Current Literature

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Early Postoperative Enteral Nutrition Improves Gut Oxygenation and Reduces Costs Compared With Total Parenteral Nutrition

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ABSTRACT: *Objective:* To evaluate the potential clinical, metabolic, and economic advantages of enteral nutrition over total parenteral nutrition. *Design:* Prospective, randomized clinical trial. *Setting:* Department of surgery in a university hospital. *Patients:* Two hundred and fifty-seven patients with cancer of the stomach (n = 121), pancreas (n = 110), or esophagus (n = 26) were randomized to receive postoperative total parenteral nutrition (TPN group, n = 131) or early enteral nutrition (EEN group, n = 126). The nutritional goal was 25 kcal/kg/day. The two nutritional formulas were isocaloric and isonitrogenous, and they were continued until oral intake was at least 800 kcal/day. *Measurements:* Morbidity, mortality, length of hospital stay, and treatment costs were evaluated in all patients. In 40 consecutive patients, selected nutritional, immunologic and inflammatory variables were studied. Moreover, intestinal oxygen tension was evaluated by micropolarographic implantable probes. *Results:* The nutritional goal was reached in 100/126 (79.3%) patients in the EEN group and in 128/131 (97.7%) patients in the TPN group ($p < .001$). In the EEN group, hyperglycemia (serum glucose, >200 mg/dL) was observed in 4.7% of the patients vs. 9.1% in the TPN group (p = NS). Alteration of serum electrolyte levels was 3.9% in the EEN group vs. 13.7% in the TPN group ($p < .01$). No significant difference was found in nutritional, immunologic, and inflammatory variables between the two groups. The overall complication rate was similar (40.4% for TPN vs. 35.7%, for EEN; p =.52). No difference was detected for either infectious or noninfectious complications, length of hospital stay, and mortality. From postoperative day 5, intestinal oxygen tension recovered faster in the EEN group than in the TPN group (43 ± 5 mm Hg vs. 31 ± 4 mm Hg at day 7; $p < .001$). EEN was four-fold less expensive than TPN ($25 vs. $90.60/day, respectively). *Conclusion:* EEN represents a rational alternative to TPN in patients who undergo upper gastrointestinal tract surgery for cancer and who clinically require postoperative artificial nutrition. (Crit Care Med 29:242–248, 2001)

COMMENT: This study adds another piece of information regarding comparison of clinical outcome of patients who received enteral *versus* parenteral nutrition in a large trial of patients with cancer of the upper gastrointestinal tract (gastric, pancreatic, and esophageal cancer). Fifty-seven patients who had palliative surgery performed because of unresectable primary or metastatic disease were excluded from the analysis, leaving a total of 257 patients that were randomized to either parenteral nutrition or enteral nutrition (via jejunostomy or a nasojejunal tube). The regimens were isocaloric and isonitrogenous and the caloric goal was designed as a weight maintenance regimen at 25 kcal/kg per day, which provided ~1 g/kg per day of protein. Gender distribution was similar and mean age for the parenteral nutrition group and the enteral nutrition group was 63 and 64 years old, respectively. Artificial nutrition was continued for a mean of 13 days in each group. The nutritional goal was achieved by day 4 in 98% of the parenterally fed group and 79% of the enterally fed patents. Eight patients were switched from enteral to parenteral nutrition due to intolerance but were kept in the enteral group during statistical analysis based on the intent to treat basis. The investigators found no difference in infectious and noninfectious complications, or hospital length of stay between both groups. Additionally, nutritional (prealbumin, retinol-binding protein), immunologic (delayed hypersensitivity response, polymorphonuclear cell phagocytosis, CD4/CD8 ratio), and acute phase reactant protein (C-reactive protein and interleukin-6) responses over the first 8 days of nutrition therapy were similar between parenterally fed and enterally fed groups. However, as expected, enteral nutrition was less expensive than parenteral nutrition. The researchers then examined outcome data in a subset of patients deemed as malnourished. Patients were classified as malnourished by a weight loss of 10% body weight within 6 months. Forty-eight patients were classified as malnourished in the parenterally fed group and 43 in the enterally fed group. The investigators found a significant decrease in length of hospital stay for those fed enterally *versus* parenterally (19.8 ± 8.9 days *versus* 22.6 ± 9.7 days, respectively; $p = .04$). Additionally, statistically insignificant trends (due to the lower number of patients) were observed for the proportion of patients with infectious complications (25% *versus* 15%) for those patients who received parenteral or enteral nutrition, respectively.

This report is somewhat reminiscent of the VA cooperative trial whereby perioperative parenteral nutrition was not helpful in reducing complications unless the patient was malnourished.

