



Original article

A protocol for sustained reduction of Total Parenteral Nutrition and cost savings by improvement of nutritional care in hospitals



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SUMMARY

Background and aims: Malnutrition and the use of Total Parenteral Nutrition (TPN) contribute considerably to hospital costs. Recently, we reported on the introduction of malnutrition screening and monitoring of TPN use in our hospital, which resulted in a large (40%) reduction in TPN and improved quality of nutritional care in two years (2011/12). Here, we aimed to assure continuation of improved care by developing a detailed malnutrition screening and TPN use protocol involving instruction tools for hospital staff, while monitoring the results in the following two years (2013/14).

Methods: A TPN decision tree for follow up of TPN in patients and a TP-EN instruction card for caregivers was introduced, showing TPN/EN introduction schedules based on the energy needs of patients according to EB guidelines, also addressing the risk of refeeding syndrome. TPN patients were monitored by dietitians and TPN usage and costs were presented to the (medical) staff. Screening and treatment of malnourished patients by dietitians is simultaneously ongoing.

Results: In 2014 48% of patients, hospitalized for at least 48 h, were screened on malnutrition, 17% of them were diagnosed at risk, 7.9% malnourished and treated by dietitians. TPN usage dropped by 53% and cost savings of 51% were obtained due to 50% decrease of TPN users in 2014 versus 2010. TPN over EN ratio dropped from 2.4 in 2010 to 1.2 in 2014.

Conclusion: Sustained improvement of nutritional care and reduction of TPN usage and costs is possible by introduction of procedures embedded in the existing structures.

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1. Introduction

The general hospital Sint-Lucas in Bruges, Belgium is a hospital of 415 beds (Table 1). Whereas patient numbers remained fairly constant, since 2007 a steady increase in the use of TPN was noticed and questions arose about the associated costs, and medical and nutritional necessity. The exact reason for the increase in TPN use is unclear, but it coincided with the start of a federal project to increase doctors awareness for malnutrition. This may have

prompted increased prescription in the absence of clear guidelines. In any case, a project was started to analyze the causes and to try and find a remedy based on the latter analysis. This was done for TPN and EN use and simultaneously malnutrition risk screening was introduced. The aim of the project was to improve quality of nutritional care of patients by screening and treatment of malnutrition and monitoring patients on TPN and EN during hospital stay based on EB guidelines by dietitians [1,2]. The initial target was reduction in consumption and costs of TPN for at least 10% in the first year (2010) or 20% in the first 2 consecutive years (2010–2011) after the introduction of the new approach. A concomitant increase in the use of EN was expected. The results of the new approach exceeded expectations, and the first results have been published summarily [3]. Briefly, the number of TPN users decreased by 29% during hospitalization, TPN usage and associated costs were reduced by 40% in 2011 compared to 2010. The procedures encompassed detailed malnutrition screening with the NRS 2002

Abbreviations: EN, enteral nutrition via tube; TPN, total parenteral nutrition; ESPEN, European Society for Parenteral and Enteral Nutrition; ASPEN, American Society for Parenteral and Enteral Nutrition; EB, evidence based.

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Table 1
Number of recognized hospital beds per unit in 2014.

Department/unit	Recognized hospital beds
Geriatrics + rehabilitation	56 + 9
Orthopedics	43
ICU	10
Cardiac and Medium care	20
General surgery, including abdominal surgery	51
Internal medicine, including internal medicine 1 (general), internal medicine 2 (oncology) and internal medicine 3 (cardiology and nephrology + rehabilitation)	65 + 8
Gynecology	8
Maternity, including neonatal ICU	22
Neurology + rehabilitation	8 + 23
Psychiatry, including Day clinic	38
Psychiatry children and adolescents	25
Pediatrics	24
Total number of recognized beds	412

[4,5] and TPN use protocols involving instruction tools for hospital staff. After publication, the project received a lot of attention from other hospitals, and many requests were received for more detailed information of the procedures followed.

Therefore, in the present study, a detailed description is given of the protocols used in our approach. Furthermore, the results of the project over the period 2009–2014 are given.

2. Methods

During the TPN project (2010–2011) the project leader/dietitian evaluated EN and TPN usage and attitudes of staff towards EN and TPN at the different nursing units in 2010. Causes and contributors to incorrect TPN use and increased costs were identified and objectives and actions were set for the nutrition team as described earlier [3].

