

Parenteral nutrition support: Beyond gut feeling? Quality control study of parenteral nutrition practices in a Tertiary Care Hospital

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Abstract

Background: Enteral nutrition (EN) is preferred over parenteral nutrition (PN) in hospitalized patients based on International consensus guidelines. Practice patterns of PN in developing countries have not been documented. **Objectives:** To assess practice pattern and quality of PN support in a tertiary hospital setting in Chennai, India. **Methods:** Retrospective record review of patients admitted between February 2010 and February 2012. **Results:** About 351,008 patients were admitted to the hospital in the study period of whom 29,484 (8.4%) required nutritional support. About 70 patients (0.24%) received PN, of whom 54 (0.18%) received PN for at least three days. Common indications for PN were major gastrointestinal surgery (55.6%), intolerance to EN (25.9%), pancreatitis (5.6%), and gastrointestinal obstruction (3.7%). **Conclusions:** The proportion of patients receiving PN was very low. Quality issues were identified relating to appropriateness of indication and calories and proteins delivered. This study helps to introspect and improve the quality of nutrition support.

Keywords: Critical illness, hospitalized patients, parenteral nutrition, quality control

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Introduction

Nutrition support for hospitalized patients has been a topic of great interest. Several advantages of enteral nutrition (EN) have been reported such as reduction in infection rates, the length of stay and mortality, all of which translate to a reduction in the cost of care.^[1] The American Society for Parenteral and EN and the European Society for Clinical Nutrition and Metabolism (ESPEN) currently recommend early initiation of EN for the critically ill patients and specific guidelines for the use of parenteral nutrition (PN).^[2] The 2009 European guidelines recommend that PN should be considered in “all patients who are not expected to be on EN within three days of Intensive Care Unit admission” or if EN is

not feasible.”^[2] Previous studies have demonstrated that quality of PN improves regarding calories and proteins delivered, infection rates, and quality of life of patients when appropriately administered by a nutritional support team.^[3] There is no available data on the practice and quality of PN delivery in the Indian setting. It is imperative that we audit this practice to optimize nutritional delivery and tailor PN only to appropriate patients. In this study, we aim to assess the prescription pattern and quality of nutritional delivery of PN support in a tertiary hospital setting in India.

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Methods

This study was done through a retrospective record review of all hospitalizations between February 2010 and February 2012. A checklist of items relevant to nutritional support was used to mine the data. PN support was defined as PN provided for at least 3 consecutive days of hospitalization. Data were validated by random supervisory checks and exported to a spreadsheet. All patient identifiers were masked and only relevant clinical information was extracted. The four components of the quality assessment framework followed in this study were proportion of nutrition provided as PN, appropriateness of indication, process, and effectiveness of PN delivery [Figure 1]. Simple descriptive analysis was done to understand the pattern and profile of patients. Effectiveness of delivery of calorie and protein were analyzed using Student's *t*-test, and *P* < 0.05 was considered significant. Statistical analyses were performed using SPSS statistical software (SPSS Statistics 17.0, Chicago, IL, USA). Since it was part of routine quality control process of the hospital, Ethical Committee approval was not sought.

Results

Proportion of parenteral nutrition

A total of 351,008 patients were admitted in the hospital during the study period. Of these, 29,484 (8.4%) required supplemental nutritional support of whom only 70 (0.24%) received some form of PN. About 54 (0.18%) patients received PN for at least 3 consecutive days, 24 (44.4%) of them received care in the coronary care unit (CCU), and 30 (55.6%) in the ward.

Appropriateness of parenteral nutrition

The clinical profile of patients who received PN is shown in Table 1. Majority of the patients who received

PN were moderately malnourished (63%) at hospital admission based on the subjective global assessment tool. The most common indications for total parenteral nutrition (TPN) were major gastrointestinal surgery and intolerance to EN [Table 2].

PN was initiated within 5 days of hospitalization in 31 (57.4%) of the patients, and the median duration was 6 days (interquartile range 3–19 days). PN was delivered as a commercially available premixed all-in-one bag admixture, which is currently the only option in India.

