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Original Article

Prevalence of malnutrition on admission to hospital – Acute and elective general surgical patients

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SUMMARY

Background & aims: Malnutrition is a common finding in elective general surgical patients on admission to hospital and is associated with greater postoperative morbidity, prolonged length of stay and higher cost of treatment. The situation in acute general surgical patients has not been clarified. The aim of the study was to investigate the prevalence of malnutrition in both acute and elective (scheduled admission) general surgical patients in a prospective cross-sectional study.

Methods: Over an eight-week period 460 (310 acute, 150 elective) consecutive patients were recruited. The primary end point was nutritional status within 48 h of admission determined using the patient-generated subjective global assessment (PG-SGA) tool. Body mass index, upper arm circumference and triceps skin fold were measured and upper arm muscle circumference derived. Admission plasma albumin and total cholesterol, total lymphocyte count and grip strength were measured. Length of total hospital stay was recorded.

Results: In the acute setting 52% of patients were malnourished or at risk (including nearly half of those with a BMI greater than 25 kg/m^2) compared to 38% of those who presented electively ($P = 0.004$). In the elective group, 66 (44%) patients presented with malignancy compared to 15 (5%) in the acute group ($P < 0.001$). Length of hospital stay increased significantly with worsening PG-SGA scores ($P < 0.001$ for both groups).

Conclusions: Malnutrition risk was found to be highly prevalent in acute surgical patients despite having a much lower malignancy rate than elective surgical patients. Admission screening should be strongly advocated for both acute and elective patients.

1. Introduction

Malnutrition is observed in up to 60% of surgical patients on admission to hospital,[1–6] and has significant implications for their prognosis.[7] Despite this, malnutrition remains under-diagnosed in 70% of patients in the hospital setting.[8] Furthermore, no studies have distinguished acute from elective surgical patients. Malnutrition at admission has prognostic significance however this influence is different for disease processes that are sudden and acute versus those that are chronic and longstanding. Acute surgical patients often present with markedly different clinical problems compared to elective patients, and the pathologies facing clinicians in these groups of patients require distinctly different approaches to management based on acuity, the metabolic response to injury and the state of metabolic stress.[9,10] Therefore the nutritional requirements of acute and elective patients are likely to differ based on acuity of illness, management issues, and timing of intervention.

In developed nations the main cause of malnutrition is disease states. This is of particular interest to the surgeon as chronic and acute disorders may differentially alter metabolism, appetite, absorption and utilisation of nutrients.[11] Several chemical mediators such as interleukin-1, interleukin-6, tumor necrosis factor-alpha and glucocorticoids are known to have catabolic effects and these stress hormones are found to be elevated in many chronic disease states such as malignancy.[12,13] Furthermore, extrinsic factors associated with the acute admission such as drug side effects, immobilisation, confusion and lack of social support, especially in elderly patients, must be recognised. As the cause of malnutrition in surgical disease is multi-factorial, with decreased intake and increased metabolism being central, early diagnosis and tailored intervention is needed. Surgery in itself, like any injury, results in release of inflammatory mediators with resultant catabolism of stores. In addition, prolonged starvation in acute surgical

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patients is common, and even 12 h of fasting pre-operatively can lead to undesirable outcomes after uncomplicated surgery.[14,15]

The problem of malnutrition is exacerbated by under-recognition and under-treatment by hospital staff. Several surveys have shown that medical staff fail to recognise malnutrition and are uninformed.[16–18] Surgical patients often need adequate and lengthy 'work-ups' and hospital routines can further exacerbate the problem, including missed meals due to other appointments, and lengthy episodes of 'nil by mouth' whilst awaiting procedures or investigations.

Malnutrition in patients undergoing surgery may have serious consequences. Importantly, malnutrition is associated with poor wound healing and increased risk of surgical and non-surgical organ complications.[9,19] Infectious and non-infectious complications are increased.[20] Malnutrition also leads to prolonged length of hospital stay (LOS) and higher nosocomial infection rates.[21,22] The end result is slowed functional recovery and increased cost of care.[23]

Although a number of studies have assessed the prevalence of malnutrition in general surgical patients, there is little information to distinguish these patients on the basis of acuity. The aim of the present study was to investigate the prevalence of malnutrition in both acute and elective surgical patients.

2. Methods

Ethical approval for the study was gained from the New Zealand Ministry of Health Northern X Auckland regional ethics committee.

