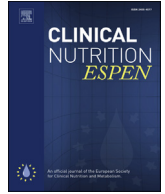


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Original article

Assessing the appropriateness of parenteral nutrition use in hospitalized patients. A comparison on parenteral nutrition bag prescription in different wards and nutritional outcomes

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SUMMARY

Purpose: Our aim is to assess parenteral nutrition (PN) bag prescription in hospitalized patients and evaluate clinical outcomes linked to PN therapy.

Methods: We performed an observational longitudinal retrospective study on PN prescription in a General Public Hospital in Turin, Italy, on ninety-five patients receiving PN prescribed by the Nutrition Support Team (NST). We described patients' demography and assessed nutritional outcomes, as well as PN bag prescription in different wards. Medians were calculated for several clinical parameters before and after PN therapy. A z-test for proportions has been performed to better understand the impact of various conditions on clinical outcomes and to compare differences between administered nutrients and required amounts.

Results: The NST resulted responsible for only 18% of bags prescribed in the geriatrics ward and for 48% in the surgery wards. PN was not able to fulfill nutritional requirements resulting in a median lack of 3.1 calories and 0.23 g of proteins per kilogram of reference body weight per day. Despite this, PN therapy was able to improve total blood proteins and calcium blood levels in our cohort. The NST changed the prescription in 55.8% of the pre-existing PN regimens.

Conclusions: More strict adherence to guidelines is needed in order to maximize effectiveness of PN and observe a positive impact on clinical parameters.

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1. Introduction

Malnutrition is a condition related to significantly higher length of hospital stay (LOS), costs and subsequent home health care needs in hospitalized patients compared with a good nutritional status [1]. A high number of hospitalized patients is malnourished or at risk for malnourishment. The Project: Iatrogenic MALnutrition in Italy (PIMAI) showed that prevalence of malnutrition in Italian hospitalized patients is 30.7% [2]. This data, obtained from 1583

subjects, is representative of the Italian population and it is aligned with the European prevalence of malnutrition of 31.1% [3]. American studies offer a heterogeneous picture of the prevalence of malnutrition in hospital settings with the prevalence ranging from 30% to 55% [4–7]. Appropriately selected nutritional support, including parenteral nutrition (PN), can address the problem of malnutrition, improve clinical outcomes and help to reduce the costs of health care [8]. Enteral feeding is the most physiologic way of nourishment and should be preferred when a well functioning gastrointestinal tract is available. However, there are conditions in which oral/enteral nutrition is not possible, such as major upper gastrointestinal surgery, high output gastrointestinal fistula, diffuse peritonitis, intestinal obstruction, ileus, intractable vomiting or diarrhea, gastrointestinal ischemia. In all these cases it is

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mandatory to correct or prevent malnutrition with a parenteral approach [9]. Several nutritional bags are available to be used in hospital settings, for both central and peripheral access. A variety of different compositions allow the physician to choose the bag that better fulfills patient's requirements. Since parenteral nutrition (PN) therapy may be quite expensive (even if the three-compartment bags used in our hospital are more economical than the customized ones [10]), it is mandatory to choose the best possible bag type and volume in order to maximize this nutritional therapy. The aim of this study is to assess the appropriate use of PN therapy in hospitalized patients and evaluate clinical outcomes on patients followed by the Nutrition Support Team (NST) at San Giovanni Bosco Hospital in Turin, Italy.

2. Materials and methods

2.1. Participants and data

We performed an observational analytical longitudinal retrospective study on PN prescription at San Giovanni Bosco Hospital, Turin, Italy in a twelve months period (from June 1st 2014 to May 30th 2015). We identified eleven wards of interest: geriatric, internal medicine A and B, psychiatry, emergency medicine, neurology, cardiology, acute coronary care unit, general surgery, urology and vascular surgery. We excluded nephrology and dialysis wards because of the specific needs in this particular population. Starting from June 1st, we selected all the patients receiving PN prescribed by the NST. We included both patients that were already on PN before the referral and those with a new PN onset prescribed by the specialist. We collected medical records of ninety-five patients from the Hospital Information System Galileo 1.5.3.3.2787 (NoemaLife S.p.A.) and from the worksheets used during the visits where the NST recorded nutritional data.

We set up a database with the following information: gender, age, ward of admission, date of admission and discharge, admitting disciplines (medical or surgical ward), date of surgery (if applicable), number of comorbidities, date of the first and second (if applicable) medical advice, actual and reference body weight, height, calories and proteins requirements, type of PN regimen already prescribed by attending physicians (if applicable: type of bag, volumes infused, additions, calories and proteins administered; Table 1), date of start and stop of PN, route of PN administration (peripheral or central), type of PN regimen prescribed by the NST (type of bag, volumes infused, additions, total calories and proteins administered, calories and proteins per kilogram of reference weight), blood tests before starting PN and at the end of the hospitalization (lymphocytes, glucose, creatinine, sodium, potassium, magnesium, calcium, phosphorus, total protein, albumin, transferrin, C reactive protein).

Table 1
Composition of parenteral nutrition bags.

Name	Vol (ml)	AA (gr)	Lip (gr)	Hc (gr)	Total kcal	Na (mMol)	K (mMol)	Ca (mMol)	Mg (mMol)	P (mMol)	Osm (mOsm/l)
Nutriperilipid	1875	60	75	120	1435	75	45	4.5	4.5	11.25	920
Olimel N4	1500	38	45	112	1050	31.5	24	3	3.3	12.7	760
Olimel N5	2000	66.8	80	230	1980	70	60	7	8	30	1120
Olimel N7	1500	66.4	60	210	1710	52.5	45	5.3	6	22.5	1360
Olimel N9	2000	113.9	80	220	2140	0	0	0	0	6	1170
Smofkabiven	986	50	38	125	1100	40	30	2.5	5	12	1500
Smofkabiven	1477	75	56	187	1600	60	45	3.8	7.5	19	1500
Smofkabiven	1970	100	75	250	2200	80	60	5	10	25	1500

Vol: bag volume, AA: amino acids, Lip: lipids, Hc: carbohydrates. Amounts provided per bag. Nutriperilipid contains 50% soybean oil and 50% medium chain triglycerides (MCT) as source of lipids, Olimel contains 80% olive oil and 20% soybean oil as source of lipids, Smofkabiven contains 30% soybean oil, 30% MCT, 25% olive oil and 15% fish oil as source of lipids.

With this information we calculated the following parameters: length of stay (LOS), number of days between surgery and the first medical advice (when applicable), body mass index (BMI), duration of PN therapy. In relation to the blood tests, we compared patient's values with reference values of the hospital laboratory (Table 2).

We identified values that were in range and those that were under or above the range. We also asked the hospital pharmaceutical service, the amount of PN bags used by the geriatrics and general surgery wards in order to obtain the number of bags prescribed by the attending physicians compared to those prescribed by the NST. Lastly, we obtained the number of all the inpatients of each ward in the study period.

2.2. Statistical analysis

Statistical analysis was performed using SAS version 9.2.2. We characterized our cohort evaluating the distribution of gender, age ranges (<30, 30–49, 50–64, 65–80, >80), admitting ward, admitting discipline (surgical or medical with sub-group of geriatrics), number of comorbidities divided into ranges (0, 1, 2, 3, >3), route of administration of PN, PN regimen, the prevalence of surgery and lastly the prevalence of pre-existing PN therapy (with the percentages of confirmation, or of modification of PN therapy). We also calculated the mean \pm standard deviation, or the median with interquartile range when appropriate, of age, BMI and reference body weight.

To evaluate patient and nutritional outcomes, we calculated the median LOS and the median of duration of PN, the median amount of days between surgery and the medical consult (with two sub-groups: medical consult performed before or after surgery). We identified the prevalence of patients who needed a subsequent medical consult after the first one. We evaluated the patient's malnutrition status considering the prevalence of patients with total blood protein before PN being <6.6 g/dl. Then we sorted out

Table 2
Reference values of blood tests.

Parameter	Measure unit	Minimum	Maximum
Lymphocytes	/UL	1500	–
Glucose	mg/dl	60	100
Creatinine	mg/dl	0.5	0.9
Sodium	mEq/l	136	145
Potassium	mEq/l	3.5	5.1
Magnesium	mEq/l	1.22	2.14
Calcium	mmol/l	2.15	2.50
Phosphorus	mg/dl	2.5	4.5
Total protein	g/dl	6.6	8.7
Albumin	g/l	35	50
Transferrin	mg/dl	200	360
Reactive C protein	mg/dl	–	0.5

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