Route of administration and process of weaning off parenteral nutrition

The most common route of administration of PN was through a peripheral vein (64.8%). 15 patients (25.9%) received it through a central line, and all of them were in the CCU [Figure 2]. Of the 54 patients who received PN, only 4 received total PN. 31 (57.4%) of patients received simultaneous parenteral as well as EN support and 19 (33.3%) received sequential oral or enteral supplementary nutritional support. In this cohort of patients, 30 (55.5%) were started on an oral diet once the PN support was weaned off. Of these, 13 (24%) were gradually weaned off to enteral feeding and the remaining 11 received both oral and enteral feeding following PN support.

Table 1: Profile of patients who received parenteral nutrition

Characteristics	n (%)
Age (years)	
<30	3 (5.5)
30-49	22 (40.7)
50-69	20 (37.0)
70-89	9 (16.6)
Mean age (years)	54 ± 14.8
Gender	
Female	18 (33.3)
Male	36 (66.6)
Mean weight (mean ± SD)	60.87 ± 16.61
Mean BMI (mean ± SD)	23.15 ± 5.55
Nutritional status on admission by subjective global assessment tool	
Well nourished	19 (35)
Moderately malnourished	34 (63)
Severely malnourished	1 (2)

BMI: Body mass index; SD: Standard deviation

Table 2: Indications for the use of parenteral nutrition

Indication for parenteral nutrition	Number of patients n (%)
Gastrointestinal surgery	30 (55.6)
Intolerance to enteral nutrition	13 (25.9)
Enterocutaneous fistula	2 (3.7)
Pancreatitis	3 (5.6)
Gastrointestinal obstruction	2 (3.7)
Malabsorption	1 (1.8)
Others	3 (5.6)

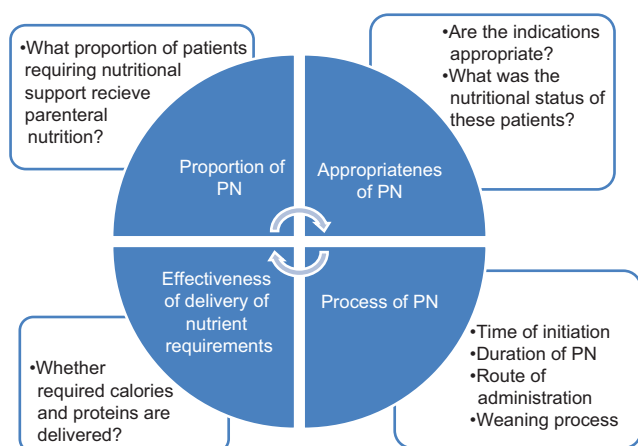


Figure 1: Framework for quality assessment of parenteral nutrition

Effectiveness of delivery of calorie and protein goals

The average calorie and protein requirements for the 54 patients who received PN support were 2018 Kcal and 85 g proteins respectively. Only 907 Kcal (45%) and 36.6 g proteins (43.5%) were provided with an average volume of 1070 ml/day [Table 3]. PN through central line provided significantly ($P = 0.002$) higher calories (56% vs. 39.8%) and protein (49% vs. 39.62%) [Table 4]. However, there was no significant difference between CCU and wards in the effectiveness of delivery of calories and protein despite the higher use of central route in the CCU.

Discussion

This study describes the practice patterns of PN in a tertiary care setting in India. The most striking finding of this study was the very low rate of initiation (0.24%) and continued use (0.18%) of PN. Major gastrointestinal surgeries and intolerance to EN were the most common indications for PN. The predominant route of delivery was peripheral with a median duration of 6 days. Target

calories and proteins were unmet, and this may be due to limitations relating to volume restriction and use of premixed standardized solutions.

The low rate of PN in this tertiary care setting in India reveals a high awareness and practice consistent with evidence-based guidelines. However, it is important for these low rates of PN use in this hospital to be contextualized in the setting of practice patterns in other similar settings in India.

It was noted that gastrointestinal surgeries were the most common indication for PN use. It was common practice in the past to keep postoperative patients "nil by mouth" and maintain them on TPN. This concept is no longer recommended even in complicated gastrointestinal surgeries.^[4] The higher rate of use of peripheral route and supplemental PN support may reflect the vestiges of the old practice and comfort level of surgeons. This should be addressed carefully in the light of emerging evidence. The current ESPEN guidelines for PN support clearly recommend the use of central venous lines for effective delivery.^[5] Peripheral cannulas may be used when using fluids of low osmolality (<850 mosm/L) for a limited period of time when a substantial proportion of nonprotein calories is given as lipids.^[5] Our study reiterates prior knowledge that peripheral lines deliver nutrients with much lesser efficacy than the central lines.^[5] We noted that PN was used predominantly in the wards and in <50% of patients in CCU. This may relate to the skill set of providers and logistic issues in care. Moreover, it was seen that about 50 patients received either simultaneous or sequential oral/EN support when the volume of PN was substantially lower. The median duration of use (6 days) was not very high which could imply that several of these patients probably did not merit PN support. A small proportion

