 (35 points total) -- Ongoing Assessments [Day 10]

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.
- 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 on Day 10. Do not round numbers

a. Energy: (2 pt)

(10 x 70 kg) + (6.25 x 177.8cm) – (5 x 32) + 5 =
700 + 1111.25 – 160 + 5 = 1656.25 kcals
1656.25 kcals x 1.1 AF = 1821.875 kcals
1821.875 kcals x 1.0 IF = 1821.875
1821.875 kcals x 1.5 IF = 2732.8125

1821.875 – 2732.8125 kcals

b. Protein: (2 pt)

70 kg x 1.5 g/kg/d = 105 g/d
70 kg x 2.0 g/kg/d = 140 g/d

105 – 140 g/d

c. Fluid: (2 pt)

1821.8125 kcal x 1 ml/kcal = 1821.8125 ml
2732.8125 x 1 ml/kcal = 2732.8125 ml
1821.875 – 2732.8125 mL

8. Calculate the energy, protein, and fluid provided by the current TF regimen. Show your work

a. Energy: (2 pt)

60 mL/hr x 24 hr = 1440 mL
1440 mL x 1.2 kcal/mL = **1728 kcal**

b. Protein: (2 pt)

(1440 mL/ 1000 mL) x 55.5 g = **79.92 g**

c. Fluid: (2 pt)

60 mL/hr x 24 hr x 0.807 = **1162.08 mL**

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)

Pt has a negative nitrogen balance indicating that his nitrogen excretion is greater than his nitrogen intake. Can be due to both catabolism and inadequate nitrogen intake (from protein). The current TF is giving pt 79.9 g Pro/d, and his needs are 105 – 140 g Pro/d. His current TF order is not adequate to meet his estimated protein needs.

10. Write an ADIME note for your day 10 follow-up assessment of Mr. G. (21 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.
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ASSESSMENT:

Patient History: 32 yo, male, admitted for severe partial and full-thickness burns over much of his trunk, arms, and back that occurred during accident at a chemical plant where he works (30% TBSA). Pt was in shock when admitted. Pt's burns currently at 15% TBSA. Nutrition consult ordered for feeding recommendations.

MD Diet Order/Rx: ND TF Jevity 1.2 at 60 mL/hr; PO intake as tolerated.

Anthropometrics: Ht: 177.8 cm; CBW: 70 kg; IBW: 74.7; %IBW: 93.7; BMI: 22.14 kg/m^2 (normal). 4.91 kg wt loss over the last 10 days (6.6% of body weight).

Weight Hx: pt experienced significant wt loss of 6.6% total body wt in 10 days, dropping from 74.91 kg to 70 kg, losing a total of 4.91 kg.

Nutrition focused physical findings:

Overall appearance: Some wounds still open but have improved from 30% to 15% TBSA.

GI: NG tube set in place for stomach decompression; Bowel peristalsis returned after 18 hrs of initial admission and is functioning; ND tube in place past the ligament of Trietz for tube feeding by 24 hrs of initial admission; Pt still having difficulty with intake PO due to pain.

Cognition: Alert and oriented.

Skin: 15% TBSA burns; some wounds still open; no significant edema.

Biomedical data/labs: Albumin: 2.7 g/dL (low); Prealbumin: 8 mg/dL (low); UUN: 23 g/24 hr (elevated); Nitrogen Balance: - 12.3 (negative).

Medications/Supplements/OTC: Maalox q 2hrs via NG tube; IV Famotidine (Pepcid); IV Therapy initiated with Ringer's Lactate.

Estimated Nutrient Needs (based on 70 kg wt):

Energy: 1822 – 2733 kcal/d; **Protein:** 105 – 140 g/d; **Fluid:** 1822 – 2733 mL/d

Food and Nutrition Hx: NPO x 12 hr or until hemodynamic upon initial admission. ND Tube places after 24 hrs of initial admission. Day 10: MD changed diet order to Jevity 1.2 at 60 mL/hr and PO intake as tolerated. Pt has been consuming 100 kcals/day PO and in taking 1728 kcals/day via TF for the past three days (total of 1828 kcals/d). TF is providing 1162 mL/d of fluid and only 79.92 g Pro/d. Kcal intake is adequate, but pro and fluid intake is not. Pt has low appetite and refuses to intake PO. Says it is difficult for him because of the pain.

Social Hx: Pt is an industrial chemist working at a chemical plant.

DIAGNOSIS:

Less than optimal enteral nutrition composition or modality (NI-2.5) r/t increased protein-energy

needs AEB negative nitrogen balance (-12.3 g N/d), significant 10# wt loss in 10 days, and current TF formula (Jevity 1.2) providing 79.9 g Pro/d and not meeting pt's needs of 105 – 140 g Pro/d.

INTERVENTION:

MNT Goal: Provide adequate nutrition support that will meet all of pt's increased needs (pro, kcals, and fluid) to promote wound healing, compensate for hypermetabolic, catabolic response that is occurring due to his injury, and maintain weight.

Recommendations:

Diet Rx: Vital AF 1.2 Cal @ 78 mL/hr x 24 hrs. Food intake PO as tolerated.

Specific Recommendations:

- Intake of 2246.4 kcals/d, 140.4 g Pro/d, 1518.192 mL fluid/d via TF
- 127 mL water flush q 4 hours (= 759 mL/d) to reach fluid needs.
- Slowly increase PO intake. Try soft or pureed food to avoid a lot of chewing or movement of the jaw.

Diet education given: Educate pt about why his ND TF formula is being changed by explaining to him that the previous formula was not meeting his protein needs, causing catabolism and weight loss, and that the new formula will promote further healing and weight maintenance for him.

Compliance: No complaints about TF. Pt currently refuses intake PO due to pain.

MONITORING/EVALUATION:

- Total kcal, pro, and fluid intake via TF and PO to make sure pt is meeting all current needs.

- Lab values: Alb, PreAlb, and UUN to determine nitrogen balance and monitor protein loss.

- Wound closure/acceptance of engraftment to ensure nutrition support is promoting healing.

- Body weight changes.

- In person F/U in 3 days (in-patient).

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Nutrition Student

02/14/18

Part 3 (6 points total) – Ongoing Assessment [Day 21]

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. The goal is to transition the patient from TF support to oral feeding. How could his current continuous TF regimen (the one recommended in your ADIME note) be modified to provide a total of approximately 1000 kcal/day and not interfere with his intake at meal times? Make specific recommendations for an appropriate transitional TF plan/order and how to monitor. (6 points total)

(4 pts) Recommended transitional feeding plan

In order to transition Mr. G from his continuous TF to oral feeding, we would need to begin by cyclic feeding. He will be given Vital AF 1.2 Cal at 69.44 mL/hr for 12 hrs at night, from 8:00pm – 8:00 am. This will provide him with 1000 kcal/d, 62.5 g Pro/d, and 675.8 mL of fluid/d from TF. During the day, pt can eat PO. Recommend soft oral supplements and snacks. TF can be discontinued once pt meets 50 – 75% of his needs PO.

1000 kcal/d / 1.2 kcal/mL = 833.3 mL/d / 12 hr/d = **69.44 mL/hr**

(69.44 mL/hr / 1000 mL) x 75 g = 5.208 g/hr x 12 hr/d = **62.496 g/d**

69.44 mL/hr x 12 hr/d x 0.811 = **675.79008 mL/d**

(2 pts) Monitoring plan

- Kcal intake.
- Tolerance to feeds: Can be monitored by paying attention to whether pt is experiencing N/V, diarrhea, constipation, abdominal pain or distension.
- Volume of feeds received relative to ordered volume: Compare average 5 – 7 day intake to ordered daily intake. If less than 90%, look for possible causes.
- Outcomes:
    - Weight
    - Albumin, prealbumin
    - Nitrogen balance
    - Wound healing

References

Nutrition Therapy and Pathophysiology

Food Medication Interactions

NUT 116BL Critical Illness lecture slides

NUT 116BL Enteral Nutrition Support lecture slides

UCDMC Formulary

Calculation

New Diet Rx provides:

78 mL/hr x 1.2 kcal/mL = 93.6 kcals/hr x 24 hr/d = 2246.4 kcals/d

78 mL/hr / 1000 mL x 75 g Pro = 5.85 g/hr x 24 hr/d = 140.4 g Pro/d

78 mL/hr x 24 hr x 0.811 = 1518.192 mL

Water Flush:

1821.875 – 1518.192 = 303.683

2732.8125 – 1518.192 = 1214.6205

303.683 + 1214.6205 / 2 = 759.15

759/6 =126.5