The American Society for Parenteral and Enteral Nutrition publishes and updates guidelines for the assessment and provision of nutrition support in critically ill patients. The recommendations from that guideline were adapted to local culture to create the following Clinical Practice Guideline.

Step One: Nutrition Assessment upon ICU Admission

A. Determine if Patient is at High Nutritional Risk:
   - Major trauma
     - Severe traumatic brain injuries (GCS<9)
     - Abdominal injury requiring laparotomy
     - Orthopedic (major pelvic fractures, two or more long bone fractures, amputation)
     - Severe chest injury
     - Burns (>20%) or inhalation injury
     - Spinal cord injury
   - Chronically malnourished patients
     - insufficient PO intake ≤75% for 1 month
     - recent weight loss ≥5% in 1 month
     - muscle and/or subcutaneous fat loss
   - Patients with limited physiologic reserve
     - Co-morbid disease (lung, liver, kidney disease, active malignancy, immune dysfunction)
     - Age > 55 years
     - BMI<25 or >35

B. Determine Energy Requirements:
   STICU
   - When available, indirect calorimetry should be used to assess energy requirements.
   - In the absence of indirect calorimetry, daily caloric goal should be determined based upon generalized estimates
     - BMI: actual body weight x (30 kcal/kg/day)
     - BMI >25: ideal body weight +10% x (30 kcal/kg/day)

Burn
   - Indirect calorimetry should be used to assess energy requirements 3 days post admit and repeated every 5-7 days. To start, use generalized estimates:
     - BMI <30, use actual body weight, BMI >30: ideal body weight +10%
     - 0-20% TBSA or inhalation injury = ~30 kcal/kg/day
− 20-35% TBSA = ~35 kcal/kg/day
− >35% TBSA = ~40 kcal/kg/day

**Step Two: Determine if Patient has a Contra-indication to Enteral Nutrition**

A. Absolute contra-indication to enteral nutrition:
   • Inadequately resuscitated trauma patient
   • Bowel obstruction/severe ileus
   • Intestinal discontinuity
   • Enteral access unattainable

B. Relative contra-indications to enteral nutrition:
   • Blood pressure support with vasopressors
   • Gastrointestinal bleeding

**Step Three: Determine Route of Administration of Enteral Nutrition**

A. Post-Admission to Feeding Timeline (completed within 4-6 hrs of ICU admission)
   • TF orders: OG or NG tube placement, KUB, tube feeding formula, and pump.
   • Clear feeding tube for use
   • Tube feeding pump delivered to unit. Tube feeding started at 20mL/hr and advance by 20mL q4H

B. Gastric feeds
   • Relative contra-indications to gastric feeds:
     − Respiratory compromise without protected airway
     − Foregut surgery (esophagus, gastric reduction)
     − Continuous high gastric residual volumes (GRV) *see below
     − Unable to elevate head of bed >30°
     − Need for frequent surgery
     − Intubated with RASS ≤ -3
     − Prone position where abdominal exam is difficult

C. Small bowel feeds
   • Small bowel access:
     − High risk pts who undergo early laparotomy – place feeding tube at time of initial laparotomy
     − Patients undergoing abbreviated laparotomy – place tube at 2nd laparotomy
     − All other patients – one attempt at blind placement of “push” NJ made by RN
     − Failed “push” NJ attempt—schedule patient for endoscopic placement per ICU team
Step Four: Determine Dose of Enteral Nutrition

A. Tube feed formulas:

<table>
<thead>
<tr>
<th>Patient Condition</th>
<th>Formula</th>
<th>Calories per mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma/Critical Care</td>
<td>Peptamen AF®</td>
<td>1.2 kcal/mL</td>
</tr>
<tr>
<td>Renal failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iHD CRRT</td>
<td>Novasource® Renal</td>
<td>2 kcal/mL</td>
</tr>
<tr>
<td></td>
<td>Peptamen AF®</td>
<td>1.2 kcal/mL</td>
</tr>
<tr>
<td>Obesity (BMI&gt;35)</td>
<td>Peptamen® Intense (VHP)</td>
<td>1 kcal/mL</td>
</tr>
<tr>
<td>Hyperglycemia</td>
<td>Peptamen AF®</td>
<td>1.2 kcal/mL</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Replete® Fiber</td>
<td>1 kcal/mL</td>
</tr>
</tbody>
</table>

