
Disclosures
- I have no commercial relationships to disclose

Presentation Overview/Summary
- Clinical practice guidelines for nutrition support management in adult patients with enterocutaneous fistula (ECF) have jointly been developed by ASPEN and FELANPE organizations. In addition, ESPEN recently endorsed guidelines on the management of acute intestinal failure (IF). ECF is classified as acute IF type II, defined as a prolonged acute condition. Patient with low-output ECF may tolerate an oral diet, but the majority will likely require supplemental EN or PN to meet full nutrient requirements. Bowel rest and PN may be needed to promote fistula healing and/or control of ECF output. Patient should be monitored for increased protein, fluid, electrolyte, and micronutrient needs due to increased GI losses. Home PN is often required for patients with ECF due to long-term requirements for PN therapy.

Learning Objectives
- At the conclusion of the presentation, the learner will be able to:
  1. Identify the preferred route for feeding patients with ECF (parenteral, enteral, oral).
  2. Determine appropriate protein and energy intake to provide optimal clinical outcomes for patients with ECF.
  3. Discuss special considerations for patients with ECF, including assessment of fluid and micronutrient requirements and role of home PN.

Key Takeaways/Fast Facts
- The preferred route of feeding in patients with ECF should be based on ECF characteristics and need for managing ECF output.
- Consider oral/EN route whenever possible in patients with ECF, but recognize that it is often difficult to meet full nutrient requirements by this route alone. PN is often the primary route of feeding.
- Protein requirements are high (1.5-2.5 g/kg/d) in patients with ECF and energy goals are influenced by target weight (gain/loss/maintenance).
- Monitor for increased fluid/electrolyte and micronutrient losses, particularly zinc.
- Consider home PN in patients with ECF when prolonged need is anticipated.

Learning Assessment Questions
- **Patient Case:** BW is a 52-year old male who sustained gunshot wound to the abdomen and underwent multiple enterotomies, partial colectomy and colostomy. Past medical history is significant for hypertension and nicotine dependence. Patient was initially discharged home on a regular diet, but later readmitted due to wound dehiscence and development of an enteroatmospheric fistula. Patient weight is 82 kg (180 lb); height 183 cm (6’). Fistula output exceeds 500 mL/d, despite NPO status. The surgeon requires that the patient stop smoking and will re-assess for reconstructive surgery in 3 months.
  1. Question 1: According to ASPEN-FELANPE clinical guidelines, what is the preferred route of feeding for this patient?
     A. Oral diet
B. Enteral nutrition
C. Parenteral nutrition

2. Question 2: Based on consensus recommendations, which of the following is the most appropriate daily protein goal?
   A. 80-100 g
   B. 100-120 g
   C. 130-150 g
   D. 160-200 g

3. Question 3: Is this patient a candidate for home PN?
   D. Yes, when medically stable.
   E. Yes, when fistula output decreases to < 500 mL/d.
   F. No; patients with enteroatmospheric fistula should remain inpatient.

Learning Assessment Answers:
1. Answer = C; Rationale: Parenteral nutrition is recommended for patients with high output ECF. He may be a candidate for fistuloclysis, depending on location of the fistula tract and ability to access a distal tube, but will likely still require PN as primary source of nutrition.
2. Answer = D; Rationale: Guidelines suggest protein goals at 2-2.5 g/kg/d for patients with high output and enteroatmospheric fistulae due to high protein losses.
3. Answer = A; Rationale: This patient meets criteria for consideration of HPN when medically stable and ECF output manageable.

References
Learning Objectives

Upon completion of this session, the learner will be able to….

