European Geriatric Medicine 7 (2016) 122–126

Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

Research paper

Nutritional risk, body mass index and rehabilitation outcome in cognitively impaired vs. cognitively normal patients

M. Vassallo [a,b,*], L. Poynter [b,*], J.C. Sharma [c], J.S.K. Kwan [d]

[a] University of Bournemouth, Fern Barrow, Poole BH12 5BB, UK
[b] Royal Bournemouth Hospital, Castle Lane East, Bournemouth BH7 7DW, UK
[c] University of Nottingham, University Park, Nottingham NG7 2RD, UK
[d] University of Hong Kong, Queen Mary Hospital, 102 Pok Fu Lam Road, Hong Kong

ARTICLE INFO

Article history:
Received 11 December 2015
Accepted 28 January 2016
Available online 23 February 2016

Keywords:
BMI
Dementia
Elderly
MUST
Rehabilitation

ABSTRACT

Introduction: The role of low body weight and body mass index in the rehabilitation of cognitively impaired (CI) patients is unclear.
Materials and methods: In a prospective cohort study in a rehabilitation unit for elderly patients recovering from acute illness, we explored functional outcomes in patients with a BMI < 20 kg/m^2 and Malnutrition Universal Screening Tool (MUST) ≥ 2 as a marker of high risk of malnutrition, in cognitively intact and impaired patients. One hundred and fifteen patients (mean age 84.7 years, range 69–98, 70 females) were followed up. All received an individually tailored rehabilitation programme as standard. The Barthel Activity of Daily Living (BADL) score was performed on admission and discharge and the primary outcome was improvement in BADL.
Results: Patients with an improved BADL had a higher mean MMSE (20.7v17.7; $P = 0.02$) and BMI (24.1v 20.9; $P = 0.006$) and lower mean MUST (0.45v1.11; $P = 0.002$). A 2-way ANOVA showed significant variance and cognitively normal patients with a BMI ≥ 20 showed the greatest improvement in BADL ($P = 0.03$). CI patients who improved had a higher BMI (23.8v21.2; $P = 0.02$) and lower MUST (0.43v1.09; $P = 0.004$). Patients with a BMI ≥ 20 (19.3v12.8; $P = 0.31$) and MUST < 2 (18.4 v15.9; $P = 0.64$) showed a greater mean improvement in BADL after rehabilitation. The total number of CI patients showing improvement in BADL was significantly higher in those with a BMI of ≥ 20 kg/m^2 [55/75 (73.3%) v10/22 (45.5%); $P = 0.02$].
Conclusion: Patients with cognitive impairment and a BMI < 20 kg/m^2 or MUST ≥ 2 on admission to rehabilitation are less likely to show improvement in BADL with rehabilitation when compared to cognitively impaired patients with a MUST < 2 or BMI ≥ 20 kg/m^2.

1. Introduction

Cognitive impairment, weight loss, low physical activity and slow gait speed are key indicators of frailty and associated with poor outcomes such as nursing home placements, chronic disability and death [1]. Weight loss is associated with sarcopenia, which is the unintentional loss of lean body mass with loss of strength and muscle contributing to functional impairment [2]. It is recognised that the loss of lean mass is accelerated in patients with Alzheimer's dementia (AD) and is associated with brain atrophy and loss of cognitive performance [3]. Malnutrition and cognition are therefore closely related in patients with dementia and nutritional care and support should be an integral part of the management of patients with dementia [4]. In community-based studies, poor nutrition was significantly related to advanced age, worse cognitive, functional and behavioural profiles [5]. A BMI of less than 25 kg/m^2 was identified as a cut-off point for worse cognitive status and a likelihood of progression of dementia [6]. Malnutrition is also related to poor physical function. Community-dwelling AD patients at risk of malnutrition were more impaired in basic and complex daily functioning than well-nourished AD patients [7]. In a long-term care setting there was a strong correlation between poor nutritional status, the Mini-Mental State Examination (MMSE), poor performance in activities of daily living and the Barthel Activity of Daily Living score (BADL)

* Corresponding authors at: Royal Bournemouth Hospital, Castle Lane East, Bournemouth BH7 7DW, UK. Tel.: +44 1202 704 539; fax: +44 1202 704 542.
E-mail addresses: michael.vassallo@rbch.nhs.uk (M. Vassallo), lynn.poynter@rbch.nhs.uk (L. Poynter).

http://dx.doi.org/10.1016/j.eurger.2016.01.010
1878-7649/

[8]. It therefore seems plausible that pathophysiology controlling sarcopenia, gait, physical function and cognition is shared and controlled in the brain via mechanisms that are vulnerable to multiple age related pathologies that may be caused or accentuated by malnutrition or deficiencies. The identification of common modifiable risk factors such as malnutrition may serve an important preventive strategy to reduce cognitive and mobility impairments [9].

Nutritional Supplementation with oral protein and energy supplementation in older people can produce a small but consistent weight gain and may reduce mortality and complications of malnutrition in older people who are undernourished. However, there remains no evidence of functional benefit or reduction in length of hospital stay with supplements [10]. The effect of nutrition supplementation in patients with dementia remains unknown and there is also insufficient evidence to suggest that enteral tube feeding is beneficial in patients with advanced dementia [11]. While the nutritional status in dementia can be improved [12] the "NutriAlz" programme showed that there was no effect on functional decline in AD patients living at home over one year [13].

