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MALNUTRITION IN ACUTELY UNWELL HOSPITALIZED ELDERLY - "THE SKELETONS ARE STILL RATTLING IN THE HOSPITAL CLOSET"

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Abstract: *Introduction:* Malnutrition is common in hospitalized patients with prevalence rates of up to 30% in Australian hospitals with adverse consequences for both the patients and health care services. Despite formulation of nutritional screening protocols, not all hospitalized patients get nutritional screening. Real life screening rates of hospitalized elderly patients are unknown. *Aim*: The present study explored nutrition screening rate in acutely unwell elderly patients admitted in a large tertiary hospital and how these patients fared depending upon their nutrition status. *Methods*: A prospective cross-sectional study involving 205 general medical patients ≥60years recruited between November 2014 and November 2015. The number of patients who missed nutrition screening were noted and all patients underwent nutritional assessment by a qualified dietitian using PG-SGA and quality of life was measured using EQ-5D 5L. A survival curve was plotted and multivariate cox proportional hazard model was used to adjust for confounders. *Results*: Only 99 (49.7%) patients underwent nutritional screening. One hundred and six (53.5%) patients were confirmed as malnourished by PG-SGA. Malnourished patients had significantly longer length of hospital stay and had worse quality of life. Mortality was significantly higher in malnourished patients at one year (23 (21.7%) vs 4 (4.3%); p<0.001) and cox proportional hazard model suggests that malnutrition significantly affects survival even after adjustment for confounders like age, sex, Charlson index and polypharmacy. *Conclusion:* This study confirms that nutrition screening is still suboptimal in elderly hospitalized patients with adverse consequences and suggests need for review of policies to improve screening practices.

Key words: Malnutrition, hospitalized elderly, nutrition screening.

Introduction

Malnutrition is defined as a state of nutrient insufficiency, as a result of inadequate nutrient intake or inability to absorb or use ingested nutrients (1, 2). Malnutrition is widely prevalent in hospitalized patients with reported worldwide prevalence rates of 13-78% depending upon the type of setting (3). In Australia, a retrospective analysis from two hospitals in New South Wales, found that 30% of patients were malnourished and 53% of patients were at risk of malnutrition (4). Malnutrition is associated with adverse clinical outcomes, as it increases risk of infections due to impaired immune response, predisposes patients to pressure ulcers, impairs wound healing, increases risks of falls and is associated with high mortality (5-8). Malnutrition is also detrimental to health care services as it is associated with increased length of hospital stay, increased utilization of health care resources, frequent readmissions and increased risk of placement with consequent increase in costs (9-12).

Malnutrition is often described as a skeleton in the hospital closet as it often goes under diagnosed and under treated (13). Diagnosis of malnutrition is often missed in hospitals due to a number of factors including low awareness of malnutrition, busy clinical settings with increasing emphasis on discharging patients home early, lack of clarity as to whether nutritional screening is a responsibility of the treating clinician or nurses and lack of understanding of the various available screening tools (14). Historically, diagnosis of malnutrition is made by the examining clinician based on the history of weight loss and clinical examination but given the high prevalence of malnutrition in hospitalized patients and a possibility that even patients with a normal or high BMI (15) can still be malnourished or at high risk of malnutrition, experts have now recommended screening all patients presenting to the hospital, for malnutrition by using a valid screening tool like the Malnutrition Universal Screening tool (MUST) and then if the screening is positive to confirm by a reference assessment tool like the Patient generated subjective global assessment tool (PG-SGA).

MUST has been validated in a number of clinical settings and is commonly used in hospitals to screen patients for risk of malnutrition. The MUST includes a Body Mass Index (BMI) score, a weight loss score, and an acute disease score. The MUST is designed to identify need for nutritional treatment as well as establishing nutritional risk on the basis of knowledge about the association between impaired nutritional status and impaired function (16-18). It has been documented to have a high degree of reliability (low inter-observer variation) with a k=0.88-1.00 (19). Subjective Global assessment (SGA) is a method of nutritional assessment based on a medical history and physical examination, whereby each patient is classified as well nourished (SGA A) or suspected of being malnourished

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(SGA B), or severely malnourished (SGA C) (20). A further development of SGA is the scored patient generated subjective global assessment (PG-SGA), which incorporates score as well as global assessment (21). Typical scores range from 0 to 35 with a higher score reflecting a greater risk of malnutrition. It has been demonstrated to be a valid method of nutrition assessment in a number of patient groups (22, 23).

