Enteral Nutrition Support of Patient with Acute Respiratory Failure

Critical illness is associated with catabolism and altered gut absorption, with up to 75% of patients experiencing feeding intolerance.[1,2] Per the nutrition risk screening tool, NRS 2002, intensive care patients on mechanical ventilation are considered at high nutrition risk with increased protein requirements.[3] Adequate provision of protein in ventilated patients is associated with lower mortality and increased likelihood of being discharged alive from the ICU.[4,5]

NUTRITIONAL CONSIDERATIONS

- **Protein and Calorie Requirements:** Indirect calorimetry is the gold standard for nutritional assessment of calorie needs. If unavailable, the following predictive equations are recommended:[6]
  - Non-Obese (BMI <30): 25-30 kcal/kg actual body weight/day and 1.2-2.0g protein/kg/day. During the early phase of critical illness, provision of 15-20 kcal/kg actual body weight or 70-80% of measured needs may be warranted.[18]
  - Obese (BMI 30-50): 11-14 kcal/kg actual body weight/day and 2.0g protein/kg ideal body weight/day for BMI 30-40 with up to 2.5 g pro/kg ideal body weight/day ideal body weight/day for BMI >40
  - Obese (BMI >50): 22-25 Kcal/kg ideal body weight/day and up to 2.5 g protein/kg ideal body weight/day for BMI >40
  - Acute Kidney Injury (no renal replacement therapy): 25-30 kcal/kg actual body weight/day and 1.2-2.0 g protein/kg actual body weight/day
  - Acute Kidney Injury (renal replacement therapy): 25-30 kcal/kg actual body weight/day and up to 2.5 g protein/kg actual body weight/day
- **Feeding Tube Placement:** Patients at high risk for aspiration may benefit from post-pyloric feeding tube placement.[6] Patients with Acute Respiratory Distress Syndrome may benefit from prone positioning with head of bed elevated 10 degrees.[7*]
- **Initiation of Enteral Feeding:** Initiate early enteral nutrition within 24-48 hours of admission to the ICU in hemodynamically stable patients.[6,18]
- **Refeeding Syndrome:** Patients on mechanical ventilation are at risk for refeeding syndrome. EN should be started at trophic (10-25mL/hour) or half rate and increased slowly over 72 hours. Monitor serum phosphate, potassium and magnesium daily for approximately 4 days.[8]
- **Prokinetic Agents:** Prokinetic agents should only be used as needed; use prophylactically in patients at high risk for aspiration.[6]
- **Vasopressor Agents:** Patients should be fully resuscitated prior to initiation of enteral feeding. Caution should be exercised when providing EN to patients on vasopressors.[6]
- **Gastric Residual Volume (GRV):** If monitored, EN should not be held for GRVs <500mL, unless other signs of intolerance exist.[6]
- **Managing Intolerance:** Monitor for intolerance, including abdominal distention, decreased bowel sounds, absence of flatus, diarrhea, constipation, abdominal pain and vomiting.[1]

INTOLERANCE	RISK FACTOR	MANAGEMENT[15]
High GRV, regurgitation, vomiting	Mechanical ventilation; age >70 years; sedation or low level of consciousness; neurological deficits, patient positioning; elevated blood glucose; gastroesophageal reflux	Alter sedation; position head of bed 10 degrees* or 30-45 degrees; improve blood glucose control; use prokinetic agents; switch to continuous feeding from bolus or intermittent. Utilize 100% whey-based formula to facilitate faster gastric emptying[16]
Diarrhea	Medication with sorbitol; antibiotics, Clostridium Difficile (C. Diff), formula rate, type and mOsm	Test for C. Diff and treat as needed; as possible, discontinue sorbitol containing medications; decrease mOsm of tube feeding formula; use continuous versus intermittent or bolus feeding. Use peptide-based feeding with easily absorbed ingredients[9]
Abdominal distention and/or pain; constipation	Ileus, obstruction, infection, swallowing air while on mechanical ventilation, constipation	Rule out/treat ileus and possible bowel obstruction-hold tube feeding; check for C.Diff and treat as needed; monitor and/or discontinue use of opioids; use preventative protocols for constipation

SELECTION OF TUBE FEEDING FORMULA

Formula should be selected, based on nutritional goals for each individual patient, with attention to tolerance, adequacy and nutritional therapeutic indications. Attributes of the tube feeding formula to consider include:

1. Tolerance and increased nitrogen absorption: Peptide-based, high in MCT.[9,10]
2. Anti-inflammatory properties and high in antioxidants: 100% whey protein, fish oil.[11,12]
3. Insulinotropic for blood glucose control: 100% whey, MCT, lower CHO content.[13]
4. Improved protein provision associated with decreased mortality: very high in protein.[4,14]

The following are Nestlé Health Science options for enteral tube feeding formulas with above mentioned attributes.