In the current period (2012–2014), further actions were taken to secure sustained improvement of the quality of nutritional care of patients during hospital stay:

- I) introduction of computerized medical records to improve screening, detection and monitoring of malnourished patients admitted to the hospital. Units excluded from screening on malnutrition risk were cardiac and medium care because of fast transfers to other units, psychiatry and maternity because of low incidence of malnutrition risk and pediatric unit because all patients are followed up closely by the pediatricians. Terminally ill patients were excluded from screening too.
- II) continuous follow up of TPN and EN use.
- III) development of a TPN decision tree (Fig. 1) for follow up of patients on TPN by dietitians based on EB Best practice guidelines [6–16].
- IV) development of a TP-EN instruction card for caregivers (physicians, dietitians) (Figs. 2, 3) to start EN and TPN in hospitalized patients according EB best practice TPN guidelines [6–9,17,18] and treatment of refeeding syndrome risk [10–16].

Much effort has been put in the structural organization of the whole process as described before [3] with a central role for the project leader/dietitian as manager of the dietitians team. The dietitians moved from the kitchen to the clinic and became part of multidisciplinary treatment teams. The manager of the dietetic department was made formally responsible for: educating and supporting dietitians about clinical nutrition concerning TPN and

EN patients, the development of clinical nutrition protocols and procedures, and the malnutrition screening process, coordination of the nutritional management team and taking part in the clinical nutrition team of the ICU. Furthermore, responsibilities involved follow up and presentation of TPN and EN usage and malnutrition screening results to the staff.

During the years 2012–2014 the manager of the dietetic department started sharing the new approach through training of dietitians teams in other hospitals in Belgium and by presenting this approach and results at conferences of dietetic associations in Belgium and other European countries.

2.1. TPN and cost calculations

Since 2011 TPN used in our hospital is Smofkabiven[®], Fresenius Kabi, consisting of three compartment bags, containing amino acids, glucose and a new generation fat emulsion, including electrolytes (or electrolyte free), delivered in 986 ml, 1477 ml and 1970 ml bags. Vitamins, minerals and trace elements are added before starting TPN. TPN administered via central venous route provides 1100 kcal total energy, contains 8 g Nitrogen or 50 g protein (18.2% of protein of total energy), 38 g lipids and 125 g glucose per 986 ml bag. In case of peripherally administered TPN, Smofkabiven[®] Peri, Fresenius Kabi, is used providing 1300 kcal, 9.8 g Nitrogen or 63 g protein (19.4% of total energy) per 1904 ml bag.

According to EB guidelines, TPN protein goals of 1.2–1.5 g per kg body weight [19] per day are recommended except for patients with end stage kidney disease (0.8 g per kg per day). Protein goals of 1.2–1.5 g per kg bodyweight could not be met with TPN only because of the fixed % of nitrogen in the used TPN, but could be reached, if patients tolerate additional protein enriched EN, based on energy needs of patients according ESPEN guidelines. EN used is Nutrison[®] protein plus, Nutricia Advanced Medical Benelux, delivering 63 g of protein, 49 g fat (20% of total energy), 142 g carbohydrates and 1250 kcal per liter bag.

Furthermore, we used TPN based on energy goals instead of protein goals. By indicating TPN based on protein goals of 1.2–1.5 g per kg per day, too much energy per kg is supplied according to current opinion, especially in ICU patients [20], increasing the risk of refeeding syndrome [10–16]. Instructions for starting TPN or EN are summarized on the TP-EN instruction card for caregivers (Figs. 2,3). If TPN patients started tolerating EN, TPN was decreased, according to available TPN-EN protocols, based on required energy goals of the patients and protein goals are more likely to be met.

TPN used before 2011 in our hospital was Oliclinomel[®], Baxter, Eigenbrakel, Belgium, costing 37 € per pack/day (10% of TPN use) and Kabiven[®], Fresenius Kabi, Schelle, Belgium average cost 49 € per pack/day (90% of TPN use). Before 2011 the average cost of all TPN used was approximately 47.70 € per pack/day. From 2011 on, Smofkabiven[®], Fresenius Kabi, was used only. Based on data provided by the hospital pharmacy the average cost of TPN of Fresenius Kabi was approximately 49 € per pack/day over the period since 2011. All cost calculations are based on the figures above.

3. Results

Over the period 2011–2014 screening on malnutrition risk of all patients admitted to the hospital for at least 48 h by initial NRS 2002 [4] by nurses increased from 18.5% to 48%. Malnutrition risk detected by nurses remained high, between 54% and 58% of screened patients admitted to the hospital between 2010 and 2012 and decreased to 34% in 2014. Over the period 2011–2014 the number of patients screened by nurses, diagnosed malnourished and treated by the dietitians increased from 649 or 6.6% of patients

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