These data suggest that there is not a clinical outcome advantage to enteral nutrition over parenteral nutrition in postoperative patients with gastrointestinal cancer except in the malnourished patient. Unfortunately, demographic data for these 2 "malnourished subgroups" were not given. I am not certain that describing a patient as malnourished based solely on weight loss over time is sufficient. It would have been helpful to compare amount of weight loss, current body weight, percentage of ideal body weight, and serum albumin and prealbumin concentrations between groups to get a better understanding of this subgroup's extent of malnutrition. Additionally, these data would be necessary to ascertain if there are any potential differences in extent of malnutrition between the parenterally fed and enterally fed groups which might potentially confound any differences in clinical outcome. Despite these limitations, this paper gives further support to our current practice to use the gastrointestinal tract as the preferred route of nutritional therapy whenever possible.

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Changing Concepts in Long-Term Central Venous Access: Catheter Selection and Cost Savings

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ABSTRACT: *Background and Objectives:* Long-term central venous access is becoming an increasingly important component of health care today. Long-term central venous access is important therapeutically for a multitude of reasons, including the administration of chemotherapy, antibiotics, and total parenteral nutrition. Central venous access can be established in a variety of ways varying from catheters inserted at the bedside to surgically placed ports. Furthermore, in an effort to control costs, many traditionally inpatient therapies have moved to an outpatient setting. This raises many questions regarding catheter selection. Which catheter will result in the best outcome at the least cost? It has become apparent in our hospital that traditionally placed surgical catheters (ie, Hickmans and central venous ports) may no longer be the only options. The objective of this study was to explore the various modalities for establishing central venous access comparing indications, costs, and complications to guide the clinician in choosing the appropriate catheter with the best outcome at the least cost. *Methods:* We evaluated our institution's central venous catheter use during a 3-year period from 1995 through 1997. Data was obtained retrospectively through chart review. In addition to demographic data, specific information regarding catheter type, placement technique, indications, complications, and catheter history were recorded. Cost data were obtained from several departments including surgery, radiology, nursing, anesthesia, pharmacy, and the hospital purchasing department. *Results:* During a 30-month period, 684 attempted central venous catheter insertions were identified, including 126 surgically placed central venous catheters, 264 peripherally inserted central catheters by the nursing service, and 294 radiologically inserted peripheral ports. Overall complications were rare but tended to be more severe in the surgical group. Relative cost differences between the groups were significant. Charges for peripherally inserted central catheters were $401 per procedure, compared with $3870 for radiologically placed peripheral ports and $3532 to $4296 for surgically placed catheters. *Conclusions:* Traditional surgically placed central catheters are increasingly being replaced by peripherally inserted central venous access devices. Significant cost savings and fewer severe complications can be realized by preferential use of peripherally inserted central catheters when clinically indicated. Cost savings may not be as significant when comparing radiologically placed versus surgically placed catheters. However, significant cost savings and fewer severe complications are associated with peripheral central venous access versus the surgical or radiologic approach. (Am J Infect Control 29:32–40, 2001)

COMMENT: These authors, using a retrospective chart review, have described current practice patterns for catheter selection at their institution. Based on their study results and a review of the literature, they attempted to identify the safest, most cost-effective, long-term central venous access device (CVAD). Practice patterns identified by the authors reflect what is being seen on a national basis. Recently, we have seen the venues for catheter insertion change as well as a wider variety of professionals placing devices. As the authors note, nurses, interventional radiologists, and surgeons are each placing a variety of devices at the bedside, in the radiology suite, or more traditionally in the operating room.

What is the safest, most cost-effective device, and who should be responsible for its insertion are multifaceted questions that must take into careful consideration each of the variables that impact on catheter selection. These variables include the type of catheter, its intended use, length of therapy, and patient-related factors. This was not adequately done in this study. The authors noted that many times the deciding factor for the requesting service was based on their personal preference or which service could place the CVAD on the same day as the request was placed. Data collected retrospectively is often incomplete. The authors noted that morbidity data was most difficult to obtain. Each service placing catheters maintained their own registries and were not consistent in the type of data collected. Therefore, complication rates for catheter types could not be compared. In addition, even though demographic groups were reported to be similar, selection bias may have been a factor. The primary indication for surgically placed tunneled catheters was the inability to place a PICC. A total of 180 peripherally inserted central catheter (PICCs) were successfully placed in 264 attempts. The majority of oncology patients received surgically placed ports.

At best, this study documents change in venue and the number of professionals placing CVADs. It also points out several important factors. First, the need for a clearinghouse for all catheter consults in institutions where a variety of individuals are placing catheters. This will ensure the appropriate catheter will be placed. Second, if you are placing the CVAD, you are responsible for appropriate follow-up and management of complications as well as consistent data collection. Finally, there is a need for a prospective evaluation of published algorithms with a valid cost analysis to guide clinicians in catheter selection and placement.

