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SHORT REPORT

Small Sample, Big Challenges: Addressing Malnutrition in Non-Acute Older Adults Discharged from the Emergency Department

Anne Griffin[1,2], Cerenay Sarier[1], Emma Brennan[1], Sheila Bowers[3], Aoife Whiston[1,2,4], Mairead Conneely[1,2], Rose Galvin[1,2]

[1]Human Nutrition & Dietetics, School of Allied Health, Faculty of Education and Health Sciences, University of Limerick, Limerick, Ireland; [2]Ageing Research Centre, Health Research Institute, University of Limerick, Limerick, Ireland; [3]Department of Clinical Nutrition & Dietetics, University of Limerick Hospital Group, Limerick, Ireland; [4]Department of Psychology, Faculty of Education and Health Sciences, University of Limerick, Limerick, Ireland

Correspondence: Anne Griffin, Human Nutrition & Dietetics, School of Allied Health, Faculty of Education and Health Sciences, University of Limerick, Limerick, V94 T9PX, Ireland, Email anne.griffin@ul.ie

Purpose: In Ireland, the rise in older adults visiting the ED and being discharged home has led to high rates of adverse outcomes, including disease-related malnutrition. The purpose of this study was to describe the nutrition care needs of older adults as part of a feasibility study exploring a multicomponent transition-to-home intervention from the ED.

Methods: Nutrition characteristics were assessed using clinical records and dietetic assessments from participants in the intervention arm of the ED PLUS pilot RCT. Data were analyzed using the Nutrition Care Process Model to identify nutrition-related problems, estimated intake, and response to intervention.

Results: Our study included nine participants with an average age of 79.5 years. Living arrangements varied, with some living independently, others with formal support, and some with family support. Malnutrition risk was identified using MNA-SF with three participants meeting the threshold. All reported nutritional impact symptoms, with average energy and protein intakes below recommendations. Dietetic interventions were needed for all participants.

Conclusion: While limited by sample size, these exploratory findings offer real-world insights into the nutrition care needs of older adults discharged from the ED and may inform current practice and future research.

Keywords: malnutrition, older adults, dietetics, emergency department, nutrition care

Introduction

The increasing ageing population alongside the consequent higher number of individuals living with multimorbidity are demographic drivers of incremental increases in Emergency Department (ED) attendances internationally.[1,2] Older adults experience high rates of adverse outcomes post discharge from the ED as they encounter a period of increased vulnerability.[3–6]

Malnutrition is a condition resulting from inadequate intake or an inability to absorb and/or digest adequate energy and/or protein.[7] Malnutrition can be caused by both acute and chronic disease- associated inflammation, injury or other mechanisms that lead to altered body composition (eg reduced muscle mass) and decline in biological functions (eg delayed wound healing).[8–10]

We have previously reported that over one-third of older adults admitted to an Irish ED are either malnourished or at risk of malnourishment.[11] We found that malnutrition was associated with a longer stay in the ED, functional decline, poorer quality of life, increased risk of hospital admissions and a greater likelihood of admission to a nursing home at 30 days. Similar findings have been reported globally, including the USA, UK, Spain, and Belgium.[12–16] Deterioration in nutrition is always accompanied by functional decline[17] and malnutrition should be considered a serious clinical risk factor.[7] Malnutrition in older adults presenting to the ED is generally under diagnosed.[18,19] While studies have reported the general factors (eg demographic, medical conditions, social, psychological, healthcare usage, etc.) associated with the

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prevalence of malnutrition among older adults presenting to ED,[13,14,20,21] few have provided detail on the clinical nutrition characteristics or the dietetic intervention required to manage the malnutrition and evaluate therapy outcome measures on discharge.[2,22–25]

The Nutrition Care Process Model is a structured, evidence-based approach used by dietitians to assess, diagnose, and manage nutrition-related health issues through personalized care.[26,27] The aim of this study was to describe the nutrition characteristics among nine older adults who presented to the ED, were triaged, and subsequently discharged without requiring hospital admission.

Methods

This is a descriptive study of the nutrition status and dietetic measures among participants in the intervention arm of a three-arm pilot feasibility randomized controlled trial (RCT), ED PLUS.[28] Ethics approval was obtained from the HSE Mid-Western Area Research Ethics Committee (Ref: 088/2020). Written informed consent was obtained from all participants. The study was performed in accordance with the ethical standards of the Declaration of Helsinki.

