PRACTICE TOOL

Use of Supplemental Parenteral Nutrition in Adult Acutely Ill Patients

In many acutely ill adult patients at risk for malnutrition, enteral nutrition (EN) or oral intake alone may not provide sufficient energy and protein to meet their nutritional needs.

- Supplemental parenteral nutrition (SPN) is defined as parenteral nutrition (PN) provided in addition to EN or oral intake to help meet calorie and protein requirements when these methods alone are insufficient.
- SPN has been studied in patients with critical illness, those undergoing major surgical procedures, and patients with cancer.
- The purpose of this practice tool is to outline appropriate uses of SPN in those three types of patients.

Supplemental PN Basics

- SPN can be delivered via peripheral or central line and is available as compounded PN or multi-chamber bag PN.
- SPN involves a blended approach combining EN or oral intake with PN to meet patients' nutrition requirements based on illness, hemodynamic instability, metabolic measurements, and/or weight-based calculations.[1]
- Peripheral SPN is an option for short-term nutrition support and can serve as a safe and effective bridge to full EN, central PN, or oral nutrition.[2]
- Peripheral PN should only be used for no more than 10–14 days, either as SPN or as a bridge during transition periods when oral intake or EN is suboptimal, or when clinical circumstances do not justify placing a central venous catheter.[3]
- Research demonstrates even with peripheral SPN, patients were able to receive 65% of their energy requirements and 58% of their protein requirements.[4]

Patients with Critical Illness

- SPN significantly increased daily caloric intake during and after ICU stay, and combining EN with SPN improved the protein and energy intake.[5,6]
- SPN with EN was associated with a decrease in ICU mortality and hospital-acquired infections.[6]
- Recent ASPEN critical care guidelines recommend not initiating supplemental PN in well nourished patients prior to day 7 of ICU admission.[7]
- Supplemental PN from day 4, as compared to an EN-only group, demonstrated a lower late nosocomial infection rate after day 9.[8]
- Early SPN shortens ventilator duration and ICU stay in patients aged ≥60 years requiring mechanical ventilation.[9]
- SPN >400 kcal/day significantly correlated with a lower occurrence of physical post-intensive care syndrome.[10]

Patients with Major Abdominal Surgery

- In patients undergoing abdominal surgery with high nutritional risk, early SPN was associated with a reduced risk of nosocomial infections.[11]
- For patients at nutritional risk after a pancreatico-duodenectomy, early EN plus SPN was safe and feasible, and significantly reduced severe complications.[12]
- In a meta-analysis of 48 studies with 6,277 patients who underwent abdominal surgery and required nutrition support, early SPN was more effective in the reduction of postoperative, infectious, and non-infectious adverse events, as compared to EN, late SPN, or total PN.[13]

Patients with Cancer

- For patients undergoing curative anticancer drug treatment, if oral food intake is inadequate, supplemental EN is recommended, and if EN is not sufficient or possible, SPN is recommended.[14]
- Identification of surgical oncology patients who require supplemental nutrition is suboptimal, and guidelines are lacking. Eighty-three percent of surgical oncologists believe pre-operative nutrition is important, but only 22% of patients receive supplementation.[14,15]
- Cancer patients who are at risk of inadequate oral nutritional intake (<60%) and decreased EN tolerance could benefit from early SPN as part of their comprehensive cancer treatment plan.[16]
- In gastric cancer patients who received preoperative hospital diet, oral nutritional supplements (ONS), or ONS plus SPN, those with ONS plus SPN improved their nutrition and inflammation markers but had no change in clinical outcomes.[17]
- SPN was linked to improvements in body mass index (BMI), fat-free mass, phase angle (PhA) and prealbumin in a narrative review of patients with cancer.[18]
- In patients with esophageal cancer, post-operative SPN was given to those where energy supply failed to reach 60% of requirements, and it effectively maintained nutritional status, improved immune function, reduced the inflammatory stress response, and reduced post-operative complications.[19]

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Case Presentation

Critical Care: Patient with ARDS

Adult patient with diabetes, hypertension, and chronic kidney disease.

- Nutritional status: Moderately malnourished, BMI 24, 75 kg, with reduced oral intake and weight loss over the past 3-4 months.
- Clinical course: Worsening respiratory status, bacterial pneumonia, and developed ARDS. Mechanical ventilation, prone position, tracheostomy on day 2, then ECMO until day 16.
- Nutrition support: Started nutrient-dense EN after 24 hours at 10 mL/h. When tolerated, EN was increased to 30 mL/h, with a goal of 50 mL/h. Requirements: (25 kcal/kg) = 1875 kcal and protein (1.3 g/kg) = 97.5 g.
- Unable to increase EN to goal due to intolerance, and SPN was added on day 4 to meet needs using PN with 60 g of protein, 1,200 calories of dextrose and ILE.

Case Presentation

Abdominal Surgery for Cancer: Patient with Pancreatic Cancer

An adult patient with pancreatic adenocarcinoma had a Whipple procedure performed with a jejunostomy feeding tube placed.

- Nutritional status: Severely malnourished, BMI 18, 60 kg, reduced oral nutrition intake and significant weight loss over the past 2 months.
- Clinical course: Developed a post-operative complication of GI fistula.
- Became septic and unable to feed enterally more than 30% of nutritional needs.
- Began supplemental central PN via PICC to prevent continued weight loss and provide adequate nutrition and fluids. PN provided 70% of nutritional needs, 55 g of protein, 1,000 calories of dextrose and ILE.
- Eventually, sepsis resolved, fistula closed, and oral diet resumed to meet needs.

Key Takeaways

SPN is another tool to help address malnutrition and may help improve patient outcomes.

- In critically ill patients, SPN or the combined use of EN/PN has repeatedly been shown to significantly increase the nutrition intake, as well as decreased risk of nosocomial infections and ICU mortality.
- In patients undergoing abdominal surgery, where oral or EN does not supply adequate nutrition, early SPN is associated with decrease post-operative complications.
- In patients with cancer, where oral or EN does not meet requirements, SPN is recommended.

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