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Original article

Decline in nutritional status is associated with prolonged length of stay in hospitalized patients admitted for 7 days or more: A prospective cohort study

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SUMMARY

Background & aims: Reducing length of stay (LOS) is a priority for hospitals but patients' decline in nutritional status may have a negative impact. The aims of the study were to assess the change in nutritional status during hospitalization and determine if its decline is associated with prolonged LOS.
Methods: This is a prospective cohort study conducted in 18 Canadian hospitals. Subjective global assessment (SGA) and weight measurements were performed at admission and discharge. Patient information was collected at admission and extracted from the chart during hospitalization. Association between LOS and changes in SGA or weight loss ≥5% was tested using multivariate Cox PH approach. Results are expressed as hazard ratios (HR) and their 95% CI.
Results: 409 patients (53% male) with a LOS >7 days were analyzed. Patients' median (q1,q3) age was 68 years (58,79) and LOS was 11 days (8,17). At admission, 49% of patients were well nourished (SGA A), 37% were moderately malnourished (SGA B) and 14% were severely malnourished (SGA C). From admission to discharge, 34% remained well-nourished, 29% remained malnourished (SGA B or C), 20% deteriorated and 17% improved. Of the 409 patients, 373 had weight measurements at admission and discharge: 92 (25%) had ≥5% weight loss. Multivariate models showed that after adjusting for covariates, decline in nutritional status from SGA A to B/C or SGA B to C (HR: 0.62, CI: (0.44, 0.87); HR: 0.35, CI: (0.20, 0.62) respectively) and weight loss ≥5% (HR: 0.52; CI: 0.40, 0.69) were significantly associated with longer LOS.
Conclusion: In-hospital decline in nutritional status as assessed by SGA or weight loss ≥5% is associated with prolonged LOS independently of factors reflecting demographics, living accommodations and disease severity. This suggests a role for nutrition care in reducing LOS.

1. Introduction

Reducing length of stay (LOS) is a priority for hospitals and health care systems, due to significant increases in costs. However,

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this marker of efficiency may be detrimentally affected by poor nutritional status or a decline in nutritional status during hospitalization.

Malnutrition is prevalent in hospitals, between 15% and 70% [1–8] depending on populations, types of institutions and methods of assessment. Several factors may contribute to malnutrition such as underlying illnesses, aging, socioeconomic situations as well as in-hospital medical procedures that impact food intake, lack of monitoring of the nutritional status and lack of standardized nutrition care protocols [8–11]. The presence of malnutrition has been shown to negatively impact outcomes such as LOS and increased health care costs [12–22], independently from other factors. However, there is very little literature on how decline in nutritional status during hospitalization can affect outcomes [14,23].

In the US, Braunschweig et al. [23] conducted a prospective observational single center study with a retrospective component, which assessed changes in nutritional status in 404 patients using subjective global assessment (SGA) at admission and discharge. Results showed that a decline in patients' nutritional status during hospitalization, regardless of their nutritional status at admission, was associated with significantly higher hospital charges and higher likelihood of complications and LOS in patients staying longer than 7 days. However, no covariate adjustment for demographics and comorbidities was done when testing the associations between nutritional status and LOS. In Italy, Caccialanza et al. [14] evaluated 1274 hospitalized patients in one hospital and evaluated the associations between malnutrition and prolonged LOS (>17 days) adjusting for several potential nutritional and clinical confounders recorded at admission and collected during and at the end of the hospital stay. They found that a nutritional risk index less than 97.5 at admission and an in-hospital weight loss of ≥5% were associated with prolonged LOS. In that study, one of the confounders, the physician-assessed severity score was performed only within 36 h of admission but was not repeated at discharge. Also, as the nutritional risk index is a weight-based measure, they excluded patients with edema from the study sample. To our knowledge, there are no other studies assessing the impact of a decline in nutritional status on LOS in general patient populations admitted to acute care hospitals and no multi-center studies. Furthermore, no studies have controlled for in-hospital changes in medical condition.