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Pharmacoeconomic Assessment of Propofol 2% Used for Prolonged Sedation

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ABSTRACT: *Objective:* To demonstrate that the use of propofol 2% is comparable to propofol 1% in effectiveness and in the wake-up time used for prolonged sedation. *Design:* Open-label, case cohort study with a cohort of historical controls, phase IV clinical trial. *Setting:* Medical and surgical intensive care unit (ICU) in a community hospital. *Patients:* Fifty-one consecutive patients (medical, surgical, and trauma) admitted to our ICU requiring mechanical ventilation for >24 hrs. *Methods:* All patients received propofol 2% (1–6 mg · kg^{-1} · hr^{-1}, starting with the lowest dose) and morphine chloride (0.5 mg · kg^{-1} · 24 hrs^{-1}). A 4–5 level of sedation (Ramsay scale) was recommended. When weaning was indicated clinically, sedation and analgesia were interrupted abruptly, mechanical ventilation was discontinued, and the patient was connected to a T-bridge. *Outcome Measurements:* Inability to attain the desired level of sedation with the highest dose rate of proposal, and hypertriglyceridemia >500

mg/dL, were considered therapeutic failure. The time between discontinuation of mechanical ventilation and extubation was measured. Those variables, as well as different items related to ICU cost, were compared between the study group and two historical groups sedated with propofol 1% and midazolam. *Results:* The duration of sedation was 122.4 ± 89.2 (SD) hrs for the propofol 2% group. The frequency of hypertriglyceridemia was 3.9% and 20.4% for the propofol 2% and the propofol 1% groups, respectively ($p = .016$). Therapeutic failure rates were 19.6% and 33.4% for the propofol 2% and propofol 1% groups, respectively ($p = .127$). The lower frequency of hypertriglyceridemia was associated with a higher number of patients reaching weaning. Weaning time was similar in the two propofol groups, 32.3 hrs ($1,744) for the propofol 2% group vs. 97.9 hrs ($5,287) for the midazolam group. Cost of sedation was $2.68 per hour for the midazolam group and $7.69 per hour for the propofol group. There was a favorable cost-benefit ratio for the propofol group, attributable to the shorter weaning time, although benefit was less than expected because higher doses of propofol 2% than propofol 1% were required during the first 48 hrs ($p < .05$). *Conclusions:* The new propofol 2% preparation is an effective sedative agent and is safe because of the low frequency of associated hypertriglyceridemia. The shorter weaning time associated with the use of propofol 2% as compared with midazolam compensates for its elevated cost. The economic benefit of propofol 2% is less than expected because higher doses of propofol 2% than propofol 1% are required over the first 48 hrs. (Crit Care Med 29:317–322, 2001).

COMMENT: Adequate sedation for mechanically ventilated patients in the intensive care unit (ICU) setting is desirable for patient comfort and safety. Both midazolam and propofol are safe and effective medications that are commonly used in the ICU setting for sedation. Because both medications are considered efficacious, additional selection criteria focus on clinical differences, side effect profiles, and cost.[1]

Propofol costs more than midazolam, but propofol has a potential advantage for more rapid weaning from the ventilator than with midazolam. However, propofol is formulated in an oil-in-water emulsion (10% fat emulsion), and hypertriglyceridemia is a frequent adverse effect.

In this study, Barrientos-Vega et al use a more concentrated propofol 2% formulation and evaluate the safety and efficacy compared with historical controls of midazolam and propofol 1%. With the 2% propofol, the same dose of propofol can be administered with less risk for developing hypertriglyceridemia.

Fifty-one patients received 2% propofol at doses ranging from 1 to 6 mg/kg per hour to achieve sedation. The duration of sedation was 122.4 ± 89.2 (SD) hours. The frequency of hypertriglyceridemia was 3.9% with the 2% propofol group compared with 20.4% for the historical 1% propofol group. Therapeutic failures, defined as inadequate sedation, requiring a propofol dose greater than 6 mg/kg per hour or serum triglyceride level greater than 500 mg/dL, occurred in 19.6% with the 2% propofol group and 33.4% with the 1% propofol group. Based on their findings, the authors concluded that 2% propofol was as effective as propofol 1% and midazolam for sedation, shorter weaning times than midazolam, and less hypertriglyceridemia than 1% propofol; therefore, the authors favored its use despite higher costs.

Although propofol may allow more rapid weaning from the ventilator than midazolam, the clinical significance is not clear.[2] The quality and level of sedation is highly patient variable. Cost advantages seem realized with short-term use of propofol but not with prolonged use. Hypertriglyceridemia is shown to be less with 2% propofol than 1% propofol, but it is concerning that both 1% and 2% propofol were used in this study. Finally, 2% propofol is not available in the United States.

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References

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