VANDERBILT UNIVERSITY
MEDICAL CENTER

DIVISION OF TRAUMA AND SURGICAL CRITICAL CARE

Trauma ICU Nutrition Management Guidelines

Trauma Critical Care Nutrition Guidelines

Clinical judgment may supersede guidelines as patient circumstances warrant

ASSESSMENT AND EVALUATION

- All patients admitted to the Trauma Intensive Care Unit require a nutrition risk assessment within 24 hours and a nutrition plan within 48 hours
- Consult Nutrition Service as needed for specific recommendations (i.e. tube feeding formulations, oral supplements, poor oral intake, education)

ADMINISTRATION

- Enteral nutrition (EN) preferred over parenteral nutrition (PN)
- Reduce risk of aspiration by reducing sedation, elevating HOB 30 – 45 degrees, performing mouth care per VAP Guidelines and minimizing transport out of ICU

Oral Nutrition

- Oral intake preferred method of nutrition if appropriate for patient
- Initiate an appropriate diet with oral diet advancement (add oral supplement to optimize po intake)

Enteral Nutrition

Initiation:

- Initiate EN ASAP following onset of critical illness and admission to ICU, after resuscitation efforts completed and/or hemodynamic stability achieved.
- Advance as quickly as tolerated within 48-72hous (if not at risk of refeeding syndrome (see below in special considerations)

- Weaning EN (transitioning to PO diet)
  - Cycle EN x 12hr, 7p to 7am (for 50% of needs during first few days of transition)
  - Consider discontinuation of EN once patient consistently consumes and tolerates on average 60% or more of meals.
- Feeding access
  - Post Pyloric access is preferable if EN access is needed, especially with high aspiration risk, however nutrition should not be delayed if only gastric access is obtained.

	Gastric	Post-pyloric
Short-term	Orogastric tube (OGT) Nasogastric tube (NGT) Dobhoff tube (DHT)	DHT (via Cortrak and placement confirmed by abdominal radiographic imaging (KUB))
Long-tern	Percutaneous endoscopic gastrostomy (PEG) or laparoscopic gastrotomy	• PEG-Jejunostomy (for unsuccessful placement of DHT for post-pyloric access) • surgical jejunostomy

- GI Intolerance
  - Gastric residual volume (GRV) is not utilized as routine evaluation of tolerance. Daily physical examination, patient symptoms, clinical risk factors, and abdominal radiographic films should be utilized to determine tolerance. If checked, Tube feeds should not be held unless GRV is > 500 cc
  - Prokinetic agents may be introduced if GI intolerance suspected or for patients with high risk of aspiration. Consider QTc prolongation.
    - Erythromycin 200mg IV or per tube q6h x 3 days
    - Metoclopramide 10mg IV q6h x 3 days
    - Naloxone 8mg q8h x 3 days, then 8mg q6h prn
- For persistent diarrhea and C. Diff infection ruled out, initiate Nutrisource fiber 4 packets in 24 hours

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Parenteral Nutrition

Nutrition risk and malnutrition

- Patients at high nutrition risk are most likely to benefit from aggressive nutrition therapy.
    - Nutrition risk increases with age >50 years, APACHE II >15, SOFA score >6, number of medical co-morbidities, and days from hospital to ICU admission.
    - Degree of nutrition risk determines how quickly to initiate/advance EN and when to initiate PN.
- If **low nutrition risk** and unable to meet ≥ 50% energy and protein requirements via EN within 7 - 10 days, then initiate PN.
- If **high nutrition risk** present (malnutrition upon admission, inability to use GI tract expected for more than 3-5 days) and EN not feasible, initiate PN as soon as possible after resuscitation efforts completed.
- If malnutrition present (malnutrition upon admission determined by AND/ASPEN criteria and inability to use GI tract expected for more than 3-5 days), initiate PN as soon as possible after resuscitation efforts completed.
    - PN is re-ordered daily by the Adult Nutrition Support Team (NST) with consideration of energy and protein intake from PO/EN. Contact Adult NST (pager 615-835-0419) for PN discontinuation when the following parameters are met:
    - PO/EN is currently at or expected to be advanced to meet ≥ 60% of goal by the end of the day
    - Low risk of intolerance to or interruption of PO/EN advancement
    - If patient has a high risk of intolerance to PO/EN advancement or further interruption to PO/EN is expected over the next day, contact the Adult NST to consider continuation of PN with reduced energy provision

<u>If LOS>7days and pt has not consistently met on average near 60% estimated needs, consider nutritional provision from a combination of PO/EN/PN routes.</u>

