# Nutrition Support in the Surgical/Trauma ICU Patient

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# Malnutrition

- Consequences of Malnutrition
  - Immunosuppression
  - Increased number of complications
  - Impaired wound healing
  - Increased length of hospital stay
  - Increased mortality
- Underfeeding vs Overfeeding
  - Underfeeding:
    - Poor wound healing; increased risk of infections
    - Decreased muscle strength-
      - Respiratory muscle strength: failure to wean from vent
      - Overall: increased DVT/PE risk
  - Overfeeding
    - Hyperglycemia, electrolyte imbalance, fatty liver, azotemia
    - CO2 retention: Failure to wean from vent

# Considerations when starting Feeds

- Enteral vs Parenteral Nutrition
- Access / Initiation
- Delivery
- Formula selection
- 1st: how many kcal / protein necessary

# SCCM/ASPEN Assessment Guidelines Energy Needs

SCCM/ASPEN guidelines are in blue.

- BMI < 30
  - 25-30 kcal/kg actual body weight
- BMI 30-50
  - 11-14 kcal/kg actual body weight
- BMI 30 – 40
  - BMI 30-40: Darby & Chris: 18-25 cal/kg actual body weight
  - BMI 40-50: Darby & Chris: 11-14 cal/kg actual body weight
- BMI > 50
  - 22-25 kcal/kg ideal body weight
- 65-70% of Indirect Calorimetry for BMI >30

- Metabolic Cart - Method of determining individual energy needs & substrate utilization by measuring gas exchange.

# SCCM/ASPEN Assessment Guidelines Protein Needs

SCCM/ASPEN guidelines are in blue.

- BMI < 30
  - 1.2-2 g/kg Actual Body Weight
    - Chris and Darby: 1.5-2g/kg Ideal Body Weight
- BMI 30-40
  - 2.0 g/kg Ideal Body Weight
  - Darby: 1.8-2 g/kg Ideal Body Weight
  - Chris: 1.5-2 g/kg Ideal Body Weight
- BMI > 40
  - Up to 2.5 g/kg Ideal Body Weight
  - Darby: 2-2.5 g/kg Ideal Body Weight
  - Chris: 2 g/kg Ideal Body Weight
- BMI > 50
  - Chris: 2-2.5 g/kg Ideal Body Weight

**Acute Kidney Injury or Hepatic Encephalopathy**

- 1.5 g prot/kg Ideal body wt.
- Hemodialysis: 1.5-2 g prot/Ideal body wt
- CVVHD: 2-2.5 g prot/kg Ideal body wt

# Enteral vs Parenteral

When the gut works use it!

When EN is not feasible:

- Low nutrition risk: PN withheld for 7 days following ICU admission
- High nutrition risk or severely malnourished: ASAP following ICU admission
- Regardless of nutrition risk, supplemental PN should be considered after 7-10 days if unable to meet >60% of nutrition needs by EN
- PN should be reduced and discontinued when the patient is receiving >60% of targeted energy needs from EN

# Access / Initiation

Enteral Access

- Gastric or small bowel (SB) feeding is acceptable
- SB feeding is preferred for the patient at high risk of aspiration

Parenteral Access

- TPN vs PPN; PICC vs Central Line placed

Enteral Initiation

- Full strength; 20-50 mL; Advance 10-25 ml every 4-24 hours

TPN initiation

- Refeeding vs uncontrolled blood sugars

# Delivery

## Enteral Nutrition

### Bolus versus Continuous

- Drug-nutrient interactions
- Location/size of feeding tube

## Parenteral Nutrition

- Continuous vs cyclic

# Enteral Formula Selection

No clear benefit regarding patient outcome has been shown in literature for routine use of specialty formula including:

- Diabetes formula
- Organ specific formula – pulmonary, renal , liver
- High fat-low carbohydrate formulas
  - Reduced respiratory quotient has been shown to be incorrect (effect seen only with overfeeding)
  - High content of Omega-6 fatty acids may drive inflammatory response
- Immune-enhancing with one exception (POST-OPERATIVE SICU PT)

Avoid mixed fiber formula to promote bowel regularity or prevent diarrhea

# Monitoring

- Tolerance – Residuals? Diarrhea?
- Weight changes / hydration status
- Avoid hyperglycemia
- Are wounds healing
- Vent weaning progress
- Progress with PT – Is pt getting stronger
- $N_2B$, Metabolic Cart, Fecal Fat

Basically is patient getting better?