Although nutrition screening protocols have been established in hospitals, limited data is available in Australia, looking into actual nutritional screening rates of elderly hospitalized patients and how these malnourished patients fare as compared to nourished patients during their hospital journey and upon discharge from hospital. The present study looked into the nutritional screening rate and clinical outcomes associated with a dietitian-supported diagnosis of malnutrition in acutely unwell elderly patients admitted to a large tertiary hospital.

Methods

A total of 205 hospitalized patients were recruited from November 2014 to November 2015. These patients are participants in a randomized control trial (RCT) (registration number ACTRN1261400083362) investigating the cost effectiveness of an extended ambulatory nutritional intervention in patients who are discharged from acute care. All patients admitted to General Medicine wards of Flinders Medical Centre who were eligible for the study based on inclusion and exclusion criteria were approached and invited to participate in the study. Inclusion criteria were age ≥60 years admitted under General Medicine ward and exclusion criteria were palliative patients, aborigines, non-English speaking patients, residing outside metropolitan Adelaide and inability to obtain valid consent. Ethics approval for the study was obtained from the Southern Adelaide Local Health Network Research and Ethics Committee (SALHNREC).

Procedure

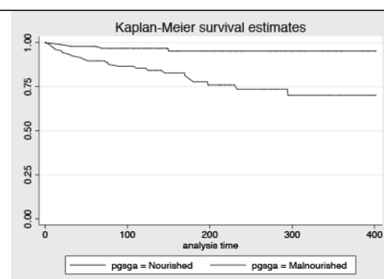
Potential participants who were admitted to the Acute Medical Unit and General Medicine wards of Flinders Medical Centre were identified and an information package about the study was provided and explained to the participants, and written informed consent was obtained from all participants. In case it was found that participants had dementia/cognitive impairment, then consent was obtained from their legal guardian.

Data Collection and Measures

Baseline data on demographics and health and medical history was obtained from medical records and case notes. The MUST score was obtained from the case notes, where available. In Flinders Medical Centre, it is expected that all patients who are admitted under General Medicine have the MUST completed, as a part of initial nursing assessment electronically and a hard copy is inserted in the case notes. Where MUST was not found in the case notes, it was taken into account and a member of the research team either asked the assessment nurse to perform MUST or completed the MUST himself/herself. All consenting patients were then referred to a research dietitian, who was blinded to the MUST nutritional risk score and performed PG-SGA as well as anthropometric measurements including hand grip strength with a hand held dynamometer in the patient's dominant hand, (MUAC) Mid-upper-arm Circumference (measured at midpoint between acromion process and olecranon), TSF (Triceps skin fold thickness) using a calibrated Harpenden skinfold caliper on the right side and MAMC (Mid-arm Muscle circumference) was determined using the formula MAMC: MUAC - (0.3142 × TSF (mm)= in cm.

A quality of life questionnaire using the Australian version of EQ5D (European Quality of life Questionnaire) was also completed to assess impact of nutritional status on quality of life. EQ-5D was developed jointly by a group of European-based researchers with the intent of constructing a simple, self-administered instrument that provides a composite index score representing the preference for a given health state (24). The EQ-5D consists of two parts: the health state descriptive system and visual analogue rating scale (25). The descriptive system records the level of self-reported problems on each of five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression). For each dimension the respondent is asked to choose between five options: no problem, some problem, moderate problem, extreme problem or unable to perform. Respondents then describe their own health status using a 20cm visual analogue scale (25) with endpoints labeled "best imaginable health state" and "worst imaginable health state" anchored at 100 and 0, respectively (26).