B. Start feeds at 20 mL/hr, advance 20 mL every 4 hours until goal reached

C. Standard free water flush is 30mL Q4H

D. Gastric feeds: check residuals q4 hours
   - If GRV <500mL and:
     - No signs of intolerance*, return 300mL aspirate to pt and continue EN, recheck GRV in 4 hrs
     - Signs of intolerance* are present, notify MD.
   - If GRV ≥500mL and:
     - No signs of intolerance*, notify MD, return 300mL aspirate to patient, begin metoclopramide 10mg IV q 6hrs (if metoclopramide already started, add erythromycin IV 250mg q6H), check GRV in 4hrs after metoclopramide dose .
     - Signs of intolerance* are present, notify MD.
   - If GRV remains ≥500mL after 4 doses of metoclopramide and/or signs of intolerance are present:
     - Hold gastric feedings, notify MD, place Small Bowel Feeding Tube, obtain KUB for placement verification, once confirmed initiate EN at 20mL/hr and advance by 20mL/hr q 4hrs to goal rate

*Signs of intolerance: abdominal distention/pain, nausea, emesis, diarrhea, constipation >3 days, a large gastric bubble from x-ray, etc.

Step Five: Additional Nutritional Supplementation

A. Trauma
   - No high quality evidence to support supplemental therapy
   - Do NOT administer supplemental glutamine.

B. Burns
   - Oxandralone 10mg PO q12 hours
Volume-based feeding protocols
A. STICU Catch-Up feeding guidelines
   o If patient receives less than 90% of daily goal volume due to procedures, a new EN catch-up rate that included the prior day’s deficit plus the current daily volume would be calculated.
   o The adjusted volume is administered over the following 24-48 hours.

   \[
   \text{EN catch-up rate} = \text{Base rate} + \text{base rate} \times (100\% - \% \text{ of EN volume received})
   \]

   \[
   \% \text{ of EN volume received} = \frac{\text{EN volume received in the past 24h}}{\text{24 EN volume goal}} \times 100\%
   \]

   o Order catch up rate only if EN reaches goal rate
   o Order catch up rate only if EN % < 90% of 24-hour goal volume
   o Maximum catch up rate is 150mL/hr
   o Do not order catch up rate if any signs of GI intolerance, serum phosphorus < 2.0 or BG >200mg/dL

B. Burn Volume-Based (PEP-Up) feeding guidelines
   o Once patient is tolerating goal EN, switch over to volume-based feedings
   o Take goal rate and multiply by 24 to get Daily Volume Goal for the entire day
   o RN adjusts feed at shift change OR when the patient returns from OR if they missed >2hrs of EN
   o RN finds volume infused since 6am via the TF pump and subtracts that volume from the Daily Volume Goal to get the Volume Left to Be Fed
   o RN then calculates the number of hours remaining til 6am the following day and uses the chart on the patient’s door to determine new rate based on Volume Left to Be Fed in the remaining hours til 6am
   o Maximum volume-based rate is 150mL/hr

Parenteral Nutrition:
- In patients with low nutrition risk:
  o Parenteral nutrition can be held over the first 7 days following ICU admission.
- In patients with high nutrition risk and:
  o Who are able to receive trophic tube feeds, parenteral nutrition started if goal enteral feeds cannot be provided within 5-7 days of ICU admission.
  o Who are unable to receive any enteral nutrition, early parenteral nutrition should be considered.