Formula	kcal/mL	kcal/L	Protein g/L	Tolerance	Antioxidant Support	Fish Oil	Very High Protein; Blood Glucose Control	High Protein	Concentrated
Peptamen® Intense VHP	1.0	1000	92	X	X	X	X	X	
Peptamen AF®	1.2	1200	76	X	X	X		X	X
Peptamen® 1.5	1.5	1500	68	X	X				X
Peptamen®	1.0	1000	40	X	X				

Tube feeding formula should be initiated at 10-25mL/hour and advanced as tolerated to the goal feeding rate over 72 hours. Protocols such as PEPuP may support enhanced delivery of protein and calories.[17]

References: **1. Allen K**, et al. *NCP* 2019;34:540-557. **2. Blaser AR**, et al. *Acta Anaesthial Scand* 2014;58:914-922. **3. Kondrup J**, et al. *Clin Nutr* 2003;22:415-421. **4. Weijs PJ**, et al. *Crit Care* 2014;18:701. **5. Allingstrup MJ**, et al. *Clin Nutr* 2012;31:462-468. **6. McClave SA**, et al. *JPEN* 2016;40:159-211. **7. Saez de la Fuente, I**, et al. *JPEN* 2016;40:250-255. **8. Allen K**, et al. *Curr Gastro Rep* 2013;15(6):327. **9. Mundi M**, et al. *NCP* 2020; DOI:10.1002/ncp.10477. **10. Borlase B**, et al. *Surgery, Gyn, Obestet* 1992;174:181-188. **11. Aguilar-Nascimento JE**, et al. *Nutrition* 2011;27:440-444. **12. Calder P**. *PLEFA*. 2005;75:197-2002. **13. Rice T**, et al. *JPEN* 2019;43:471-480. **14. Ochoa J**, et al. *Critical Care* 2019;23(Supp 2):P280. **15. Tatsumi H.** *J of Intensive Care* 2019;7:30. **16. Fried MD**, et al. *J of Ped* 1992;120:569-572. **17. Heyland D**, et al. *JPEN* 2018;42:308-317. **18. Singer P**, et al. *Clin Nutr* 2019;38:48-79.

Suggested Adult Enteral Feeding Protocol for Optimizing Tolerance Sample Order Set

Enteral Feeding Initiation (Check Approporiate Order(s)

- ☐ 1. RD Nutrition Consult for nutrition assessment, feeding recommendations, tolerance assessment and tracking of cumulative calorie deficit
- ☐ 2. Insert nasogastric feeding tube and verify tube placement with abdominal film –OR–
- ☐ 3. Consult GI or Tube Team for specialized feeding tube placement: (Circle one) nasogastric, nasojejunal, percutaneous gastrostomy
- ☐ 4. If patient has had nothing by mouth for >10 days or is <85% IBW, monitor for Refeeding Syndrome

Formula Selection and Infusion Method (Check Approporiate Order(s)

- ☐ 1. Prescribing physician –OR– ☐ RD complete Malabsorption Index™ to determine optimal formula
- ☐ 2. Consider early initiation (within 24-48 hrs) of immune modulating peptide-based formula for the appropriate patient population (major elective surgery, trauma, burns, head and neck cancer)
- ☐ 3. Select enzymatically hydrolyzed 100% whey formula:
  - ☐ Select enzymatically hydrolyzed 100% whey, 37% protein formula for enhanced protein delivery and blood glucose management:
  - ☐ Defer to RD for formula selection
- ☐ 4. Select infusion method:
  - ☐ Continuous feeding: Begin_____ mL/hour full strength and advance 25 mL/hour every 8 hours as tolerated to goal rate: (Specify)_____mL/hour
  - ☐ Bolus feeding: _____mL every_____hours
  - ☐ Volume based feeding:_____mL daily, nurse to infuse over available hours/day, not exceeding 280 mL/hour for gastric feeding and 150 mL/hour post-pyloric feeding
- ☐ 5. Select free water flush: ☐ 200 mL/shift —OR— _____mL free water every _____hour

Routine Nursing Orders

- Mouthwash swab application 10 mL chlorhexidine to mucous membrane twice daily
- Record accurate initial height and daily weights
- Keep head of bed elevated 30-45 degrees at all times, unless contraindicated
- For clogged feeding tube, instill pancrelipase tablet and bicarbonate tablet crushed in 10 mL water _____ time(s)
- Record stool frequency
- DO NOT stop feeds for residuals less than 500 mL where there are no other signs of intolerance
- Gastric residual aspirate of <500 mL should be returned to the patient when no accompanying signs of intolerance are present
- Flush with 50 mL water every 4 hours if flush is not ordered
- Flush feeding tube with 10 mL at beginning and ending of feedings, after gastric residual aspiration and before/after medication administration
- Nursing to resume feeding once tube placement has been confirmed by radiologist or physician responsible for care
- Do not stop tube feedings for diagnostic tests, usual nursing care, or routine bedside procedures unless specifically ordered by the physician

Optional Orders

- Monitor blood glucose every ____hours (default is every 6 hours)
- Call physician if blood glucose is greater than _____mg/dL or less than _____mg/dL
- For inadvertent gastric enteral feeding tube removal, nurse may reinsert tube and order abdominal x-ray for placement confirmation
- Metoclopramide 10 mg every 6 hours, if indicated/tolerated for increased gastric motility
- Erythromycin 12 mg every 6 hours, if indicated/tolerated for increased gastric motility

Physician Signature_____ Date and Time_____

Nurse Signature_____ Date and Time_____

USE UNDER MEDICAL SUPERVISION

This sample order set is based on various clinical references and is not intended as a substitute for clinical judgment or facility protocols.

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