The methods for the pilot feasibility RCT are published in detail elsewhere.[29] The trial is registered at Clinical trials.gov (NCT049836020). In brief, participants were community-dwelling adults aged ≥65 years who presented to the ED with undifferentiated medical complaints between Monday and Thursday, 8:00 AM–5:00 PM. Eligibility criteria included medical stability (as assessed by the treating physician), a score of ≥2 on the Identification of Seniors at Risk (ISAR) screening tool,[30] a predicted ED stay of ≤72 hours, and a confirmed negative COVID-19 test on presentation. Eligible participants who were subsequently discharged were randomized into one of three intervention arms. While the inclusion criteria ensured a focused and clinically relevant sample, the small sample size may limit the extent to which findings can be generalized.

ED PLUS aimed to provide a continuum of care from the ED to the patient's home through addressing participants' issues with mobility, strength, balance, malnutrition, medication adherence, fatigue and enable self-management.[29] Figure 1 outlines the frequency and format of sessions held with participants.

Malnutrition risk was screened at the index visit using the Mini Nutritional Assessment – Short Form (MNA-SF)[31] to determine nutrition status: "malnourished" (0–7 points), "at risk of malnourishment" (8–11 points), and "normal nutritional status" (12–14 points). Weight (kg) was measured at the index and last home visit using an Omron BF511 Body Composition Monitor scale. Height was measured at the index visit using a portable Leicester Height Measure. Body Mass Index (BMI kg/

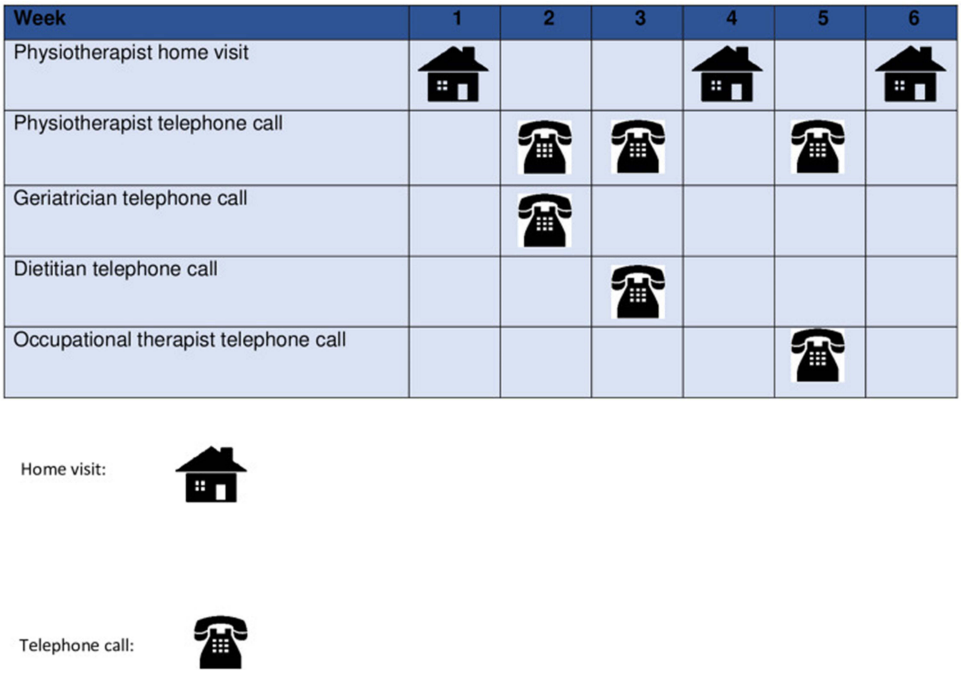

Figure 1 Frequency and format of ED PLUS sessions.

m^2) was calculated and interpreted with reference to age-specific centiles for older Irish adults and to GLIM low-BMI thresholds, one of the phenotypic indicators within the GLIM malnutrition criteria.[32,33]

A registered dietitian conducted the nutritional assessment via telephone in week 3 of the ED PLUS programme, averaging 45–60 minutes. The nutrition assessment followed the Nutrition Care Process Model[26,27] as adapted by the Irish Nutrition and Dietetic Institute.[34] See supplementary file 1: Dietetic outcome measures.