Criteria for Protein-Calorie Malnutrition:\n- Insufficient energy intake
- Weight loss
- Decreased muscle mass
- Decreased subcutaneous fat mass
- Increased fluid accumulation
- Decreased functional status

Moderate or severe protein-calorie malnutrition exists when a patient has ≥2 of the above criteria.
PATIENT SELECTION: HIGH RISK PATIENT POPULATIONS TO RECEIVE EARLY ENTERAL NUTRITION (WITHIN 24HRS)

- Major Trauma [Severe TBI, abdominal, orthopedic [major pelvic fracture, two or more long bone fracture], severe chest, burn]
- Major upper gastrointestinal surgery that precludes oral intake for >5 days
- Chronically malnourished patients (insufficient PO intake ≤75% for 1 month, recent wt. loss ≥ 5% in 1 month, muscle and/or subcutaneous fat loss)
- Patients with limited physiologic reserve (significant co-morbid disease; lung, liver, kidney disease, active malignancy, immune dysfunction, age > 55 years, BMI<25 or >35)

CONTRAINDICATIONS TO EN
- Incomplete resuscitation
- Bowel obstruction/severe ileus
- Bowel discontinuity
- Enteral access unattainable

RELATIVE CONTRAINDICATIONS TO GASTRIC EN
- Respiratory compromise without protected airway
- Foregut surgery (esophagus, gastric reduction)
- Continuous high gastric residual volumes (GRV) *see below
- Unable to elevate head of bed >30°
- Need for frequent surgery
- Intubated with RASS ≤ -3
- Prone position where abdominal exam is difficult

PLACE NASO/OROGASTRIC FEEDING TUBE
- Initiate full strength formula at 20mL/hr, advance EN by 20mL/hr q4hrs to goal rate.
- Check GRV q 4hrs
- If GRV<500mL and no signs of intolerance*, return 300mL aspirate to pt and continue EN, recheck GRV in 4 hrs
- If GRV<500mL and signs of intolerance* are present, notify MD.
- If GRV ≥ 500mL and no signs of intolerance*, notify MD, return 300mL aspirate to pt, begin metoclopramide 10mg IV q 6hrs (if metoclopramide already started, add erythromycin IV 250mg q6H), check GRV in 4hrs after Reglan dose
- If GRV ≥ 500mL and signs of intolerance* are present, notify MD.
- If GRV remains ≥500mL after 4 doses of metoclopramide and/or signs of intolerance are present:
  - Hold gastric feedings, notify MD, place Small Bowl Feeding Tube, obtain KUB for placement verification, once confirmed initiate EN at 20mL/hr and advance by 20mL/hr q 4hrs to goal rate
*Signs of intolerance: abdominal distention/pain, nausea, emesis, diarrhea, constipation >3 days, a large gastric bubble from x-ray, etc.

CONSIDER TPN
*If high risk and unable to initiate enteral nutrition by ICU day 7 with tolerance
*see indications/contraindications to TPN under Enteral Protocol

PLACE SMALL BOWEL FEEDING TUBE WITHIN 24HRS AFTER ADMISSION
- High risk pts who undergo early laparotomy – place feeding tube at time of initial laparotomy
- Pts undergoing abbreviated laparotomy – place tube at 2nd laparotomy
- All other pts – one attempt at blind placement of “push” NJ made by RN
- Failed “push” NJ attempt—schedule pt for endoscopic placement per ICU team

REMININDERS:
- Maintain HOB ≥45° (or in 30° reverse trendlenberg), unless contraindicated
- Consult with Dietitian on a daily basis
- Follow STICU/SIMU/Burn Preoperative NPO Protocol for bedside, IR & OR surgical procedures
- Follow volume-based feeding guidelines for pt that receives less than daily goal volume due to procedures
- Restart EN at the previous rate after PEG placement

No

CONTRAINDICATIONS TO EN

Yes

CONSIDER TPN

Yes

PLACE SMALL BOWEL FEEDING TUBE

No
References:
