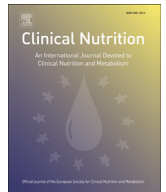




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Original article

Nutrition-related risk indexes and long-term mortality in noncritically ill inpatients who receive total parenteral nutrition (prospective multicenter study)

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SUMMARY

Background: Malnutrition in hospitalized patients is associated with an increased risk of death, in both the short and the long term.

Aims: The purpose of this study was to determine which nutrition-related risk index predicts long-term mortality better (three years) in patients who receive total parenteral nutrition (TPN).

Abbreviations: CRP, C-reactive protein; GNRI, geriatric nutritional risk index; HbA1c, glycated hemoglobin; NRI, nutritional risk index; SGA, subjective global assessment; TPN, total parenteral nutrition; WLO, ideal weight according to the Lorentz formula.

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Methods: This prospective, multicenter study involved noncritically ill patients who were prescribed TPN during hospitalization. Data were collected on Subjective Global Assessment (SGA), Nutritional Risk Index (NRI), Geriatric Nutritional Risk Index (GNRI), body mass index, albumin and prealbumin, as well as long-term mortality.

Results: Over the 1- and 3-year follow-up periods, 174 and 244 study subjects (28.8% and 40.3%) respectively, died. Based on the Cox proportional hazards survival model, the nutrition-related risk indexes most strongly associated with mortality were SGA and albumin (<2.5 g/dL) (after adjustment for age, gender, C-reactive protein levels, prior comorbidity, mean capillary blood glucose during TPN infusion, diabetes status prior to TPN, diagnosis, and infectious complications during hospitalization).

Conclusions: The SGA and very low albumin levels are simple tools that predict the risk of long-term mortality better than other tools in noncritically ill patients who receive TPN during hospitalization.

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1. Introduction

Malnutrition is highly prevalent in hospitalized patients and it is associated with an increased risk of hospital complications, a longer hospital stay, higher hospitalization costs and a greater mortality rate [1–4].

However, no “gold standard” exists for determining nutrition status [1,2] and a great diversity of nutrition screening and assessment tools are available. However, not all these tools adequately predict poor short-term and long-term nutrition-related outcomes [3]. Plasma albumin and prealbumin levels have been found to be indicators of inflammatory activity and their evolution is a reliable sign of whether that activity is diminished or increased in patients with an acute or chronic illness. Their levels are associated with the development of complications and mortality in hospitalized patients in the short term [1,4] and the long term [5–8]. Various tools have been developed to score the severity of the complications, such as the Nutritional Risk Index (NRI), which combines 2 nutritional indicators (albumin and weight loss), and the Geriatric Nutritional Risk Index (GNRI) [9,10], which replaces the usual body weight by ideal body weight (calculated according to the Lorentz formula) in the NRI equation. Other tools that help to identify patients with malnutrition, such as the Subjective Global Assessment (SGA) [11,12] (completely based on clinical evaluations), are also associated with an increase in complications and mortality in hospitalized patients in both the short term [13] and the long term [14,15].

Few studies, however, have prospectively examined long-term clinical outcomes, particularly mortality, of hospital malnutrition [6,14,15], and no study has yet been undertaken specifically in a noncritically ill population receiving TPN during their hospitalization. Furthermore, the population selected is often very old [16] (which may not be representative of the population admitted to acute care hospitals) or old and institutionalized [10,17–19], or in a nursing home [19], and consideration of the confounding effect of disease is rare [14]. Even fewer studies have investigated mortality outcomes using data from national death registries [14,15], thus ensuring accuracy in data collection.

The beneficial effect of total parenteral nutrition (TPN) in hospitalized patients who are malnourished or at risk of malnutrition is well established. However, studies are lacking about the prognostic value of the nutrition-related risk indexes and malnutrition tools for the risk of long-term mortality in noncritically ill inpatients receiving elective TPN, controlling for other confounding variables that may greatly influence both malnutrition and mortality. We hypothesized that the SGA (a subjective method) could predict this risk as well as or better than other objective tools.

The aim of this prospective multicenter study was to determine which nutritional index is associated with the best prediction of

long-term mortality (up to three years) in hospitalized noncritically ill TPN patients under conditions of daily clinical practice and controlling for confounding variables.

2. Materials and methods

This multicenter prospective study involved 19 hospitals in Spain (16 university hospitals and 3 non-university hospitals). The study included all hospitalized noncritically ill patients (i.e., patients in the non-intensive care unit setting) who started TPN as a sole source of nutrition between September and December 2010. Patients were excluded if they were in intensive care units, were receiving parenteral nutrition together with enteral nutrition, pregnant, or <14 years of age. The study was approved by the Research Ethics Committees of Malaga Regional University Hospital and all of the other participating hospitals, and all the subjects gave written informed consent. Before starting TPN all the patients were assessed by a member of the hospital nutrition team, who determined the indication for TPN according to criteria of good clinical practice [20] and undertook the follow-up of the patients until discharge.

Data were recorded on demographic variables (age, gender); diagnosis on admission (in four groups: surgery, oncology (solid and hematologic), digestive, and infectious disorders); prior comorbidity (history of any of the following: kidney or liver failure, respiratory or cardiac disease, transplant), type of TPN, and infectious complications during hospitalization. Data were also obtained as recorded on the charts about a catheter or noncatheter infection, identified as an elevated white blood cell count in addition to one or more of the following: positive blood culture, chest x-ray suggestive of pneumonia, positive urine culture, postoperative wound infection and the use of antibiotics. Prior to starting the TPN infusion a blood sample was drawn to measure glucose, albumin, prealbumin, C-reactive protein (CRP) (with an autoanalyzer) and glycated hemoglobin (following the international recommendations for standardization of the hemoglobin A1c measurement) at the laboratories of each hospital. Patients were considered to have known diabetes if they had a documented history of diabetes and unknown diabetes if there was no record of them having diabetes mellitus but the HbA1c was $\geq 6.5\%$. Patients were considered to have prediabetes if the HbA1c was $\geq 5.7\%$ but $< 6.5\%$ and to have stress hyperglycemia if their HbA1c was $< 5.7\%$ but their blood glucose was ≥ 126 mg/dL prior to TPN infusion. Prospective measurements were made of capillary blood glucose each 6 h, though if the blood glucose levels were < 140 mg/dL the measurements were made every 8 h.

The nutritional tools and prognostic indexes were determined before starting TPN. The subjective global assessment (SGA) was calculated according to Detsky [11] (all the professionals were

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