Dietary intake and pattern was assessed by diet history and subsequently analyzed for nutritional content (per day: energy (kcals); protein (g); carbohydrate (g), of which sugars (g), fibre (g); total fat (g), of which saturated fat (g), polyunsaturated (g), monounsaturated (g), omega 3 (g); sodium (mg), calcium (mg), vitamin D (µg), iron (mg) and fluids (mL)) using Nutritics software (v5.85; 2019). Nutrient intake analysis excluded contributions from supplements and fortified foods, which were introduced only during the dietary intervention and were not present at baseline. Clinical recommendations of 30 kcal/kg body weight/ day for people aged over 65 years, and adjusted for gender, nutritional status, disease state and physical activity and protein intake of at least 1.0 g/kg/day were used for comparison.[23] Micronutrient intakes were compared to the recommendations for healthy older persons according to Irish and European Food Safety Authorities.[35,36]

Descriptive data analysis was conducted using SPSS (IBM SPSS Statistics 29.0), with measures including mean, standard deviation (SD), median, and range used to summarize participant demographics, clinical characteristics, nutritional intake, and anthropometric data. Missing data were left blank and not imputed, consistent with the exploratory nature of the feasibility study. Descriptive statistics of the demographic and dietetic measures data are presented as a table to profile the clinical nutrition characteristics of the individual participants.

Results

Participant Demographics

Nine participants (7 female) received dietetic consultation. Individual level characteristics including demographic and presenting complaint at index visit, nutrition impact symptoms, dietary analysis and anthropometrics related to nutrition care are shown in Table 1. The average age was 79.5 (SD 8.26; range of 66–89) years old. All patients reported comorbidities, with n=6 living with multiple conditions. These included chronic kidney disease (n=2), diverticular disease (n=1), arthritis (n=5), chronic obstructive pulmonary disease (n=1), osteoporosis (n=1), mental health problems (n=1), irritable bowel syndrome (n=1), vascular disease (n=3), and type 2 diabetes (n=1).[37]

Anthropometry

The average bodyweight at baseline was 75.4kg (SD = 12.4). Three participants are $\geq 90^{th}$ centile, three fall between 75^{th} – 90^{th} centile and three between 10^{th} - 50^{th} centile of BMI for similar age and sex.[33] At the 6-week follow up, patient 1 had gained a clinically significant 567g in bodyweight per week. Otherwise, participants' weights could be described as relatively stable over time.[23]

Nutrition Assessment

One-third of the older adults (n=3, 2 female) screened at risk of malnutrition using the MNA-SF tool (Table 1). Of these, one participant can be considered clinically underweight with a BMI of <22kg/m^2 and aged over 70 years[32] and two had a BMI >25kg/m^2 that would classify as overweight/obese.[38]

Nutritional impact symptoms were reported among all participants (Table 1). Eight participants reported more than one symptom. The most common concern was hydration status. Participants were estimated to be consuming between 584 mL/day and 2484 mL/day of total fluid from both food and beverages. Five participants reported an appetite score of 7 or higher out of ten (excellent appetite). Two participants reported appetites of 1 (no appetite) out of 10. Three participants reported digestive issues related to feeling nauseous.

Four participants reported that they received external support with the provision of meals including Meals on Wheels service (MOW, n=2; Table 1). Of these, two participants reported missing meals on the days that home help or MOW was not delivered. In relation to grocery shopping, three participants did their own shopping, four participants had

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Table 1 Individual Level Characteristics Including Demographic and Clinical Condition at Index Visit, Nutrition Impact Symptoms, Dietary Analysis and Anthropometrics Related to Nutrition Care