1. Identify the preferred route for feeding patients with ECF (parenteral, enteral, oral)
2. Determine appropriate protein and energy intake to provide optimal clinical outcomes for patients with ECF
3. Discuss special considerations for patients with ECF, including assessment of fluid and micronutrient requirements and role of HPN

ECF classified as Type II (Acute IF II)

- Prolonged acute condition, often in metabolically unstable patients requiring complex multi-disciplinary care and IV supplementation over weeks to months

Oral Route of Feeding

- Patients advised to eat as tolerated, unless bowel rest needed to promote fistula healing or control
- Majority will not achieve adequate oral intake
- Supplemental nutrition support needed (EN/PN)

Enteral Route of Feeding

- Consider use whenever possible to provide trophic benefits
- Difficult to meet requirements exclusively by enteral route
- Distal feeding techniques:
  - Fistuloclysis
  - Reinfusion of succus entericus


Parenteral Route of Feeding

- Often represents the main option for feeding
- Used alone when EN contraindicated:
  - Bowel obstruction
  - Bowel perforation
  - Uncontrolled ECF output
- Used in combination with EN whenever possible

Q2: In adult patients with ECF, what is the preferred route of nutrition therapy?

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study Design</th>
<th>Population</th>
<th>Study Objective</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martinez, 1998</td>
<td>OBS, Retrospective</td>
<td>PN, n=16; No PN, n=9</td>
<td>Evaluate effects of PN on morbidity &amp; mortality</td>
<td>Mortality: PN, 5/12 (22%); No PN, 5/9 (21%)</td>
</tr>
<tr>
<td>Dardai, 1991</td>
<td>CBS, Retrospective, Historical control</td>
<td>n=64 (w/ 71 ECF)</td>
<td>Evaluate effects of PN &amp; EN on closure &amp; mortality</td>
<td>Spontaneous closure: PN/EN, 24/48 (50%); No PN/EN, 3/23 (13%) Mortality: PN/EN, 15/45 (33%); No PN/EN, 10/19 (53%)</td>
</tr>
<tr>
<td>Yuan, 2011</td>
<td>OBS, Retrospective</td>
<td>n=82 (high output, n=41)</td>
<td>Evaluate early EN (w/ 14 days of admit) versus late EN</td>
<td>Surgical closure: Early EN, 142.8 ± 46.2 days; Late EN, 184.5 ± 62.7 days, p=0.017 Composite complications: Early EN, 7/36; Late EN, 18/46, p=0.045</td>
</tr>
</tbody>
</table>

Quality of Evidence: Very low

Q2: In adult patients with ECF, what is the preferred route of nutrition therapy?

- Low-output ECF (< 500 mL/d)
  - If oral diet not tolerated, consider EN when enteral access can be obtained distal to the fistula
  - Rule out distal obstruction
  - Consider supplemental PN if nutrient goals not met with oral/EN

Q2: In adult patients with ECF, what is the preferred route of nutrition therapy?

- PN recommended for the following patients with ECF:
  - High-output ECF (> 500 mL/d)
  - Presence of bowel obstruction
  - Oral/EN failure:
    - ECF drainage significantly compromises wound and skin care
    - ECF drainage significantly impairs the ability to maintain fluid/electrolyte balance

Q2: In adult patients with ECF, what is the preferred route of nutrition therapy?

- Assess fistula characteristics
  - Location
  - Length
  - Quantity output
  - Rule out distal obstruction
- Detailed assessment may not be possible until tract has matured
Route of Nutrition Therapy

**NPO 24-48 hr**
- Resuscitation
- Correct fluid/electrolyte
- Diagnostic work-up

**ECF < 500 mL/d**
- Proximal small bowel w/ FT below ECF
- EN may be feasible & tolerated
- Consider PN if ECF output not manageable or to meet nutrient goals

**ECF > 500 mL/d**
- Proximal small bowel
- EN may be feasible & tolerated
- Consider PN if ECF output not manageable or to meet nutrient goals

**Intake PN**
- Consider EN as adjunct to PN

**Q3: In adult patients with ECF, what protein & energy intake provide best clinical outcomes?**

**Retrospective observation:** *
- ECF patients, 56 cases, 1953-1963
- High oral calorie intake (1600-200 Kcal/d) vs low (< 1000 Kcal/d)
- Spontaneous closure:
  - High kcal, 16/18 (89%)
  - Low kcal, 13/36 (37%)
- Mortality:
  - High kcal, 3/18 (12%)
  - Low kcal, 22/38 (55%)