To assess nutritional status, SGA [24] is a well validated tool [2,5,21,25–29] associated with clinical outcomes [15,21,23,25,30–34]. Except for Braunschweig's study [23], there is no report on its use to assess nutritional decline in hospitalized patients and SGA is not regularly used by health care professionals. Body weight is more routinely measured on the wards but has limitations due to fluctuations in fluid status. Excluding patients with fluid issues, a weight loss ≥5% has been associated with extended LOS [14]. It would be of interest to determine if weight loss ≥5% in the "real world" of clinical practice, i.e. not specifically excluding patients with fluid retention, has the same impact.

The first aim of this study was to measure the nutritional status of patients at hospital admission and at discharge, using SGA as the primary measure, and body weight as a secondary measure, and to assess the changes during hospitalization. The second aim was to determine if decline in nutritional status, as assessed by these 2 measures, is associated with prolonged LOS.

2. Materials and methods

Patients with a hospital stay of at least 7 days, discharged alive, and with nutritional assessment performed at admission and discharge were selected from a larger prospective multicenter cohort study involving 1022 patients. A 7-day threshold was chosen to select the study subgroup to better detect any potential changes in nutritional status based on clinical experience and literature [23]. This large cohort study was conducted from July 2010 to February 2013 (Fig. 1) and included adult patients (≥18 y) admitted for ≥2 days directly to the surgical and medical wards of 18 participating acute care hospitals (11 academic, 7 community) from 8 provinces across Canada with the main goal of determining contributors to malnutrition at hospital admission and its impact on LOS [35]. Hospitals were made aware of the study by various modes of communication (national conferences, direct contact with hospital dietitians and administrators, through website visit at www.nutritioncareincanada.ca). Patients were excluded if admitted directly to intensive care unit (ICU), obstetric, psychiatry, palliative wards or admitted to a medical day unit. Patients were enrolled according to a strict protocol to avoid selection bias. Days of enrollment rotated from Monday to Friday, with Monday capturing the week-end admissions from Friday 5pm to Monday 5pm. Consecutive admissions were approached for consent and a maximum of 7 patients were followed at the same time. The study was approved by all institutions' administration and REBs and all participants or their alternative decision maker signed a consent form.

2.1. Data collection

The nutritional status of the patients was assessed at admission and at discharge using two different measures. SGA [24] was performed by 18 trained coordinators (one in each hospital) to avoid inter-rater variability (SGA A = well-nourished; SGA B = moderately malnourished; SGA C = severely malnourished). Body weight was measured in light clothes with shoes off using a chair scale (Seca 952 Chair Scale. Weigh and Measure, LLC). Both parameters were measured within 48 h from admission to the hospital ward and prior to discharge.

Data regarding demography, contact information, living arrangements, primary admission diagnosis, presence/absence of cancer, Charlson Comorbidity Index (CCI) [36] and number of medications were collected at admission. Due to the variety of diagnoses, these were classified under 11 broad standard categories (Table 1). If there was more than one category for the same patient, a 2nd and 3rd diagnostic category was coded. During hospitalization patient charts were reviewed approximately every two days: new diagnostic categories, new diagnosis of cancer, numbers of daily medications for the first 10 days of admission and surgical interventions were recorded. At discharge, CCI was again evaluated to assess potential changes in medical condition during hospitalization.

2.2. Measures of nutritional status, main outcomes and covariates

Change in nutritional status was assessed as a difference between nutritional parameters at admission and at discharge. For SGA, we considered that patients with SGA A at admission and SGA B or C at discharge, or SGA B on admission and SGA C at discharge had a decline in nutritional status during hospitalization. For SGA C further deterioration in nutritional status was defined as having ≥5% decrease in weight from admission to discharge: as there was only 1 such patient in our data set, the observation was included into "SGA C stable" group for the analysis. Seven patients with admission SGA C had a weight measurement missing; as the main outcome (LOS) was not statistically significantly different for these as compared to other patients with SGA C (data not given), they were grouped with the "SGA C stable" group. Patients who had SGA B at admission and SGA A on discharge or SGA C at admission and

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