Participant	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Demographic and clinical condition at index visit									
Age (years)	69	89	85	82	66	85	84	72	84
Sex	Female	Female	Female	Female	Female	Female	Male	Female	Male
Meal provision	Self	Carer	Self	Meals on Wheels/ family	Self	Carer	Meals on Wheels/ family	Self	Self
Living situation	With spouse	Alone	Alone	With grown children	With sibling	Religious order	Alone	Alone	With spouse
Presenting complaint	Fall	Unwell	Hip Pain	Fracture	Back Pain	Fall	Chest Pain	Fall	Fall
Comorbidity (#)	Yes (1)	Yes (1)	Yes (2)$^{+}$	Yes (3)$^{+}$	Yes (2)$^{+}$	Yes (1)	Yes (2)$^{+}$	Yes (2)$^{+}$	Yes (2)$^{+}$
Malnutrition (MNA-SF)	14	9^{+}	14	14	10^{+}	14	11^{+}	14	14
Barthel Index Score	19	15	18	18	18	18	18	20	16
Nutritional Impact Symptoms									
Oral health	Dentures^{+}	Dentures/ Pain^{+}	NA	NA	Recent oral thrush^{+}	Eczema^{+}	Dry mouth^{+}	Ulcers^{+}	Dry mouth^{+}
Appetite score	8	1^{+}	5	3^{+}	1^{+}	7	7	7	9
Abdominal discomfort	None	None	None	Yes^{+}	Yes^{+}	None	None	Yes^{+}	None
Reported Bowel movements	Normal	Normal	Severe constipation^{+}	Mild constipation^{+}	Varies	Normal	Normal	Normal	Normal
Risk of dehydration	Mild^{+}	Mild^{+}	Mild^{+}	Hydrated	Mild^{+}	Mild^{+}	Mild^{+}	Mild^{+}	Mild^{+}
Dietary analysis*									
Energy intake (Kcal/kg/d)	25.8^{+}	29.4^{+}	22.5^{+}	17.5^{+}	11.0^{+}	21.1^{+}	18.0^{+}	25.2^{+}	13.0^{+}
Protein intake g/kg/d	0.9^{+}	1.5	1.3	0.6^{+}	0.5^{+}	0.8^{+}	0.8^{+}	1.2	0.6^{+}
Fiber Intake Vs Requirement (g/d)	19.9 vs 26^{+}	19.5 vs 18.3	11.5 vs 18.7^{+}	12.8 vs 18.0^{+}	9.7 vs 13.3^{+}	17.5 vs 19.2^{+}	18.6 vs 17.7	20.9 vs 21.3^{+}	15.0 vs 13.7
Total Fluid Intake (mL/d)	1104^{+}	1864	1364^{+}	1727	584^{+}	2484	2074	1201^{+}	1021^{+}
BMI (Kg/m^{2})	30.0	20.6^{+}	25.5	34.0	36.6	31.3	28.7	24.2	28.4

Nutrition diagnosis									
Nutrition Problem identified	Food and nutrition related knowledge deficit	Inadequate protein energy intake	Limited access to food	Food and nutrition related knowledge deficit	Food and nutrition related knowledge deficit	Inadequate protein energy intake	Food and nutrition related knowledge deficit	Food and nutrition related knowledge deficit	Food and nutrition related knowledge deficit

Notes: [+]Nutrition concern. # Number of comorbidities present (eg, hypertension, diabetes, arthritis, etc). MNA-SF: Mini Nutritional Assessment – Short Form[31] to determine nutrition status: "malnourished" (0–7 points), "at risk of malnourishment" (8–11 points), and "normal nutritional status" (12–14 points). Barthel Index Score:[37] Total possible scores range from 0–20, with lower scores indicating increased disability. Appetite score:[2] 1=no appetite; 10=excellent appetite. *Dietary reference targets (ESPEN):[23] Energy, 30kcal/kg/bodyweight/day; Protein, 1.2–1.5g/kg/bodyweight/day; Fibre, energy intake (MJ) x 3g; Total Fluid, 1.6L females, and 2L males per day. GLIM criteria:[32] Moderate malnutrition, BMI < 20kg/m^2 if < 70 years or <22kg/m^2 if >70 years.

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shopping completed by family members or neighbors, one participant completed their grocery shopping online and one participant was not concerned (living with a religious order).

Dietary Assessment

The average total energy intake reported among the group was 1471.56kcal (SD = 285) per day. [23] The average intakes were 20.4kcal/kg/day (range 11–29.4kcal/kg/day) with none meeting the clinical recommendation for energy intake in older adults of 30kcals/kg/d.