* Chapman, 1964

**Q3: In adult patients with ECF, what protein & energy intake provide best clinical outcomes?**

- Observational studies, 1990
  - Energy goal: 25-30 kcal/kg/d
  - Protein goal: 1.5 g/kg/d
  - High output: 1.5-2.5 g/kg/d
  - Actual intake achieved not reported
  - Effects on clinical outcomes not reported
  - Modification for obesity not addressed

**Consensus Recommendation:**
- Energy goal: based on results of nutritional assessment
- Protein goal: 1.5 – 2 g/kg/d
- High-output and entero-atmospheric fistula: consider up to 2.5 g/kg/d
- Obese patients with ECF: refer to ASPEN-SCCM guidelines
  - Energy:
    - BMI 30-34 kg/m²: → 20-25 kcal/kg/d ABW
    - BMI 35-39 kg/m²: → 22-25 kcal/kg/d ABW
    - BMI > 40 kg/m²: → 2.5 kcal/kg/d AW
  - Protein:
    - BMI 30-34 kg/m²: → 2 g/kg/d IBW
    - BMI 35-39 kg/m²: → 2.5 g/kg/d IBW

**Protein & Energy Requirements**

**Special Considerations**

- Achieve glucose control
- Determine target weight
  - Weight loss
  - Weight maintenance
  - Weight gain
- If weight gain/desired → goal: 1-2 lbs per week
Fluid Requirements

- Normal fluid intake, secretion, and absorption

- Monitor Intake/Output
  - Compare enteral intake to ECF output
  - Assess adequacy of urine output
  - Consider oral fluid restriction

- Monitor weight
- Assess for edema
- Account for insensible fluid losses

Standard fluid requirements: 30-40 mL/kg/d

Micronutrient Considerations: Zinc

- Absorbed from duodenum and jejunum
- Elimination:
  - GI loss ≤ 1.5 mg/d
  - Renal loss <10%
- Excessive loss associated with high output ECF
- Estimated zinc loss:*
  - SBS patients: 3.6 mg/kg of fluid lost
  - Intact GI tract w/ diarrhea: 15.2 mg/kg fluid lost


Micronutrient Considerations: Zinc

- Zinc deficiency associated with impaired wound healing
- Serum zinc useful, but not sensitive to mild deficiency
- Serum zinc in hypoalbuminemia, inflammation
- Daily parenteral requirements without abnormal GI losses: 3-4 mg/d
- Replacement doses: 5-15 mg/d

Role of Home PN

- PN used to stabilize nutrition and fluid balance while permitting wound healing
- Extended time for healing often required prior to reconstructive surgery
- Extended time for resolution of inflammatory response
- Reimbursement structure (U.S.) favors home setting for long-term use of PN (≥ 3 months)
- Quality of life issues

Q7: In adult patients with ECF, when is home PN indicated?

- Consensus Recommendation: Consider HPN when...
  - Patient medically stable
  - ECF output manageable
    - Including adequate skin protection
  - High-output ECF (> 500 mL)
    - Patient w/ low output may tolerate diet/EN
  - When surgical repair is not yet advised

Nutrition Support for ECF Summary

- Preferred route of feeding should be based on ECF characteristics & need for managing output.
- Consider oral/EN whenever possible, but difficult to meet full nutrient requirements by this route alone.
- PN is often the primary route of feeding.
- High protein requirements → Goal: 1.5-2.5 g/kg/d.
- Energy goals influenced by target weight (gain/loss/maintenance).
- Monitor for increased fluid/electrolyte, zinc losses.
- Consider home PN when prolonged use indicated.
References


Pharmacologic and “Nutriceutical” Treatment of Enterocutaneous Fistulas
ASPEN 2019 Nutrition Science and Practice Conference
Tuesday, March 26th in Phoenix, AZ

I. Title, Author (slide 1)

II. Disclosures (slide 2)
   a. I have no commercial relationships to disclose.

III. Learning Objectives (slide 3)
   a. Understand the mechanism of action and rationale for using the following medications in the medical treatment of enterocutaneous fistulas (ECF):
      i. Glutamine
      ii. Juven
      iii. Loperamide
      iv. Diphenoxylate/atropine
      v. Octreotide
      vi. Clonidine
      vii. Amitriptyline
   b. Summarize the literature supporting and limitations of each medication.
   c. Review any published guidelines and/or consensus statements regarding these medications and ECF treatment.