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DOSING

- Dosing weight
  - Use actual weight or known usual body weight (UBW) if BMI <29.99 for height.
  - Use upper ideal body weight (IBW) for height if BMI 30 or greater.
  - Hamwi Method to calculate IBW
    - Men: 106# (48kg) for 1st 5 feet, then add 6# (2.7kg) per inch >5 feet, +/-10%
    - Women: 100# (45kg) 1st 5 feet, then add 5# (2.3kg) per inch >5feet, +/-10%
  - Use actual body weight if weight < IBW
- Energy goals:
  - 25 to 30 kcal/kg dosing weight/day
  - If BMI >30 (Class I, Class II or Class III Obesity), use 22 to 25 kcal/kg upper IBW/day
- Protein goals:
  - General 1.2 – 2.0 g/kg dosing weight/day
  - Obesity
    - If BMI 30 –39.99, use 2g/kg upper IBW/day
    - If BMI > 40, use 2.5g/kg upper IBW/day
  - Renal Failure:
    - HD 1.5 - 2.0 g/kg dosing weight
    - CRRT: 1.5 -2.0 with maximum 2.5g/kg dosing weight
  - Hepatic Failure: 1.2 - 2.0/kg dry or actual body weight/day
  - Spinal Cord Injury: 2.0/kg dosing weight (acute injury)
  - Traumatic Brain Injury: 1.5-2.0/kg dosing weight
  - Open Abdomen w/negative pressure therapy estimated protein loss: add 2.9gm/liter exudate lost.

Tube Patency

Minimum 30ml water flush every 4 hours to maintain tube patency.

MONITORING

- Serum protein markers (i.e. prealbumin, CRP) not recommended for evaluation of nutritional status or goals but can be useful in series. However, since inflammation affects results, when assessing specific vitamin or mineral levels simultaneously assessing CRP is needed to interpret lab results.
- When the length of ICU stay is >2 weeks consider assessing CRP and Vit D simultaneously to assess Vitamin D deficiency.

Special considerations

Open Abdomen

- Early EN recommended 24 – 48 hours after injury, without evidence of bowel injury.
- Consider PN if bowel is in discontinuity and patient is unlikely to receive adequate EN within the next 3 – 5 days.
  - Consider PN as soon as possible if patient has moderate or severe malnutrition and EN is unable to be provided.

Hyperglycemia:

VUMC EN formulary does not have a “diabetic” EN formula.

Per gram protein provided Impact Peptide 1.5 or Peptamen Intense VHP will provide lowest amount of carbohydrate per TF goal.

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Refeeding syndrome

Refeeding syndrome occurs when the body moves from fat/protein metabolism to carbohydrate metabolism causing a rapid increase in insulin that stimulates movement of potassium, magnesium and phosphorus into the depleted intracellular compartments causing a rapid fall in the extracellular serum concentrations. Sodium and water retention may occur that if severe, may lead to pulmonary edema or congestive heart failure. Thiamine needs increase and thiamine deficiency can become clinically relevant**.**

- Replace electrolytes, provide thiamine (100mg/day x 5-7 days or longer in patients with severe starvation, chronic alcoholism, other high deficiency risk and/or sign pf thiamin deficiency), and MVI prior to initiation of tube feedings.
- Patients at risk for refeeding syndrome, initiate trophic feedings (no more than 25% of goal) and then check BMP, phosphorus and magnesium.
- Advance tube feedings slowly over 3–4 days
- Check BMP, phosphorus, and magnesium levels daily as EN advances to goal
- Continue to monitor BMP, phosphorus, and magnesium levels after TF has reached goal rate until repletion has occurred (at least 2 days at goal rate without need for replacement.)

CRRT

- Regardless of intake from EN, schedule the following empirically upon CRRT initiation and continue for the duration of CRRT:
  Per tube: Adult Liquid Multivitamin/minerals 15 mL per tube daily
- Note: This liquid MVI does not contain folic acid or vitamin K. Supplement these separately if needed
  - If Liquid MVI unavailable Pediatric chewable multivitamin twice daily per tube (can be crushed)
  - Thiamine 100 mg per tube daily
  - Folic acid 1 mg per tube daily
  - Ascorbic acid 500 mg per tube b.i.d.
- After 7 days on CRRT, begin copper gluconate 2 mg daily and check the following labs:
  - C-reactive protein (CRP; to guide interpretation of micronutrient level assessment)
  - B1 (thiamine), **whole blood**
  - B6 (pyridoxine)
  - B9 (folate)
  - Copper
- If deficiencies are present, consult TICU Pharmacist or Nutrition Support Pharmacist for dosing recommendations. Majority of micronutrients cannot be interpreted correctly in critically ill patients without a simultaneous CRP result. Refer to the following table for interpretation of micronutrient levels in relationship to CRP.

