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An exploratory study to evaluate whether medical nutrition therapy can improve dietary intake in hospital patients who eat poorly

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Conflict of interests, source of funding and authorship

The authors declare that there are no conflicts of interest. EA is the recipient of the Australian Postgraduate Award. There is no other source of funding to declare. This project was undertaken as part of the PhD study of EA and was supervised by EI, MF and MB. EA, EI, MF and MB conceived, planned and designed the study. EA collected, analysed and interpreted the data. EA wrote the original manuscript. All authors critically reviewed the manuscript and approved the final version submitted for publication.

Keywords: acute care, inadequate intake, medical nutrition therapy.

List of Abbreviations:

ANCDS: Australasian Nutrition Care Day Survey
LOS: Length of stay
MNT: Medical Nutrition Therapy
MST: Malnutrition Screening Tool
OR: Odds Ratio
SGA: Subjective Global Assessment

ABSTRACT:

Background and aims: The Australasian Nutrition Care Day Survey (ANCDS) reported two-in-five patients consume ≤50% of the offered food in Australian and New Zealand hospitals. After controlling for confounders (nutritional status, age, disease type and severity), the ANCDS also established an independent association between poor food intake and increased in-hospital mortality. This study aimed to evaluate if medical nutrition therapy (MNT) could improve dietary intake in hospital patients eating poorly.

Methods: An exploratory pilot study was conducted in the respiratory, neurology and orthopaedic wards of an Australian hospital. At baseline, percentage food intake (0%, 25%, 50%, 75%, and 100%) was evaluated for each main meal and snack for a 24-hour period in patients hospitalised for ≥2 days and not under dietetic review. Patients consuming ≤50% of offered meals due to nutrition-impact symptoms were referred to ward dietitians for MNT. Food intake was re-evaluated on the seventh day following recruitment (post-MNT).

Results: 184 patients were observed over four weeks; 32 patients were referred for MNT. Although baseline and post-MNT data for 20 participants (68±17years, 65% females) indicated a significant increase in median energy and protein intake post-MNT (3600kJ/day, 40g/day) versus baseline (2250kJ/day, 25g/day) ($p<0.05$), the increased intake met only 50% of dietary requirements. Persistent nutrition impact symptoms affected intake.

Conclusion: In this pilot study whilst dietary intake improved, it remained inadequate to meet participants' estimated requirements due to ongoing nutrition-impact symptoms. Appropriate medical management and early enteral feeding could be a possible solution for such patients.

(247 words)

INTRODUCTION

The Australasian Nutrition Care Day Survey (ANCDS) is the most comprehensive evaluation of nutritional issues (nutrition care practices, and prevalence of malnutrition and decreased food intake in patients) in Australian and New Zealand hospitals (Agarwal et al., 2012a, Agarwal et al., 2012b). Malnutrition was prevalent in 32% of the cohort (N= 3122) and more than half the malnourished patients (n= 558, 53%) and one-in-three well-nourished patients (n=725, 35%) consumed up to half the offered meals, indicating that decreased food intake was common in hospital patients in this region (Agarwal et al., 2012b). The European NutritionDay is the largest study to evaluate 24-hour food intake in acute care patients admitted across European hospitals (Hiesmayr et al., 2009). The study also reported that only one-third of the participants (N= 16290) consumed all the offered food (Hiesmayr et al., 2009).

Participants in the ANCDS and European NutritionDay cited "not hungry" as the most common reason for not consuming all the offered food (Agarwal et al., 2012b, Hiesmayr et al., 2009). Both studies also found a significant association between decreased food intake and increased risk of in-hospital mortality (Agarwal et al., In Press, Hiesmayr et al., 2009). Multiple regression analyses controlling for confounders (age, disease type and severity, nutritional status) indicated that consumption of less than a quarter of the offered food was independently associated with two-three fold increased risk for 30- and 90-day in-hospital mortality (Agarwal et al., In Press).

Malnutrition management guidelines (Mueller et al., 2011, Watterson et al., 2009, Elia M (chairman and editor), 2003, Kondrup et al., 2003) recommend the routine use of valid and reliable nutrition screening tools (e.g. Malnutrition Screening Tool, Malnutrition Universal Screening Tool)for the identification of malnutrition in hospital patients and facilitate medical nutrition therapy (MNT, defined as diagnostic, therapeutic, and counselling services offered by a dietitian for the management of any disease, condition, illness or disorder). However, no nutrition screening tool identifies patients with inadequate intake during hospitalisation (Young et al., 2013). Therefore, the aims of the present study were to evaluate:

i. if MNT can improve dietary intake in acute care patients who eat poorly during hospitalisation;
ii. if MNT can influence the choice and quantity of food items consumed by acute care patients; and
iii. reasons for decreased food intake in acute care patients.