IV. Review of each medication (3 slides per medication x 5 = ~15 slides)
   a. First slide includes the type of medication, brief history, available dosing, side effects, FDA approved/not approved for ECF healing
   b. Slides two and three include an extensive review of literature table with a goal of 10 top references (favoring RCT), example below:
# Octreotide

<table>
<thead>
<tr>
<th>CITATION</th>
<th>STUDY DESIGN</th>
<th>PATIENT POPULATION</th>
<th>GROUPS</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findlay et al. 1994</td>
<td>RCT</td>
<td>N=51 Patients with GI and pancreatic fistulas</td>
<td>Placebo (N=25) &lt;br&gt; Group 1 (N=25): 5000 IU/day somatostatin &lt;br&gt; Group 2 (N=25): 100 μg TID octreotide</td>
<td>Fistula closure rate was 84% for somatostatin, 0% in the octreotide group, and 27% in the control (p=0.007)</td>
</tr>
<tr>
<td>Jami et al. 2014</td>
<td>RCT</td>
<td>N=33 Patients with various ECF (mostly ileum/jejunum)</td>
<td>Placebo (N=17): standard tx, TPN, NPO, ASX, skin/wound care, control of sepsis &lt;br&gt; Treatment (N=16): standard tx plus 100 μg TID octreotide</td>
<td>Fistula closure for the treatment group at day 21 was 94% vs 92% for the tx group (not statistically significant)</td>
</tr>
<tr>
<td>Sancho et al. 1995</td>
<td>Double-blind RCT</td>
<td>N=31 Patients with postoperative ECF of &lt;6 days in duration</td>
<td>Placebo (N=17): standard tx, TPN, NPO &lt;br&gt; Treatment (N=14): TPN, NPO + 100 μg Q2hrs octreotide</td>
<td>Fistula closure at day 20 for the treatment group was 81.4% vs 61.7% (35%) in the treatment group (not statistically significant, p=0.4)</td>
</tr>
<tr>
<td>Kusunaka et al. 1992</td>
<td>RCT</td>
<td>N=12 Patients with high-output ileostomies</td>
<td>Phase 1 controlled diet (2000 kcal, 77 gm protein, 45 gm fat, 300 gm CHO) with a 1000 mL fluid restriction &lt;br&gt; Phase 2 (days 6-10), phase 1 + placebo &lt;br&gt; Phase 3 (days 11-15), phase 1 + 100 μg TID octreotide</td>
<td>Mean daily ileostomy output decreased from a daily average of 607 mL to 725 mL (p=0.05); Significant reduction in the daily losses of sodium and chloride in the ileostomy content (p=0.05)</td>
</tr>
<tr>
<td>Sitges-Serra et al. 1995</td>
<td>RCT</td>
<td>N=20 Patients with postop GI ECF</td>
<td>Group A (N=10): TPN → placebo (2 days) → 100 μg Q2hrs octreotide (2 days)</td>
<td>Group A had a decrease in fistula output after 48 hrs with octreotide (775 mL vs 151 mL, p&lt;0.02) Group B had an increase in fistula output after the octreotide was stopped (218 mL vs 436 mL, p=0.09)</td>
</tr>
</tbody>
</table>

V. Review of any published guidelines/consensus statements (1-2 slides)
   a. ASPEN
   b. ESPEN
   c. SCCM
   d. ACS

VI. Recommendations (1 slide)

**Summary:** 25 minutes, ~24 slides