Figure 1



Data Analysis

Data analysis was performed using STATA (version 13.1). Descriptive analysis was conducted for all the demographic variables and categorical variables expressed as proportions. Data are presented as means, unless otherwise specified. Data were assessed for normality using the sk test (Skewness/Kurtosis test). To describe patient characteristics according to malnutrition risk, comparisons were made using t test for two independent samples and rank sum (Mann Whitney U-test) if data were skewed. Proportions were compared using x2

Table 1
Baseline Demographics of patients n=199

		Nourished	Malnourished	p value
PG-SGA Diagnosis		92 (46.5%)	106 (53.5%)	
MUST Screening		85 (42.7%)	114 (57.3%)	
Significant (>5%) weight loss		20 (38.7%)	63 (44.3%)	<0.001
Age (mean) (sd)		77.3 (8.4)	81.6 (8.5)	=0.004
Sex	Males	34 (50.0%)	34 (50.0%)	=0.47
	Females	58 (44.6%)	72 (55.4%)	
Cognition	Normal	90 (97.8%)	2 (2.2%)	=0.51
	Impaired	102 (96.2%)	4 (3.8%)	
Residential Status	Home	83 (90.2%)	92 (86.8%)	=0.35
	Nursing Home	8 (8.7%)	14 (13.2%)	
	Other	1 (1.1%)	0	
No. of comorbidities (mean) (sd)		6.2 (2.9)	6.3 (2.9)	=0.94
Charlson Index (mean) (sd)		2.5 (1.9)	2.3 (1.9)	=0.43
Mobility	Independent	59 (64.8%)	41 (40.2%)	=0.002
	Stick	8 (8.8%)	7 (6.9%)	
	Walking frame	22 (24.2%)	48 (47.1%)	
	Bedbound	2 (2.2%)	6 (5.8%)	
No. of Medications (mean) (sd)		9.4 (4.7)	9.6 (4.5)	=0.77
Vitamin D/Calcium supplements		62 (68.1%)	63 (59.4%)	=0.20
Principal Diagnosis	Respiratory	34 (37.4%)	36 (33.9%)	=0.41
	Cardiovascular	9 (9.9%)	16 (15.1%)	
	Falls	11 (12.1%)	12 (11.3%)	
	CNS	8 (8.8%)	4 (3.8%)	
	Miscellaneous	29 (31.9%)	38 (35.8%)	
MUST completion rate at admission		32 (35.9%)	64 (61.5%)	=.001

PG-SGA, Patient-Generated Subjective Global Assessment; MUST, Malnutrition Universal Screening Tool; sd, standard deviation; CNS, Central Nervous System

(chi-square) statistics or Fisher's exact test. For comparison all patients with a MUST score of zero were classified as nourished and those with MUST score of ≥1 as malnourished. Similarly, all patients with PG-SGA class A were classified as nourished and PG-SGA class B and C as malnourished.

Investigating the association between malnutrition status and length of hospital stay (LOS) is problematic since those who die earlier on in the follow-up period may, by definition, have a lower LOS. Therefore LOS was adjusted for in-hospital mortality. In order to account for the source of cofounding, a Cox proportional hazards model was used with death as the censoring variable (event) and including the covariates of PG-SGA, age, gender, Charlson index and total number of medications used. The covariate of interest is the effect of nutritional status on survival status so the survival plot displaying the cumulative survival function on a linear scale and PG-SGA category and the associated hazard ratios from the cox regression are presented. Statistical significance was defined as p ≤0.05.

Results

A total 205 patients were enrolled from November 2014-November 2015 and complete data was available for 199 patients for analysis. Initial nutrition screening by MUST was found to be performed in 99 (49.7%) of patients while 100 (50.3%) missed MUST screening by nursing staff but had MUST screening subsequently performed by research staff. Ninety two (46.5%) patients were confirmed to be well nourished and 106 (53.5%) as malnourished by PG-SGA while

Table 2
Anthropometric and Laboratory parameters of Nourished and Malnourished patients confirmed by PG-SGA