In a rehabilitation environment, malnutrition has been shown to be an independent predictor of mortality, adverse clinical events and poor clinical outcomes [14] particularly in stroke and fracture neck of femur patients [15,16]. However, the relationship between malnutrition and short term rehabilitation outcomes in cognitively impaired patients has to our knowledge not been explored. We evaluated rehabilitation outcomes in cognitively impaired and cognitively intact patients with a low BMI and MUST as a marker of risk of malnutrition to test the hypothesis that low BMI and/or risk of malnutrition are associated with less favourable rehabilitation outcomes in patients with cognitive impairment.

2. Methods

In a prospective observational study, we evaluated a cohort of consecutive patients admitted for rehabilitation. Data were collected over a 1-year period from 2 general rehabilitation wards in a UK rehabilitation unit for older people by a trained researcher. Participants were recruited within the first week of admission and followed until discharge. All patients were transferred from an acute setting after an admission with an acute medical or surgical condition. Ninety percent of admissions were from medical wards. Individuals with hip fracture and stroke were not admitted to these wards and were naturally excluded however patients with other neurological conditions such as Parkinson's disease were included. Patients were also excluded if they had delirium or other acute illness that precluded participation in rehabilitation at the point of admission. Patients would have been assessed prior to transfer by a multidisciplinary team consisting of a doctor, nurse, physiotherapist and occupational therapist and were deemed to have sufficiently recovered from their acute illness to be able to participate in rehabilitation. As this was an observational study, there was no defined time period for rehabilitation but an analysis was made at a cut-off point of 80 days.

The 'Malnutrition Universal Screening Tool' ('MUST') is a five-step screening tool to identify adults, who are malnourished or at risk of malnutrition. A scoring system is based on calculation of BMI in step one followed by an estimate of recent weight loss and the impact of acute illness on food intake. It is the most widely used nutritional screening tool for patients at risk of malnutrition in the UK and is recommended by the National Institute for Clinical Excellence [17]. It is also commonly used worldwide. It has been evaluated in hospital wards, outpatient clinics, general practice, community and in care homes [18]. All patients had a BMI and MUST score calculated on admission. A score of ≥ 2 indicated a high risk of malnutrition. Although the BMI is part of the MUST this latter score requires further assessments and patients with a normal BMI may still have a high risk MUST or medium risk MUST with a low BMI. We therefore reported outcomes for both measures. Cognition was assessed on admission using the MMSE [19] and participants were grouped using MMSE scores as described by National Institute for Health and Clinical Excellence guidelines [20]. Patients were cognitively normal if they had a MMSE score of 27–30 and cognitively impaired if they had a score less than 27. Cognition was also evaluated using the CLOX test [21] and the correlation to MMSE evaluated. Functional ability was also assessed on admission using the BADL score [22]. This validated tool assesses the ability to care for oneself based on 10 activities including: feeding, bathing, grooming, dressing, bowel control, bladder control, toileting, chair transfer, ambulation and stair climbing. This score was calculated within 2 days of admission. Function was then reassessed at discharge. As the BADL score is made up of discrete items and is not scored in a continuous fashion, our primary outcome was improvement in the score. This was defined as improvement in at least one item that will have resulted in an improvement of at least 5 points in the score. Information pertaining to comorbidities was collected and scored using the Charlson Comorbidity Index (CCI) [23]. Comorbidity was defined as the number of disorders/diseases that the patient suffered from. This could include behavioural or mental disorders. To complete the CCI diseases noted included myocardial infarct, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular disease, chronic lung disease, connective tissue disease, peptic ulcer, chronic liver disease, diabetes, hemiplegia, kidney disease, diabetes with end organ damage, tumour, leukemia, lymphoma, malignant tumours, metastasis, acquired immunodeficiency syndrome. The number of medications taken regularly was recorded. Medications taken occasionally were not included. We evaluated patient mood using the Hospital Anxiety and Depression scale [24].

Each participant had formal input from physiotherapists and occupational therapists and informal therapy by nursing staff. Each had a personalized plan depending on individual abilities with the intention of addressing rehabilitation needs on a daily basis. Physiotherapy was aimed to increasing mobility with therapies to increase muscle strength and balance. This included individual and supervised group training to maintain or improve mobility and performance of daily activities. Exercises were of gradually increasing intensity and comprised walking, exercise to-set routines, skills training, stretching, and relaxation activities. Physical therapist led group training combining aerobic, resistance, flexibility and balance exercises depending on individual need [25] Occupational therapist input aimed to improve activities of daily living. All patients had informal therapy by nursing staff when mobilising and through support for activities of daily living. Patients identified to be nutritionally at risk were reviewed by a dietician or doctor with a view of formulating an individual care plan aimed at improving nutrition. When appropriate on discharge patients had advice about home exercises and/or outpatient physiotherapy.

Ethical approval was obtained from the Dorset Research and Ethics Committee, and informed consent was obtained from all participants. Participants with severe cognitive impairment who could not give informed consent were included after next of kin gave assent on their behalf.

2.1. Statistics

Categorical data were analysed using Fishers Exact Probability Test and medians for non-parametric data using the Mann-Whitney U Test as appropriate. The interaction between cognition