Micronutrient	**CRP<15mg/L**	**CRP 100-200mg/L**	**Interpretation with elevated CRP**
Copper	10-15% **increase**	30% **increase**	Actual Level is **lower** than lab result.
Zinc	10% decrease	40-60% decrease	Actual level is higher than lab result. Patients on RRT may have elevated levels due to contamination of dialysate fluids during the manufacturing process.
Selenium	10% decrease	40 -60% decrease	Actual level is higher than lab result.
Vitamins B1, 2,9,12	No change	No change	Interpret results based on normal ranges.
Vitamin B6	? decrease	40-50% decrease	Actual level is higher than lab result.
Vitamin C	-------	>75% decrease	Unless vitamin C deficiency is suspected, checking levels during critical illness should be generally avoided due to limited utility of lab results.

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Wound Healing

For large wounds and risk factors for micronutrient deficiencies, consider supplementing with the following:

- Multivitamin daily
  - Per tube: Adult Liquid Multivitamin/minerals 15 mL per tube daily
    Note: This product does not contain folic acid or vitamin K. Supplement these separately if needed.
  - or if liquid MVI unavailable
    Use Pediatric chewable multivitamin twice daily per tube (can be crushed)
  - PO: Vicon® Multivitamin/minerals/folic acid capsule
- Ascorbic acid 500 mg PO/per tube BID
- Vitamin A 10,000 international units PO/per tube daily
- Zinc 50 mg (elemental) PO/per tube daily
  - Baseline status of vitamin A and zinc should be assessed using the guidelines below. If no deficiencies are present and the patient is receiving adequate nutrition, supplementation should be discontinued.

Alcoholism

Vitamin Supplementation is based on route of administration.
Thiamine 100 mg PO/PT/IV daily x 3 days
Folic acid 1 mg PO/PT/IV daily x 3 days
Multivitamin PO/PT/IV daily x 3 days

ASSOCIATED TSCC PMGs

- Electrolyte replacement protocol
- Glycemic Protocol
- Gastrointestinal Stress Ulcer Prophylaxis
- VAP Protocol
- Alcohol Withdrawal Prevention Guideline

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Appendix 1

TICU ENTERAL NUTRITION TUBE FEEDING FORMULATIONS

Critically Ill Patient	**Obese Critically Ill Patient**	**Non-Critically Ill Patient**
Impact Peptide 1.5 (high protein as peptides, immune enhancing formula)	Peptamen Intense VHP (very high protein formula)	Isosource HN Nutren 1.5 Nutren 2.0 (standard intact protein formulas)

Consult Nutrition Service for disease specific formulations in TICU

Respiratory failure	**Admitted with pre-existing renal failure**	**Renal failure develops**	**Acute Pancreatitis**	**MODS/Chyle Leak**	**Modulars** **Nutrisource Fiber** **Prostat Max (Protein)**
Nutren 2.0 (Volume restricted formula)	Novasource Renal (Electrolyte restricted formula)	iHD: Novasource Renal CRRT: Impact Peptide 1.5 or Peptamen Intense VHP	Peptamen 1.5	Vivonex RTF 1.0	

If product shortage occurs, refer to: Tube Feeding Formula Substitution List for Trauma Patients 2025 (see next page)

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Tube feeding (TF) Formulas	
If VUMC is out of TF formula ordered	**Temporarily Substitute this at same goal rate or adjust as below.** Or until RD can reset goal with substituted product if long term need for substitution
Compleat Standard 1.4 (used for vegan/milk allergy)	**Compleat Peptide 1.5**
Compleat Peptide 1.5 (used for vegan/milk allergy)	**No substitution if needs vegan and peptide formula.** Can use Peptamen 1.5 if pt okay for nonvegan/milk- protein-based peptide product
Isosource HN	**Nutren 1.5** (overfeeds calories/little less protein)
Impact Peptide 1.5	**Peptamen 1.5** (little less protein)
Fibersource HN (fiber containing)	**Isosource HN** (non-fiber containing**)**
Nutren 1.5	**Nutren 2.0** (cut ml/hr rate by 25%)
Nutren 2.0	**Nutren 1.5** (increase ml/hr rate by 25%)
Novasource Renal	**Nutren 2.0** (monitor K, Mag, Phos)
Nutrisource Fiber packets	**No substitution** (or used fiber medication as sub)
Peptamen 1.5	**Vivonex RTF**
Peptamen Intense VHP	**Impact Peptide 1.5** (will overfed calories yet meet protein needs)
Prostat Max	**No substitute**
Vivonex RTF	**No substitute**