The average total protein intake was 65.9g/d (SD = 13) ranging from 47g – 83g per day. Average protein intakes were 0.9 (0.3) g/kg/day. At an individual level, three participants were meeting the clinical recommendation of at least 1.0/kg/d.[23] Furthermore, three participants did not meet the recommended 0.83g/kg/d for healthy older adults.[35] Of the 3 participants screened at risk of malnutrition, two failed to meet energy and protein requirements. High quality protein foods[36] were most frequently consumed in the afternoon and evening with many (6/9 participants) consuming low protein breakfast options such as toast with butter and jam or marmalade, porridge made with water or fruit.

Average total intake of fiber was 16.2g/d (SD =3.8g/d, range 9.7–20.9g/d; Table 1) with four participants meeting dietary recommendations.[36]

Total fluid intake (from all sources) is shown in Table 1. Only one participant consumed an adequate volume to meet both current health and clinical nutrition recommendations.[23,36] Four reached recommendations when the additional fluid volume consumed from food was included.

In relation to non-prescribed supplementation, four participants consumed over-the-counter nutritional supplements including antioxidant (n=1), omega 3 fish oils (n = 2), a probiotic (n = 1), B vitamin complex (n = 1), glucosamine (n = 1), Vitamin D (n = 1), and a calcium supplement (n = 1).

Nutrition Diagnosis

The most common nutrition diagnosis among the participants was a lack of knowledge about food and nutrients, due to insufficient dietary education. This was evidenced by nutrient intake data that did not meet recommended requirements (Table 1). An inadequate protein energy intake and limited access to food related to decreased ability to consume adequate nutrients were also reported (n=3).

Dietetic Intervention

All participants required several dietetic interventions to improve nutritional status, including advice about weight management (n=2), heart health (n=2), increasing iron intake (n=2), chronic renal disease (n=1), type 2 diabetes (n=1), warfarin (n=1) and gut health (n=1). Referral to additional services including dentistry, pharmacy and local grocery delivery were noted.

Discussion

In this study, malnutrition is identified in three of nine participants. However, a comprehensive nutrition assessment completed by a registered dietitian identified risk to nutrition status indicating nutrition vulnerability and a need for personalized nutrition support among all participants. Deficits in nutritional intake evaluated against both healthy eating[35,36] and clinical guidelines[23] are reported. Hydration status with evidence of dehydration based on measures of fluid intake and output is a major concern reported in this study. A need for clear diagnostic criteria and a screening tool for dehydration has previously been reported.[39] While clinical guidelines for nutrition provide evidence-based recommendations to support optimal dietary care, tailored to individual health needs and clinical conditions, are available[23] the level of nutrition care in the ED is rarely reported.[22] In particular, the deficit of food and nutritional knowledge reported among this cohort suggests a lack of prior exposure to dietary education highlighting the need for nutritional counselling to deliver advice appropriate to disease management.[23,36] Individualized and comprehensive interventions that tackle malnutrition have been shown to have both health and quality of life benefits.[23,39,40] The small number of older adults included in this study limits the true situation of malnutrition among older adults presenting to the ED. It is also acknowledged that participants who enrolled in the ED PLUS RCT may differ from the wider ED population, particularly

in their capacity or willingness to engage in follow-up. Indeed, the health assessment and nutrition needs of older adults are recognised as complex and the health system that supports and manages healthcare intervention is complicated. While based on a small sample, this study highlights the potential value of piloting dietitian-led nutrition and hydration assessments in ED settings, guided by the Nutrition Care Process. The observed deficits in intake, hydration status, and nutrition knowledge suggest that individualized care and counselling may be beneficial and warrant further investigation.

Conclusions

Our findings support the value of reporting clinical nutrition characteristics in older adults discharged from the ED as a means of understanding nutrition-related risk and informing the development of transitionary care from the ED to home.

Data Sharing Statement

The datasets generated during and/or analysed during the current study are openly available at https://osf.io/3hmda.

Ethical Approval

This study was conducted in accordance with the Declaration of Helsinki. This study was conducted with approval from the HSE Mid-Western Area Research Ethics Committee (Ref: 088/2020). No identifiable participant information (such as patients' images, faces, or names) was disclosed in the study.

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Disclosure

The authors report no conflicts of interest in this work.

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