I. INTRODUCTION

Malnutrition and nutrient depletion is associated with increased morbidity and mortality and therefore needs to be identified and treated appropriately. Nutrition supplementation should be anticipated on all Surgical Critical Care (SCC) patients based upon disease state, acuity, and pre-existing nutritional status. The goals of nutrition support in the surgical critical care units are to: provide nutrition commensurate with the patient’s medical condition and anticipated nutritional needs; avoid complications related to route of nutrient administration; decrease costs through standardized nutrition protocol; and improve patient outcomes by decreasing overall morbidity and mortality through optimization of nutrition status.

II. PURPOSE

To provide a standard for providing nutrition to SCC patients, thereby improving quality of care and concurrently reducing costs by providing the framework for decision-making regarding optimal timing, route, and schedule for advancement of enteral nutrition in the SCC patient.

III. INTERVENTION

A. The nutrition plan will be addressed on all SCC patients within 24 hours of admission to a SCC unit. In patients with a functional GI tract, enteral nutrition should be initiated as early as possible. In patients with a non-functional GI tract or a demonstrated intolerance to enteral nutrition, parenteral nutrition may need to be considered (see III.C.3.). In collaboration with the primary service, nutrition supplementation will be initiated based upon the following timeframes:
   1. Within 12-24 hours:
      a) Major trauma, burn, surgery
      b) Severe traumatic brain injury (TBI)
   2. Within 24-48hrs:
      a) Critically ill, ventilated patients
   3. Within 48 hours:
      a) Non-ventilated patients with mild/moderate malnutrition and NPO

B. Enteral versus parenteral feeding
In patients unable to take oral feeds (intubation, anatomic defect), the enteral route is the preferred route of feeding. Enteral feeding has been shown to be well tolerated by the patient post injury and post surgery even in the absence of gastric motility, colonic peristalsis, bowel
sounds, or flatus. Feeding the gut is associated with preservation of gut mucosa, reduced bacterial translocation, and decreased infectious complications. Enteral feeding is also associated with certain risks such as aspiration and gastrointestinal complications and therefore must be applied to the appropriate patient population.

1. Contraindications to enteral feeding
   a) Incomplete resuscitation/hemodynamic instability as defined by ICU attending
   b) Bowel obstruction
   c) High output fistula
   d) Enteral access unattainable

2. Relative contraindication to enteral feeding
   a) High vasopressor therapy for hemodynamic instability (inadequate perfusion)- as defined by ICU attending

C. Choice of enteral route

1. **Gastric Total Enteral Nutrition (Gastric TEN)**
   Gastric TEN should be used as the first route for enteral nutrition. The ease of achieving gastric access allows for early initiation of enteral nutrition. Feeding intolerance is easy to identify with gastric TEN due to the ease of monitoring gastric residual volumes which may decrease the rate of complications associated with Gastric TEN.

   a) Gastric TEN is given via nasogastric tube placed in the stomach to allow for aspiration of gastric residual volumes (not a small bore “Dobhoff” tube)
      1. Residuals should be aspirated, measured, and recorded on the flowsheet every four hours.
      2. Residual \( \geq 250\text{ml} \) is considered significant (in some instances, use of a residual >500ml may be clinically appropriate)
      3. Consider transitioning to a smaller bore tube (e.g. “Dobhoff tube”) when patient tolerance dictates.

   b) Contraindications to Gastric TEN
      1. HOB>30° not possible
      2. Intractable nausea/vomiting
      3. Severe reflux
      4. History of aspiration of gastric TEN
      5. Gastroparesis
      6. Foregut surgery (esophagus or gastric reduction surgery)
      7. Relative contraindication - GCS<9
      8. Persistent high gastric residual volumes (>250ml)
c) Potential complications
   (1) Aspiration pneumonitis/pneumonia
   (2) Malpositioning of nasogastric tube
   (3) Nasal alar necrosis with nasogastric tube