2.1. Patients

Consecutive surgical inpatients admitted for greater than 24 h under the general surgical services in the acute and elective settings in a tertiary academic hospital in the South Auckland region of New Zealand over an 8-week period starting in October 2008 were included in the study. Acute patients were admitted to Middlemore hospital in the Otahuhu district and elective patients at the affiliated elective hospital (Manukau Surgery Centre) in the Manukau district of Auckland. Patients who were admitted directly to the intensive care unit from admission were excluded. All those eligible were approached within 24 h at admission and enrolled into the study after verbal consent was given. All screening was performed within 48 h of admission. Acute indications for admission under the general surgical service at Middlemore hospital include trauma, surgical gastrointestinal pathology (including lower gastrointestinal bleeding), hepatopancreaticobiliary (excluding transplant) surgery, surgical infections, peripheral vascular disease, abdominal aortic aneurysm complications, and urological cases not requiring tertiary urology referral. Elective procedures carried out by general surgeons include breast, endocrine, hepatopancreaticobiliary (excluding transplant), gastrointestinal, bariatric, vascular (peripheral vascular disease, carotid surgery and abdominal aortic aneurysm), and surgical oncology. At the conclusion of the study we screened for patients who may have been enrolled in both acute and elective groups, or in the same group more than once, during the study period by using digital identification numbers. If duplication was found, the later entry was deleted.

2.2. Nutritional assessment

Nutritional status was assessed using the patient-generated subjective global assessment (PG-SGA) tool.[24] The PG-SGA is based on the subjective global assessment (SGA) first described by Detsky et al.[25] and has been validated in surgical patients.[26,27] It classifies patients into three groups based on interview information on weight loss, change in dietary intake, digestive organ symptoms persisting for more than two weeks, changes in physical capacity, and physical examination looking at subcutaneous fat, muscle wasting and presence of oedema or ascites. Patients in group A are deemed normally nourished, those in group B are moderately malnourished or at risk of malnutrition, and those in group C severely malnourished. Those with SGA-B or SGA-C were therefore classified as malnourished for the purposes of this study.

2.3. Anthropometry

Height was measured using standard "KaWe" ward stadiometers (AS Medizintechnik Gmb, Tuttlingen, Germany) or, for supine patients, a standard inextensible medical measuring tape. Weight was measured using factory calibrated sitting scales (Atrax, Auckland, New Zealand) and body mass index (BMI) was calculated using weight in kilograms divided by height in metres squared. Mid-arm circumference (MAC) was measured using a standard inextensible medical measuring tape and triceps skin fold (TSF) was measured using Harpenden skin fold calipers (Baty International, West Sussex, United Kingdom) with the arm hanging relaxed at the side at the level of the midpoint of the acromion and olecranon. Upper arm muscle circumference (AMC) was calculated using the formula: $AMC = MAC - (\pi \times TSF)$.[28] Grip strength, as a measure of proportion of protein loss,[29] of the dominant hand was measured in the dominant hand and recorded as best effort from three attempts using a factory calibrated Jamar hydraulic hand dynamometer (Sammons Preston, Chicago, IL).

2.4. Biochemical and hematological data

Venous blood samples were collected from each patient on admission and sent to the hospital laboratory for processing. Plasma total white cell count, and lymphocyte count were measured using the XE-5000 automated hematology analyzer (Sysmex Corporation, Kobe, Japan). Albumin and total cholesterol were measured using the Architect ci8200 (Abbott Laboratories, IL).

2.5. Length of hospital stay

Admission and discharge of patients was decided solely by the multidisciplinary clinical teams directly involved in patient care, and according to their clinical discretion. The on-line secure patient electronic records were reviewed at 30, 60 and 140 days after the beginning of the study in order to determine the date of discharge and hence to calculate LOS for each patient.

2.6. Statistical analysis

All analysis was carried out using SPSS for windows software (version 15.0; SPSS, Chicago, IL). Data are presented as mean ± SD unless stated otherwise. Differences between means were tested using students *t*-test. The χ^2 test was used for categorical variables. Spearman's rank procedure was used for correlation analysis. LOS data were compared using the log rank test. Linear regression modelling was used to examine the effects of multiple variables on LOS. Statistical significance was defined as $P < 0.05$.

3. Results

3.1. Patient characteristics

310 of the 322 eligible acute patients and 150 of the 155 eligible elective patients were screened (Table 1). The gender distribution and the ethnicity composition were similar in both groups. Elective patients were older ($P < 0.0001$) than acute patients while mean BMI