Current concepts in Critical Care Nutrition

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Objectives

• Why?
  – Enteral or Parenteral

• When?
  – Early usage of Nutrition
  – Does it impact outcome?

• How?
  – Routes

• What?
  – Commercial vs Kitchen feeds
The patient

- is not allowed ...
- is not able ...
- doesn’t want ...

- Pre-and Postoperative, Intensive Care
- Unconsciousness, Dysphagia, Stroke
- Tumor, Anorexia

... to eat normal food sufficiently
Alteration of Gut Structure and Function: Bacterial Overgrowth

- Intestinal epithelial cell death
- Decreased enzyme production
- Decreased blood flow
- Decreased immunoglobulin production
- Increased translocation of bacteria and cytokines
Enteral vs. Parenteral

• Advantages of Enteral:
  – **Safer (Fewer complications)**
    • Metabolic: Dextrose; Fluid and electrolyte
    • Catheter Related: Mechanical & Septic
  – **Maintains GI Function**
    • TPN: Loss of GI function: atrophy
    • Immune function: Prevents bacterial translocation
Enteral vs Parenteral

- Advantages of Enteral
  - Lower Cost:
    - Formula and delivery system costs
    - Less patient care time
  - Simpler system
    - Easier for caregiver or self administration
PN vs EN in critically ill

- Simpson & Doig 2004
  - 11 trials
    - No additional immune enhancing ingredients
  - Significant increase in infectious complications with PN (OR 1.66)
  - Reduced mortality with PN (OR 0.51, p=0.04)
  - PN vs early EN (<24 h) no significant difference
  - B+ recommendation for PN in patients in whom EN cannot be initiated within 24 hrs

- Gramlich et al. 2004
  - 1 meta-analysis
  - 12 studies
    - No elective surgery
    - 5 studies associated PN with a larger caloric intake
  - EN is associated with fewer infectious complications (RR 0.64)
  - No significant difference in mortality
  - 4 studies reported cost savings with EN
  - EN should be first choice for nutritional support in ICU
Enteral feeding should be part of routine care

- Protein-calorie malnutrition with inadequate oral intake for the previous 5 days
- Severe dysphagia
- Major full-thickness burns
- Massive small bowel resection in combination with administration of TPN
- Low output enterocutaneous fistulas
Enteral feeding would usually be helpful

- Major trauma
- Radiation therapy
- Chemotherapy
- Liver failure and severe renal dysfunction
Enteral feeding of limited or undetermined value

- Immediate postoperative or poststress period
- Acute enteritis
- Less than 10% remaining small intestine
Enteral feeding *should not be used*

- Complete mechanical intestinal obstruction
- Severe uncontrollable diarrhea
- High output external fistulas
- Severe pancreatitis (not any more!)
- Shock
Early Enteral Nutrition

- How early is early?
  - Less than 36 hours

- Meta analysis (Moore et al. Ann Surg 216 (2); 172-183)
  - Reduced post operative infections

- Zaloga et al (2001)
  - Early nutrition (12-24 hrs post insult) reduced LOS and mortality
Early EN in polytrauma

• Early EN (initiated 4.4 hours after ICU admission on average) resulted in less organ dysfunction than delayed feeding (initiated 36.5 hours after ICU admission on average)
### Early EN in polytrauma

<table>
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<tr>
<th>NPO Days</th>
<th>Calorie Deficit (kcal)</th>
<th>MOF</th>
<th>Vent Days</th>
<th>% with Infections</th>
<th>ICU LOS</th>
<th>Hosp LOS</th>
<th>Day Diet Started</th>
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<td>&lt;3 days</td>
<td>45%</td>
<td>5.4</td>
<td>40%</td>
<td>11.4</td>
<td>20.4</td>
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<td>&gt;3 days</td>
<td>68%</td>
<td>11.5*</td>
<td>54%</td>
<td>19.8*</td>
<td>28.8**</td>
<td>5.6*</td>
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</table>

* p<.05; ** p=.06

*(Franklin, McClave, et al. JPEN 2008;32(3):324)*
Administration Techniques

- Short term access
- Long term access
- Continuous feeding
- Bolus feeding
Short term access

- NG (Nasogastric) tube or Ryle’s tube
  - Made of soft silastic material
  - Various sizes
    - Small bore feeding tube more comfortable
    - Larger bore tube (sump): check gastric residuals
  - Placement verified by x-ray
Continuous vs bolus feeding

• **Continuous**
  – Most frequent method used in hospitals and nursing homes
  – Less nursing time
  – Generally better tolerance: Less diarrhea and emesis
  – Better compliance

• **Bolus**
  – Often used for home patients to self administer
  – Costs less to administer
  – Simplest to teach
  – More patient freedom
Cyclic

- At night only to improve oral intake during the day
- Calorie adjustments appropriately for nocturnal cycling
How much is enough?