	Nourished	Malnourished	p value
Weight in Kg (mean) (sd)	72.3 (18.5)	56.7 (13.3)	<0.001
BMI in kg/m^2 (mean) (sd)	25.3 (6.5)	20.6 (5.10)	<0.001
Handgrip strength in kg (mean) (sd)	19.7 (8.2)	16.3 (7.5)	<0.001
Midarm Circumference in cm (mean) (sd)	29.7 (5.0)	24.7 (4.2)	<0.001
Triceps skinfold thickness in mm (mean) (sd)	19.1 (9.8)	11.1(5.9)	<0.001
Midarm muscle circumference in cm (mean) (sd)	23.8 (3.9)	21.4 (3.3)	<0.001
PG-SGA Score (mean) (sd)	5.5 (2.9)	13.3 (4.8)	<0.001
Albumin in g/L (mean) (sd)	35.2 (8.2)	33.4 (19.3)	=0.01
Hemoglobin in g/L (mean) (sd)	124.04 (18.3)	122.03 (21.0)	=0.47
C-Reacting Protein in mg/L (mean) (sd)	48.9 (68.9)	50.3 (62.0)	=0.97

sd, standard deviation; BMI, Body Mass Index; PG-SGA, Patient-Generated Subjective Global Assessment;

Table 3
Clinical Outcome comparison between Nourished and Malnourished patients

	Nourished	Malnourished	p value
Length of Hospital Stay median (IQR)	5.0 (2.9,7.9)	8.2 (4.2,14.5)	<0.001
EQ5D index median (IQR)	0.801 (0.651,0.892)	0.742 (0.533,0.8655)	=0.002
Nosocomial complications (%)	16 (17.4%)	36 (33.9%)	=0.008
In-hospital mortality (%)	0	7 (6.6%)	<0.001
Mortality at 1-year (%)	4 (4.3%)	23 (21.7%)	<0.001
Readmission at 7 days (%)	2 (2.2%)	8 (7.5%)	=0.08
Readmissions at 28 days (%)	10 (10.9%)	17 (16.0%)	=0.29
Readmission at 90 days (%)	23 (25.0%)	35 (33.0%)	=0.21

IQR, interquartile range; EQ5D, European Quality of Life Questionnaire.

Table 4
Univariate and multivariate analysis of survival with Cox proportional hazard regression model

	Univariate analysis		Multivariate analysis	
	HR (95% CI)	P value	HR (95% CI)	P value
Malnourished (PG-SGA)	5.755 (1.9868-16.667)	0.001	5.032 (1.703-14.863)	0.003
Age	1.043 (0.997-1.091)	0.066	1.028 (0.980-1.078)	0.256
Female sex	0.874 (0.412-1.851)	0.726	0.842 (0.377-1.883)	0.677
Charlson index	1.042 (0.869-1.251)	0.651	1.014 (0.836-1.231)	0.882
No. of medications	1.040 (0.962-1.125)	0.318	1.038 (0.955-1.128)	0.372

PG-SGA; Patient Generated Subjective Global Assessment

MUST screening found 85 (42.7%) as well nourished and 114 (57.3%) as malnourished. MUST was found to have a sensitivity of 75% (95% CI 65.6-83) and specificity of 66.3% (95% CI 55.5-76) in detecting malnourished patients as compared to the PG-SGA. Malnourished patients were significantly older than nourished patients with a mean age of 81.6 (SD 8.5) years and 77.3 (SD 8.4) years respectively and both groups had more females, similar number of co-morbidities, similar Charlson index and were on polypharmacy but more nourished patients 62 (68.1%) were on Calcium and Vitamin D supplements (Table 1). Residential status of the majority of the patients prior to acute admission was home but more well nourished patients were independent in mobility. The most common presenting diagnosis was respiratory illness and the next most common presentation was miscellaneous problems like sepsis n=29 (31.9%).

The median (IQR) length of hospital stay was significantly longer in malnourished patients compared to well nourished patients: 8.2 (4.2, 14.2) versus 3.4 (2.1,16.6) (p<0.001, Table 2). Malnourished patients had significantly lower Quality of Life (27) as indicated by median (IQR) EQ5D index: 0.742 (0.533,0.8655) versus 0.801 (0.651,0.892), p=0.02 but there was no statistically significant difference in the Visual Analogue scale. Malnourished patients had significantly more nosocomial complications and the overall in-hospital mortality was 3.4% (i.e. 7 patients) and all deaths occurred in the malnourished group. Within a year of discharge, an additional 16 malnourished patients had died, an additional 15.2% of the original cohort, producing a cumulative mortality of 23 (21.7%) at 1 year after discharge (Table 3). Multivariate Cox proportional hazard model (Table 4) suggests that malnourished patients have a significantly worse survival even after adjustment for confounders like age, sex, Charlsons index and total number of medications (HR 5.32, 95%CI 1.703-14.863), (p=0.003). Readmission rate was higher in malnourished patients at day 7, 28 and 180 but this was not statistically significant (Table 3).

