European Journal of Cancer 63 (2016) 189–200

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.ejcancer.com

Original Research

Chemotherapy dose intensity predicted by baseline nutrition assessment in gastrointestinal malignancies: A multicentre analysis☆

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Received 2 September 2015; received in revised form 5 May 2016; accepted 10 May 2016
Available online 27 June 2016

KEYWORDS
Malnutrition;
Chemotherapy toxicity;
Gastrointestinal malignancy

Abstract ***Background:*** Malnutrition is prevalent in cancer patients and is associated with inferior outcomes. We examined the association between malnutrition, as measured by the Subjective Global Assessment (SGA), and chemotherapy dose reduction in patients with gastrointestinal malignancies. We hypothesised that malnutrition, defined by a patient's baseline SGA, would be associated with a greater degree of chemotherapy dose-reduction, with the implication of greater chemotherapy related toxicity.
Design: We reviewed chemotherapy dosing and treatment related toxicity for patients enrolled in a prospective Gastrointestinal Cancer Registry over their first 8 weeks of treatment. We compared results between well-nourished and malnourished patients.

☆ Prior presentation: Abstract – ASCO's 2015 Gastrointestinal Cancers Symposium, January 15–17 in San Francisco, CA (poster presentation).

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http://dx.doi.org/10.1016/j.ejca.2016.05.011

Results: Malnourished patients were more likely than well-nourished patients to have their starting chemotherapy dose reduced from standard published dosing (67% versus 35%, p = 0.0001). Despite attenuated initial dosing, malnourished patients received a smaller fraction of planned chemotherapy (mean 80 ± 23% versus 90 ± 15% of cycle 1, p = 0.005), primarily due to toxicity-related dose reductions. After controlling for age, gender, Eastern Cooperative Oncology Group performance status (ECOG), albumin, smoking status, body habitus, and weight loss, malnutrition remained the strongest independent predictor of the magnitude of chemotherapy dose reduction (estimate −10.3%, 95% confidence interval −19.0 to −0.1.6%, p = 0.020).
Conclusions: Malnutrition is an independent predictor of chemotherapy dose-reduction for toxicity. This study highlights the practical significance of malnutrition in gastrointestinal malignancies and provides a baseline for future nutrition intervention studies to improve chemotherapy tolerability in malnourished patients.

1. Introduction

Malnutrition affects over half of all patients with gastrointestinal cancer [1] and is associated with reduced response to treatment and increased hospitalisation, mortality, and healthcare costs [2]. Nevertheless malnutrition remains under recognised by medical oncologists [1]. The majority of malnourished patients receive no nutritional support [3] owing to lack of time, lack of clear guidelines, and lack of quality randomised-controlled evidence for nutrition interventions [4].

Weight loss, body mass index (BMI), and serum albumin have been used clinically to assess nutritional status, however these metrics can be influenced by non-nutritional factors, and interpretation can be obscured by hydration status and disease processes [5,6]. More accurate nutrition assessment tools are available [7–9], though such tools are not routinely used in clinical practice due to complexity, time utilisation, and lack of actionable therapeutic options. The subjective global assessment (SGA) is a brief, validated and reliable assessment of nutritional status which takes only 1–2 min to perform [7,10]. It incorporates the provider's assessment of weight change, dietary intake change, gastrointestinal symptoms, change in functional status, and physical exam, and facilitates a nutritional assessment. The Patient-Generated SGA (PG-SGA), a patient completed questionnaire adapted from the SGA correlates closely with the percentage of weight loss in the prior 6 months, has a sensitivity of 98% and specificity of 82% [7]. Both the SGA and PG-SGA have been used to identify malnourished patients with cancer [11–13]. In prospective studies nutrition interventions in patients classified as malnourished by these assessments decrease both morbidity and mortality [7,11,14], and in patients with pancreatic cancer improvement in SGA score was an independent and inverse predictor of mortality, even in patients with evidence of tumour progression [15].

Chemotherapy tolerability is difficult to predict for an individual patient. Weight loss [16], cachexia, and loss of skeletal muscle mass have each been associated with increased chemotherapy-related toxicity [17], however they remain difficult to assess clinically, particularly in the setting of obesity.

The SGA is a reliable screening tool which has primarily been used to identify malnourished patients and guide nutrition intervention rather than as a predictor of treatment related toxicity [7,13–15]. We examined baseline malnutrition, as well as several factors which have been associated with malnutrition [18], and its relationship to chemotherapy dosing and delivery in patients enrolled in a prospective Gastrointestinal Oncology Registry. We hypothesised that malnutrition, defined by a patient's baseline SGA, is associated with a greater degree of chemotherapy dose-reduction, suggesting greater chemotherapy related toxicity.

2. Subjects and methods

2.1. Data sources

All consenting patients seen at Weill Cornell Medical College of Cornell University and a local community practice (Englewood Hospital, Englewood, NJ) were enrolled in the Weill Cornell Medical Center Gastrointestinal Registry, which collects baseline demographic data, co-morbidities, quality of life, and nutrition assessment (SGA) at the time of enrolment. Four hundred and nine patients were enrolled in the registry between May 2012 and May 2013.

2.2. Study population

Patients receiving their first line of chemotherapy for gastrointestinal carcinoma were included in the analysis; patients with neuroendocrine tumours, gastrointestinal stromal tumours, lymphoma, sarcoma, and melanoma were excluded. Patients who were lost to follow-up were excluded from the analysis. Three patients who clearly died of progressive disease less than 2 weeks from