What about PAB and ALB?

# Case #1

56 yo female s/p MVC resulting in TBI, SDH, SAH, open fx of temporal bone, L femur fx, closed fx of humerus, bilateral forearm fxs, frontal lobe contusion, multiple bilateral rib fx. h/o DM, ESRD on dialysis, starting CVVHD, On vasopressors.

When to start feeds?

- Vasopressors
- Surgical plan

Enteral versus Parenteral?

Formula Selection?

- Immunonutrition (Pivot)
- Low carbohydrate due to diabetes (glucerna)
- Renal Failure (Nepro)
- Other: Ensure, Osmolite (1.2-1.5), Jevity, Two Cal

Bolus vs Continuous?

# Case #2

76 yo male with acute onset GI bleeding. EGD #1 duodenal ulcer with adherent clot and visible spurting vessel→ local epinephrine, cautery, and attempted hemoclip. 12hrs later- H/H still dropping EGD #2 with local epinephrine, cautery, and hemoclips. 6hrs later- to IRx2 for coil embolization of superior duodenal artery and middle colic artery. He became hemodynamically unstable→intubated and taken to the OR for exploratory laparotomy, oversewing of duodenal ulcer, pyloric exclusion, G-tube and J-tube placement.

POD1-Off vasopressors, still on ventilator

Meds: levothyroxine (Synthroid) 50 mcg jejunal q6AM ; Quetiapine (Seroquel) jejunal Q12h; acetaminophen 650mg jejunal Q4h; pantoprazole 40mg jejunal QD

Start feeds via j-tube.

- Formula Selection
- Bolus vs Continuous
  - levothyroxine
- Let’s talk a bit about medications and feeding tubes

# Feeding Tubes/Medications

Important to know where medications are administered and specifics of tubes. Ordered medication route should be specific.

CRUSHED TABLETS OR LIQUIDS
Naso-gastric / Oro-gastric 16-18 French
Standard PEG Kit 20 French
Surgically placed G-Tubes 16-18-20 French (per Surgeon)

FULLY DISSOLVED MEDS OR LIQUIDS
DHT-need to know where placement is-?post-pyloric

| | |
|---|---|
| (white- Kendell) | 8 French |
| (yellow – Corpek) | 10 French |

ONLY LIQUID MEDICATIONS/NO PPI, BANANA FLAKES, METAMUCIL
J-Tubes

- Needle catheter jejunostomies
- WVU Medicine: 12-22 French
- Surgeon Preference (one SON surgeon uses 16-18 French)
- > 8 french : fiber containing formulas are OK

# Medications

- Levothyroxine
- Quetiapine (Seroquel)
- Acetaminophen
- Pantoprazole

# Case #3

- 68 yo male colon cancer s/p exp lap,LOA, segmental colon resection with SB adherent to tumor, primary anastomosis, repair of ventral hernia. POD 5 and CT findings suggestive of SBO. Remains on vent.

- 5’10”  83.3 kg (190lbs)  114% IBW  BMI 27.2

- Should we consider TPN yet?

# Case #3 continued

UBW:  104.5 kg (230 lbs)

Past 6 months has lost 17.3% of his body weight due to chronic N/V abdominal pain

Meets requirements to code for severe protein calorie malnutrition

Yes TPN could be considered.