2. Small Bowel Total Enteral Nutrition (Small Bowel TEN)
Small Bowel TEN is associated with early achievement of nutrition goals when
compared to gastric TEN in patients who show intolerance to gastric feeds for greater
than 24 hours. However, small bowel feeding tube placement is often difficult to
achieve leading to multiple attempts and ultimately delayed initiation of enteral
feeding. For this reason, the patient should be converted to Small Bowel TEN after
documentation of intolerance/contraindication to gastric TEN Contraindications
   (1) Incomplete resuscitation (as defined by ICU attending)
   (2) SB access not achieved
   (3) Bowel obstruction (with inability to achieve access distal to obstruction)
   (4) High output fistula (unless enteral access can be safely achieved distal to
the fistula)

b) Relative Contraindications
   (1) Elevated vasopressor therapy for hemodynamic instability (inadequate
perfusion) – as defined by ICU attending

c) Potential complications
   (1) Aspiration pneumonitis/pneumonia
   (2) Misplacement of nasoenteric tube
   (3) Nasal alar necrosis with naso-enteric tube

D. Enteral Feeding Initiation Guideline
1. Gastric Total Enteral Nutrition – After confirmation of gastric enteral access, gastric
TEN should be routinely started by the bedside RN per the established timeframes above
unless there is an exclusionary order from the critical care service to delay TEN initiation
or a contraindication to gastric TEN.
   a) On ICU admission, the RN should confirm with the critical care team that there
is not a contraindication to gastric TEN
   b) RN should confirm correct tube position with the critical care team prior to
feeding
   c) Secure nasal gastric tube assuring no alar pressure. Assess nasal alar daily for
signs and symptoms of necrosis
   d) Elevate HOB ≥ 30° (reverse trendelenberg for thoracic and lumbar spine
precautions)
e) Begin with continuous feeding at 20ml/hour of Standard formula
f) When TEN is initiated, liquid protein supplementation should also begin at a dose of 1 packet every 8 hours. Nutrition will advise additional information.

g) Check gastric residual volumes 4 hours after feeding initiation and every four hours thereafter.

(1) If gastric residual volume <250ml, return gastric residual volume to stomach and continue feeding. Advance Gastric TEN to 50ml/hr. Monitor for signs and symptoms of feeding intolerance. If residuals remain <250ml
and there are no other signs or symptoms of feeding intolerance, advance TEN to patient specific TEN goal rate by 30ml every 4hrs.

(a) The TEN goal rate will be calculated by the Clinical Nutrition Support Service (CNSS). The goal rate will be based on an 18 hour feeding time to allow for feeding discontinuation for operative procedures, patient transport, medication administration, etc.

(2) If gastric residual volume \( \geq 250\text{mL} \), return gastric residual volume to stomach and hold feeding. Recheck gastric residual volume in two hours. If \( < 250\text{mL} \), continue Gastric TEN. Advance as above. Continue to check gastric residual volume every 4 hours.

(3) If gastric residual volume \( \geq 250\text{mL} \) on two consecutive aspirations, consider promotility agent.

(4) If gastric residual volume \( \geq 250\text{mL} \) for 48 hours, consider change to small bowel feeding.

(5) Continue to monitor for signs and symptoms of feeding intolerance.

2. Small Bowel Total Enteral Nutrition – For use in patients with a small bowel enteral access on ICU admission or in patients with a contraindication or intolerance to gastric TEN.

a) RN should confirm correct tube position with the critical care team prior to feeding

b) Secure nasal tubes assuring no alar pressure. Assess nasal alar daily for signs and symptoms of necrosis

c) Elevate HOB \( \geq 30^\circ \) (reverse trendelenberg for thoracic and lumbar spine precautions)

d) Start small bowel TEN at 20ml/hour Standard formula for 4-6 hours.

e) When TEN is initiated, liquid protein supplementation should also begin at a dose of 1 packet every 8 hours.

f) Monitor for signs and symptoms of TEN intolerance (as described below)

(1) Advance to 50ml/hr for 4-6hrs and monitor for feeding intolerance. If well-tolerated, advance to patient specific TEN goal rate.

(a) The TEN goal rate will be calculated by the Clinical Nutrition Support Service (CNSS). The goal rate will be based on an 18 hour feeding time to allow for feeding discontinuation for operative procedures, patient transport, medication administration, etc.

(g) Continue to monitor for signs and symptoms of feeding intolerance.