Discussion

The present study indicates that nutritional screening is still suboptimal in our hospitals as only 49.7% of patients presenting to General Medicine department of our hospital were routinely screened for malnutrition at the time of admission. Porter et al in their study in Australian hospitals also found low nutritional screening rates with the highest rate of screening using the MUST tool of only 61% and they highlighted numerous barriers including workload pressures and lack of awareness among the staff as significant factors and suggested need for a nursing leadership role to establish nutrition screening culture among staff (28). In the UK, evidence based clinical practice guidelines for nutritional support in adults recommend to screen all patients for malnutrition, as available research indicates that early screening and treatment of malnourished patients can reduce length of hospital stay (29). Studies suggest that hospitalization is associated with significant decline in nutritional status due to a number of factors including catabolic effects of illness, anorexia due to polypharmacy, dislike for hospital food, nil per oral orders and a missed diagnosis of malnutrition at this crucial phase often results in patients being discharged with a significantly worse nutritional state than they were at the time of hospital admission, which further justifies that we cannot take chances by missing this important but often hidden diagnosis (30, 31).

Our study indicates that malnourished patients' median length of hospital stay was about five days longer than of nourished patients which significantly increases hospital costs. Kyle et al in their study in hospitalized patients also found a significant association between increased LOS and high risk MUST score (32). Similarly Correia and Waitzberg in their study in hospitalized patients found significantly longer LOS in malnourished patients (mean 16.7 days vs 10.1 days) with a significant increase in hospital costs for care of malnourished patients (33).

Our study shows that there was a significantly higher mortality among malnourished patients at 1-year even after adjusting for confounders like age, sex, Charlson index and polypharmacy. The Kaplan Meier survival graph suggests that mortality begins to increase within the first few weeks after discharge from hospital and this emphasizes the need for an early nutritional intervention, preferably beginning when the patient is still in the hospital. Our results are similar to Lim et al who found that malnutrition was a significant predictor of mortality at 1-year with an adjusted relative risk of death more than three times that of well nourished patients (34).

Our study also confirms that elderly malnourished patients have relatively poor quality of life (27) with a median EQ5D index of 0.742 as compared to nourished patients who had higher median EQ5D index of 0.801, which was statistically significant. Our results are similar to Rasheed and Woods, who in their study in elderly hospitalized patients also found in general low quality of life in hospitalized patients with malnourished patients experiencing a significantly lower QoL compared to well nourished patients in both physical and mental dimensions of EQ5D (35). Food and eating are essential for health and inability to eat as a result of loss of appetite, digestive problems or swallowing difficulties affect QoL and these problems may be a significant contributor to a low Qol in unwell hospitalized elderly patients (36). The beneficial effects of nutritional intervention gains further significance as there is a correlation between nutrition deficiencies and cognitive decline in the elderly and recent nutritional intervention studies have shown positive preliminary results on cognitive outcomes (37).

Limitations of the present study

We acknowledge that this is a single centre study and we were not able to recruit a significant number of cognitively impaired patients, mainly due to difficulty in obtaining valid consent. This study is limited to general medical patients with multiple clinical problems and we cannot generalize our results to sub-specialty patients with single organ involvement. A major strength of our study is however that nutritional status was confirmed by a research dietitian who was blinded to the screening results using a validated and commonly accepted nutrition assessment tool.

Conclusion

Our study confirms poor health outcomes in acutely unwell elderly hospitalized malnourished patients and more than half of these patients typically remain undiagnosed and thus miss any opportunity to receive a nutritional intervention. This is an area of concern despite already established nutritional screening protocols and guidelines. We suggest a multidisciplinary approach led by clinicians, nurses and dietitians to address this problem. We suggest educating clinicians and nurses on a regular basis, to reinforce hospital nutritional screening programmes and inclusion of MUST in medical and nursing assessment and discharge tools as well as regular audits to check MUST completion rate to address this common but easily treatable condition.

Conflict of interest: The authors have no conflict of interest to declare.

Ethical standards: This study was approved by the Southern Adelaide Local Health Network Research and Ethics Committee.

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