# Case #3 continued

Things to consider:

1. Start TPN slowly or at goal?
2. Other caloric sources (propofol, dextrose MIVF)
   - Propofol provides 1.1 kcal/ml fat
   - D5 = 170 kcal/L  D10 = 340 kcal/L
3. Daily BMP, calcium, magnesium, phosphorus
   - can add daily need electrolytes to TPN but not use for supplements (ex. Lasix/K+)
4. Blood sugars -any h/o diabetes or steroid use
   - should have standing SSI order
5. LFTs and TG weekly
6. Daily orders ideally by 12n; absolute cutoff 2pm
7. Access? PPN (based on volume ) vs TPN (concentrated)-access must be in place and confirmed before TPN ordered

# Case #3 continued

- Start TPN slowly to avoid refeeding
  - 100-200 g dextrose/day
  - 15-20 kcal/kg
- 200 mg thiamine before TPN started then 100mg daily x 5 days (can put in TPN)
- Supplement phos if low/low WNL and at risk
- Discontinue or change any IVF with dextrose

# Case #3 continued

Day 2:

| | |
|---|---|
| Na+ 141 | K+ 3.5 |
| CL 108 | CO2 108 |
| BUN 17 | Cr 0.8 |
| Phos 2.4 | Mg 1.8 |
| Gluc 118 | |

Increase TPN or keep the same?

# Case #3 conclusion

- Phos 2.4 (WNL but dropped from 4.1)
- Already determined at risk for refeeding
- Keep the same TPN
- Refeeding can happen 2-3 days after start of nutrition
- Continue daily BMP, Mg, Phos, BG and advance 200-300 kcal as able.

# Case #4

## same patient, slightly different scenario

68 yo male s/p exp lap,LOA, segmental colon resection with SB adherent to tumor, primary anastomosis, repair of ventral hernia. POD 7 and CT findings suggestive of SBO. Remains on vent.

- History CAD, hyperlipidemia, diabetes with uncontrolled blood sugars, triglycerides 270
- Weight has been stable, eating well PTA, doesn't meet requirements to code for malnutrition

Should we consider starting TPN?

If yes start at goal or still start slow?

# Case #4 continued

Yes, still meets requirements for TPN

Start at goal except dextrose, start at ½ (~540 dextrose kcal)

Day 2
Finger sticks:  380, 402
What would you do with the TPN? Insulin?

Day 3
Fingersticks:  290, 350
Triglyceride: 420
What would you do with the TPN? Insulin?

# Case #4 Conclusion

Day 3 TPN

Same dextrose, remove fat, maximize protein

- Push protein to decrease total dextrose goal
- Check triglycerides twice/week now

Day 4 TPN and beyond

- Dextrose: continue to increase slowly to goal
- Fat??
  - Depends on what triglycerides do
  - Essential Fatty Acid Deficiency

# Summary

- When the gut works use it!
- Consideration for feeding should start at admission (or prior to operative procedures)
- Avoid underfeeding/overfeeding
- Know what access you have (tubes/lines)
- Order medications by appropriate route-contact pharmacist with dosage form help

# Question #1

- Refeeding syndrome should be a consideration in any patient who has been without adequate nutrition for more than 5-7days.

- Which measure(s) should be taken to avoid refeeding syndrome?
  - A) start MIVF with dextrose ASAP
  - B) start thiamine and replace phosphorus if low/low normal
  - C) begin feeds with low protein/ goal dextrose/goal fat keeping kcal <20kcal/kg/day
  - D) begin feeds with goal protein/low dextrose/goal fat keeping kcal <20kcal/kg/day
  - E) B and D are both correct

# Question #2

- Feeding tubes vary in size and placement. Tube feeds and medications require specific orders for administration via tubes.

Which order(s) is/are incorrect?

- A) Pivot via jejunal tube at 10ml/hr-advance 10ml/hr to goal 60ml/hr and all meds by gastric tube
- B) TwoCal HN via NG tube advance to goal 35ml/hr and banana flakes via NG for diarrhea
- C) Osmolite 1.5 via PEG bolus 1 can 5x daily and Regular insulin 3 units IV with each tube feed 5x daily
- D) Osmolite 1.2 via jejunal tube at 50ml/hr over 22hrs and levothyroxine liquid 50mcg qam holding TF 1hr before and after
- E) All are correct

# Name of Lecture

## Nutrition Support in the Surgical/Trauma ICU Patient

Thank you for your attention.