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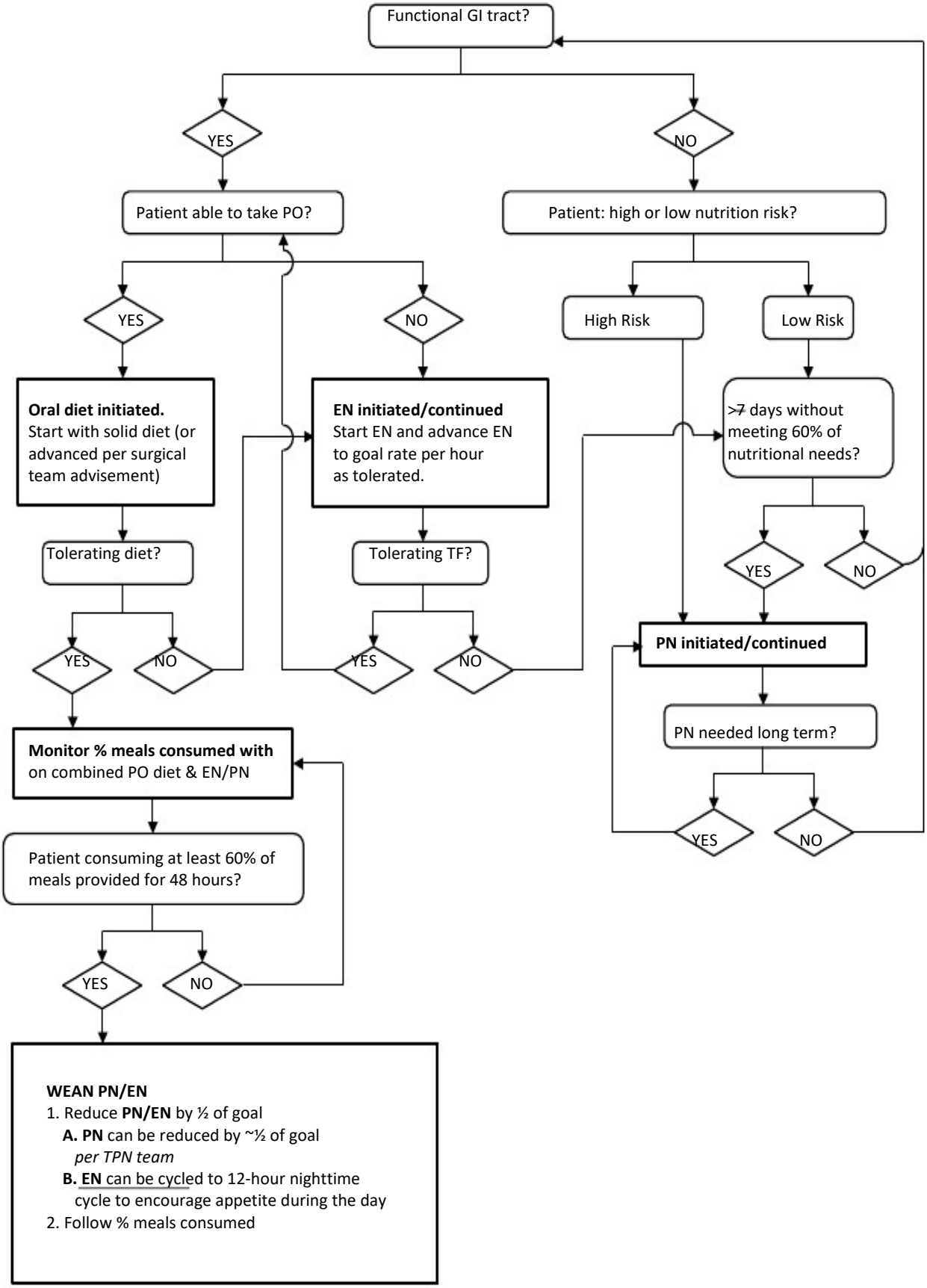
Appendix 2

ENTERAL/PARENTERAL NUTRITION FLOW DIAGRAM



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Appendix 3

PREOPERATIVE ENTERAL NUTRITION PROTOCOL FOR PATIENTS WITH PROTECTED AIRWAY (Trach/Oral ETT)

NON-ABDOMINAL SURGERY

- Turn tube feedings off just prior to OR departure or bedside procedure.
- Gastric tube will be flushed and aspirated.

ABDOMINAL SURGERY OR OPERATIVE INTERVENTION REQUIRING PRONE POSITIONING

- Turn tube feedings off 6 hours before planned anesthesia.
- Gastric tube will be flushed and aspiration prior to OR departure.

UPPER GI ENDOSCOPY

- Turn tube feedings off 1 hour prior to elective endoscopy.
- Place NGT to suction.

OTHER CONSIDERATIONS

- Stop insulin infusion prior to OR transport.
- Alert anesthesiology to perform accucheck perioperatively in OR if SQ insulin given within 2 hours.
- Restart tube feedings post-surgery unless requires orders to hold post-surgery.
- Patients with confirmed post-pyloric feeding tube, consider perioperative continuous feeding by anesthesiology and surgeon.

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