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Original Research Article

Recommended Nutritional Strategies for Enteral Nutrition Management in Acute Respiratory Distress Syndrome (COVID Application)

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Abstract: Acute Respiratory Distress Syndrome (ARDS), a complication seen in severe COVID-19 cases, presents unique nutritional management challenges due to profound metabolic alterations, increased catabolic rates, and frequent dependence on mechanical ventilation. Enteral nutrition (EN) remains the preferred route for feeding critically ill patients with ARDS for its benefits in maintaining gut function, modulating immune response, and improving outcomes. This article provides a comprehensive review of evidence-based enteral feeding strategies for ARDS with special consideration of patients with COVID-19, including timing, calorie and protein targets, management in prone ventilation, formula selection, and safety protocols.

Keywords: Acute Respiratory Distress Syndrome (ARDS), Enteral nutrition (EN), COVID-19, Critical care nutrition, Prone ventilation.

INTRODUCTION

Nutritional support is a critical component in the management of patients with ARDS, including those with COVID-19-induced lung injury. Malnutrition can worsen the disease course, prolong mechanical ventilation, and increase morbidity and mortality. A targeted EN protocol optimizes metabolic support while minimizing feeding-related complications, such as aspiration or intolerance, especially in the context of complex ICU care environments[1][2].

PATHOPHYSIOLOGY AND NUTRITIONAL RISK IN ARDS

Patients with ARDS experience a hypermetabolic, hypercatabolic state, driven by inflammation and stress. These changes increase energy expenditure, augment protein turnover, and escalate the risk of muscle wasting. COVID-19 ARDS further compounds these risks due to longer ventilation durations and frequent proning[3][2].

Timing of Enteral Nutrition

- **Early EN Initiation:** Begin EN within 24-36 hours of ICU admission or within 12 hours after intubation/mechanical ventilation, unless contraindicated (such as uncontrolled shock or high vasopressor requirements)[2][4].

- **Progression:** Start with low-dose, trophic feeding, typically 10–20kcal/kg for the first 24–48 hours, increasing as tolerated toward full nutritional goals by day 3–4[1][2].

Caloric Requirements

- **Initial Goals:** 15–20kcal/kg/day for the first 3–5 days to avoid overfeeding in the acute phase.
- **After Stabilization:** Gradual escalation to 25–30kcal/kg/day as the patient's clinical state improves[1][5][2].
- **Monitoring:** Indirect calorimetry is ideal for assessing energy needs, but if unavailable, predictive equations based on actual or adjusted body weight are used[1].

Phase	Calories (kcal/kg/day)
Acute (Days 1–3)	15–20
Rehabilitation (>Day 4)	25–30

Protein Requirements

- **Recommendation:** 1.2–2.0g/kg/day for most adult ARDS patients, and up to 2.5g/kg/day in obese or high-risk patients, to support lean mass preservation and recovery[1][2].
- **Escalation:** Increase protein intake gradually to minimize feeding intolerance while targeting the upper limit as quickly as clinically feasible[2][5].

Patient Type	Protein Target (g/kg/day)
Non-obese/critically ill	1.2–2.0
Obese	2.0–2.5 (adj. body wt.)

ENTERAL FORMULA SELECTION

- **Standard Polymerics:** Initiate with high-protein, normocaloric or energy-dense polymeric formulas (1.5–2.0kcal/ml), tailor to tolerance and fluid restriction needs[6][2].
- **Fiber Considerations:** Use fiber-free formulas for patients with gastrointestinal dysfunction; consider fiber/postbiotic supplemented formulas once initial tolerance established.
- **Micronutrient Supplementation:** Antioxidants (selenium, zinc, vitamins C and E) may have a role, but routine immune-modulating feeds for ARDS/COVID-19 are not universally recommended[1][7].
- **Specialty Formulas:** Reserve oligomeric or immune-modulating formulas for persistent feeding intolerance or malabsorption[2].

Management in Prone Position/With Neuromuscular Blockade

- **Feeding in Prone:** Proning is not a contraindication to EN; continuous feeding via an infusion pump is recommended. Bedhead elevation (25°–30°, reverse Trendelenburg) reduces aspiration risk[3][2].
- **Tolerability:** Regularly monitor for signs of intolerance (gastric residual volumes, vomiting, abdominal distension). Prokinetics can be used prophylactically or as needed[3][8][9].
- **Pausing/Restarting Feeds:** Temporarily hold EN for airway manipulation, high aspiration risk, or severe GI intolerance, but resume promptly once safe[2].

Fluid and Electrolyte Management

- **Concentrated Formulas:** Use high-calorie formulas to deliver nutrition under fluid restriction, as ARDS is often associated with fluid overload or renal dysfunction[10][6].
- **Electrolyte Monitoring:** Regularly evaluate and correct electrolyte abnormalities due to refeeding syndrome risk, diuretics, or renal replacement therapies[2].

Feeding Access and Protocol

- **Preferred Route:** Nasogastric tube is standard; consider post-pyloric feeding (nasojejunal) in high aspiration risk or failure of gastric EN[4].
- **Continuous Infusion:** Minimizes risk of aspiration, diarrhea, and glycemic variability versus bolus feeding[2].

Monitoring and Complication Prevention

- **Nutrition Assessment:** Frequent reassessment of energy/protein delivery, GI tolerance, metabolic parameters, and glycemic control[1][2].

- **Intolerance Management:** Address high gastric residual volumes (>500ml) with prokinetics or consider post-pyloric feeds. Monitor for abdominal compartment syndrome, ischemia, or acute intolerance[2].

Outcomes Associated With Optimal Enteral Nutrition

- **Reduced Mortality:** Early, adequate EN in ARDS/COVID patients is associated with improved survival, fewer infections, and shorter ICU stays[6][5][7][4].
- **Improved Recovery:** Adequate nutrition preserves lean mass, supports ventilator weaning, and improves functional outcomes after ICU discharge[3].

Table: Key Practices for Enteral Nutrition in ARDS (COVID-19)

Practice	Details
Timing	Initiate EN within 24–36h or 12h post-intubation
Initial Caloric Goal	15–20kcal/kg/day, advance to 25–30kcal/kg/day by day 4
Protein Target	1.2–2g/kg/day (non-obese), up to 2.5g/kg/day (obese)
Formula Type	High-protein, energy-dense; fiber-free if GI intolerance
Prone Position	Continue EN, elevate head, monitor tolerance
Monitoring	Assess residuals routinely, biomarkers, electrolyte balance
Route	Nasogastric preferred, post-pyloric if high aspiration risk

Figure 1. Progression of Enteral Nutrition in ARDS (COVID-19)

Day	% Caloric Goal Targeted
1	25–30%
2	50%
3	75%
4+	100%

Graph: Mortality Rate in ARDS with Adequate EN vs. Inadequate EN

Group	Mortality Rate (%)
Adequate EN	25
Inadequate EN	42

CONCLUSION

Optimal enteral nutrition in ARDS, particularly in COVID-19, is realized through early initiation, gradual escalation to evidence-based caloric/protein goals, careful management during prone ventilation, and frequent monitoring for complications. Adherence to best practices leads to improved survival, reduced ICU complications, and better recovery. Individualization and teamwork among clinicians, dietitians, and nursing staff are key for successful EN implementation in this vulnerable population[1][2][3].

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