3. If patient is unable to tolerate \( >40-60\% \) goal TEN in the following timeframes, supplemental parenteral nutrition in addition to TEN may be indicated:
a) >2 days in patients with severe TBI
b) >2 days in patients with severe malnutrition
c) >5 days in patients with major trauma
d) >7 days in all other patients

E. Feeding Intolerance

1. Enteral nutrition should be held for signs/symptoms of feeding intolerance until resolved or until another cause has been clearly established.
   a) Vomiting
   b) Abdominal distention
   c) Cramping or tenderness
   d) Intractable diarrhea
   e) High gastric residual volumes (>250ml)
   f) Significant change in abdominal exam
   g) Deterioration in clinical exam

F. Total Parenteral Nutrition (TPN)

Parenteral nutrition is recommended when enteral access cannot be achieved or when enteral nutrition is contraindicated for the patient. It can also be used as an adjunct when enteral nutrition is not meeting >60% of the patient’s nutritional needs or when the patient is transitioning from parenteral nutrition to enteral nutrition. Parenteral nutrition is also associated with certain risks such as infection and hyperglycemia and therefore should be used on a limited basis and monitored closely. The patient should be converted to enteral nutrition as early as can be safely administered. TPN should not be discontinued until tolerance to enteral nutrition near goal rate is achieved and maintained.

1. Contraindications
   a) Candidate for enteral nutrition
   b) No central venous access

2. Potential complications
   a) Increased infectious episodes such as pneumonia and line sepsis
   b) Central venous access related complications (PTX, line infection)
   c) Hyperglycemia
   d) Cholestasis
   e) Hypertriglyceridemia

3. Glucose control with parenteral nutrition
1) Blood glucose should be monitored every six hours when parenteral nutrition is initiated until target blood glucose range is accomplished and maintained.
2) Target blood glucose range is <150gm/dl.
3) Insulin drips should be used in conjunction with parenteral nutrition to maintain blood glucose within the target range.
4) Continue to monitor blood glucose as per protocol while on insulin drip.
5) Once a patient has stable insulin requirement, insulin can be added to the TPN. When adding insulin to TPN, the insulin dose should be ~50% of the insulin drip requirement over the past 24 hours.

IV. Small bowel feeding tube insertion- refer to UPHS policy.
V. BIBLIOGRAPHY


Clinical Practice Guidelines (CPG) are meant to standardize and optimize care and decrease variability in practice. They are intended to be used as framework for the delivery of patient care in the surgical critical care units. CPG’s are a combination of evidence-based medicine and accepted practices in critical care medicine. CPG’s are intended to provide decision support for the management of the majority of patients, and are not proposed as directives, rules, or policies. They are not substitutes for clinical judgment. Deviations from the CPG’s are expected when deemed medically necessary; all exceptions should be documented in the medical record and require discussion between the Surgical Critical Care attending and the attending of the primary or consulting service.
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Algorithm

Need for nutrition identified? 12-24 hours after ICU admit: Major trauma, surgery, severe TBI
24-48 hours after ICU admit: Critically ill, ventilated patients
Within 48 hours of ICU admit: Non-ventilated patients with mild/moderate malnutrition and NPO

Contraindications to enteral feeding?
(Bowel obstruction, Feeding intolerance (FI), High output fistula, Enteral access unattainable, Incomplete Resuscitation)

Contraindications to Gastric TEN?
(HOB <30 degrees, Intractable N/V, Severe reflux, Gastroparesi, Residuals >250mL, Aspiration of gastric TEN, Foregut Surgery, GCS <9 (relative contraindication))

Place/confirm NG tube. Begin TEN at 20 mL/hr.

Advance 30mL every 4 hours to goal.

Continue TEN. Check residuals every 4 hours. Monitor for feeding intolerance.

Check residuals every four hours. ≥ 250mL? Signs of Feeding Intolerance?

Hold TEN 2 hours and recheck residual. Resume TEN if ≤ 250mL.

Residuals ≥ 250mL x 2? Feeding Intolerance?

Add prokinetic agent.

Residuals >250mL? Feeding Intolerance

Obtain small bowel access

Begin SB TEN at 20mL/hour and liquid protein 1 pack q 8hrs.

Monitor for feeding intolerance

Hold TEN for 2 hours and reassess abdominal exam.

Advance by 30mL every 4hrs to goal.

Ongoing Feeding Intolerance?

Consider TPN

Malnourished: on admission
Well-nourished: Day 7