- Immune benefit
  - 15 – 30% calories needed
- Visceral blood flow benefit
  - 10 – 20% calories enterally
- Maintenance of gut mass and gut barrier function
  - 50 - 60% requirements early post injury (24 - 48 hours)

(Cresci & Martindale 2001)
(Bistrian, ESPEN, 2002)
(US Summit, JPEN 2001)
Products

- Complete Formulas
- Modular (Supplements)
- Elemental
- Disease Specific
Multicentre, clinical trial of algorithms for critical-care enteral and parenteral therapy (ACCEPT)

- Evidence-based recommendations for nutritional support can be implemented as a set of algorithms and can improve nutritional support to critically ill patients, leading to a decrease in hospital mortality rate and length of stay

  - Martin et al. CMAJ 2004; 170 (2):197
A

At ICU admission:
Should this patient be fed?

Yes ➔

Can EN be started within 24 hours?

Yes ➔

Gastric challenge: Use full-strength concentration
Consider prokinetic with challenge
Goal: at least 80% of requirements at 72 h
Assess q12h

Is progression on target to reach at least 80% by 72 h?

Yes ➔

• Use prokinetic
• Use postpyloric tube

Increase rate to 100% of requirements

Yes ➔

Is goal met?

No ➔

• Continue EN to maximum tolerated
• Supplement with PN
• Continue EN challenges q12h

No ➔

Acceptable conditions:
• Tolerating adequate oral diet
• < 24 h to oral intake
• Palliative care

Acceptable conditions:
• Acute pancreatitis*
• Enteric anastomosis*
• Ischemic bowel
• Enteric fistula
• Imminent bowel resection
• Imminent endoscopy
• Bowel obstruction
• High nasogastric losses
• Severe exacerbation of inflammatory bowel disease

*May still opt for elemental enteral feeding

Begin TPN
Reassess q12h for EN eligibility
Diarrhea: Prevention & Treatment

- Use isotonic feedings
- Start feeding at 25-50 ml/hr & advance gradually
- Limit hang time to 6 hours or use ready to hang product
- Enzyme deficiency: use elemental feeding
- Change medications if possible
- Check stool for C. difficile titre
- Use a product with fiber
Assess gastrointestinal tolerance to tube feeding q4h

Intolerant patients have:
- Clinically significant stools or
- Readily apparent abdominal distension or
- Increased abdominal girth or
- Multiple emetic episodes or
- Clinically detected aspiration or
- Gastric residuals > 200 mL for nasogastric feeds

*Clinically significant stools:
- Liquid stools > 300 mL/d or
- > 4 loose stools per day or
- Risk of contamination of wounds or catheters

†Medications that commonly cause diarrhea:
- Metoclopramide
- Quinidine
- Xylitol
- Magnesium
- Erythromycin
- Aminophylline
- Sorbitol
- Phosphorus
Multiple Containers

- **Advantages**
  - Varied proportion of carbohydrate, protein and Lipid can be used
  - One component can be avoided if desired

- **Disadvantages**
  - Errors in mixing causing incompatibilities
  - Labile components like vitamins, polyunsaturated fatty acids can be degraded during hang time
  - Needs frequent bottle change, increasing risk of contamination
Peripheral TPN

- **Advantages**
  - Easy access

- **Disadvantages**
  - May be difficult to meet caloric demands, particularly if volume restricted

- **Remember**
  - Use when enteral route not available
  - Central Line not available or infected
  - Ideal for short term use
  - Total or Partial PN
  - Osmolality less than 900 mosm
Central TPN

- Aseptic precautions for insertion
- Transparent dressing / no gauze
- No three way
- Hand hygiene – while handling
- Do not use for other purpose
  - Dedicated port
- Change IV set every 24hrs
- Resite / remove line when infected
Monitoring TPN

- Monitor parameters at least once in 3 days
- Labs
  - CBC, Glucose, Electrolytes, BUN, Creat
  - LFT, TGL, PT
- Close monitoring of Blood glucose
- Intake and output
- Watch for line related complications
Nutritional Approach

• Nutritional assessment & support must be implemented upon admission
• Enteral Nutrition (EN) is preferred
• Parenteral nutrition is used to supplement EN when necessary & when EN not feasible
• Overfeeding is avoided and tight glycemic control maintained
• Diarrhea is aggressively managed
Experience a whole new way

THE APOLLO WAY
Nutrition Support Team

THE APOLLO WAY