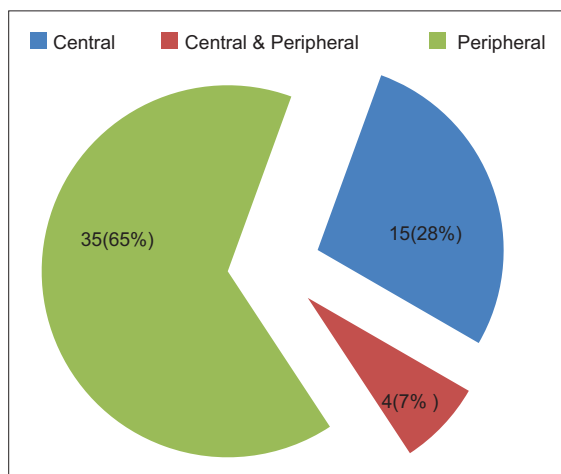


Figure 2: Route of administration of parenteral nutrition

Table 3: Effectiveness of delivery of calorie and protein requirements through parenteral nutrition

	Number of patients	Number of days of parenteral nutrition	Mean calorie requirement	Mean calories delivered	Percentage of calorie requirement delivered	Mean protein requirement	Mean proteins delivered	Percentage of protein requirement delivered	Mean volume of parenteral nutrition
Total	54	6.5 (3-19)	2018	907	45	85	36.6	43.5	1070
Critical care unit	24	6.75 (3-18)	2104	1021	48.5	92	42	45.6	1115
Wards	30	6.4 (3-19)	1948.9	815	41.8	79	32	40.5	1034

Table 4: Comparison of effectiveness of nutrient delivery through various routes of administration of parenteral nutrition

Route	Mean calories requirement (Kcal)	Mean calories delivered (Kcal)	Percentage of calories delivered	Mean proteins requirement (g)	Mean proteins delivered (g)	Percentage of proteins delivered
Central line	2035	1143	56.16	95.9	47	49
Peripheral line	1990	792.35	39.81	79	31.3	39.62
Central + peripheral line	2193	1018	46.4	91.8	44	47.93

of patients with pancreatitis were also maintained on PN support, which defies current knowledge from systemic reviews that demonstrate the benefit of EN compared to PN in this group.^[1]

The poor delivery of required nutrition through PN in this study requires attention. As highlighted earlier, only premixed all-in-one bag admixtures are available in India and customized PN support is not an option. The practical limitations due to volume restrictions and the inherent limitations of premixed bags in delivering all nutrient requirements in the required proportion for a patient with multiple comorbidities are real and described earlier.^[6]

A previous quality control audit from Switzerland showed that PN was appropriate in 93% of the patients. Overfeeding was observed in 62% against underfeeding in 14%.^[7] Another audit from Northern England showed that 18% of patients on PN did not have a proper indication and 15% developed a complication.^[8] In another audit at the Medical University of South Carolina, 40% of the parenteral support was noted to be inappropriate and could have been avoided.^[9] In a tertiary care setting in Singapore, it was found that 15.9% of PN supports were inappropriate according to the ASPEN guidelines.^[10]

This study is one of the very few documentations of PN practices in India. It is an important quality audit as it highlights the various aspects of PN therapy in the tertiary care setting and identifies gaps in nutritional support. The extremely low proportion of patients who received PN support in this hospital is in keeping with current evidence-based guidelines and could provide a reference for PN practice in other settings.

Conclusion

- Use of PN is very less in this tertiary hospital setting in keeping with emerging consensus
- The appropriateness of indications PN needs to be reviewed
- Use of peripheral venous line as the common route of administration needs to be reviewed and altered to align with current recommendations
- Delivery of required nutrition through PN is suboptimal.

This quality control study will help improving the quality of services and clinical outcomes. We would like to analyze our performance in implementing changes based on the findings and ensure quality assurance.

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Conflicts of interest

There are no conflicts of interest.

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