METHODS

Study design, setting and participants: This was an exploratory pilot study, conducted in the respiratory, orthopaedic and neurology wards of a large tertiary teaching hospital in Brisbane, Australia. Inclusion criteria for recruitment:

- Age ≥18 years;
- Hospital stay of ≥2 days;
- Observed intake of ≤50% of the offered meals for 1 day.

Exclusion criteria:

- Under dietitian's review at the time of recruitment;
- Terminal/critical illness;
- Cognitive impairment;
- Not on solid diet (e.g. nil-by-mouth, fluid diet, receiving artificial nutrition support (e.g. total parenteral nutrition, tube feeds).

Ethics approval for the study was obtained from Metro South Human Research Ethics Committee and from the Medical and Research Ethics Committee (University of Queensland).

Data collection: Data were collected by the first author (EA) over four weeks in 2012. Patients admitted in this hospital are routinely provided with menus to self-select standard sized meals. Dietary intake data were collected at two time points during the study:

- ***Baseline:*** Percentage consumption of each food item offered at main meals (breakfast, lunch, dinner) and snacks (morning-tea and afternoon tea) were observed and recorded on a five-point scale (0, 25, 50, 75, and 100%). The software package CBORD, which contains nutrient analysis of all the food items offered in the hospital was used to record energy and protein values of offered food items. Nutritional values in CBORD are derived from the standard national Australian database – Food Standards Australia and New Zealand (FSANZ; http://www.foodstandards.gov.au. Energy and protein values corresponding to percentage consumption for each food item were calculated for the entire day. "Decreased food intake" was defined as consumption of ≤50% of the offered meals during a 24-hour period. If observed food intake was ≤50% of that offered, patients were asked to provide reason/s for not eating everything. If patients indicated nutrition-impact symptoms (e.g. poor appetite, early satiety, disliking taste/smell) they were referred to the ward dietitian for nutrition assessment and MNT. If patients reported other issues (e.g. food-service related, no feeding assistance) EA liaised with nursing staff to address the issues. Patients were excluded from the study if after addressing these issues intake improved to ≥75%.

- ***Post-MNT:*** Data were collected on the seventh day following recruitment using the same protocol. Medical chart documentation by the dietitian (e.g. nutritional assessment, type of MNT implemented, number of reviews) was recorded.

Demographic data (age, gender, anthropometric measurements) were recorded from medical charts. Participants' energy and protein requirements were calculated as 120kJ/kg/day and 1.2g/kg/day respectively (National Collaborating Centre for Acute Care, 2006).

Statistical analyses:

Data were analysed using PASW Statistics 18. Categorical variables were reported as frequency and percentage and bivariate analyses were undertaken using chi-square tests. Continuous variables were reported using mean ± standard deviation if normally distributed (age), or medians (range) if not normally distributed (energy and protein values). Non-parametric Wilcoxin Signed Rank Test was used to determine changes in energy and protein intake between baseline and post-MNT. A *p*-value <0.05 was considered statistically significant.

RESULTS

Of the 184 patients whose food intake was evaluated, one third (n=62) consumed ≤50% of the offered food. Thirty patients indicated dissatisfaction with not self-selecting menu items (n=20), and not receiving feeding assistance at meal times (n=10). Nursing staff were informed and issues were resolved for all 30 patients, who were then excluded from the study.

At baseline, 32 patients consumed ≤50% of the offered food due to nutrition-impact symptoms. Five patients were terminally ill and thus excluded from study Seven participants were lost to follow-up. Complete data were available for 20 participants.

a) ***Demographic characteristics:*** 60% of the cohort was aged ≥65 years (Table1). Seven participants (35%) were malnourished (Table1).
b) ***Energy and Protein consumed:*** At baseline, participants' intake was equivalent to approximately 30% of energy (2250kJ/day) and protein (25g/day) requirements (Table2). Post-MNT this improved significantly to 50% of median energy (3600kJ/day, *p*=0.005) and protein (41g/day, *p*=0.001) requirements (Table2).
c) ***Reason for not eating all the offered food:*** "Not hungry" and "feeling full" were the most commonly cited reason for not consuming all the offered food at baseline and post-MNT respectively (Table3).

d) Type of MNT: Sixteen participants (80%) received an initial assessment, and 4 participants (20%) received an additional review. Interventions included high energy-protein diets ± ONS (n=9, 45%), ONS (n=9, 45%), texture modification (n=2, 10%), and dietary counselling (n=17, 85%).

DISCUSSION

The present study aimed to explore the efficacy of MNT in improving dietary intake in patients who ate poorly during hospitalisation. Despite statistical improvements in dietary intake post-MNT, a majority of participants met only half their dietary requirements due to persistent nutrition-impact symptoms. Prolonged inadequate dietary intake can lead to an advanced state of depletion of the body's nutritional reserves(Sullivan et al., 1999). Anorexia and early satiety were most commonly cited for not consuming all the offered food. Both symptoms are common characteristics of acute illness and self-limiting factors (Lennie, 1999), which makes oral replenishment of nutritional deficits challenging (Sullivan et al., 1999). A recent study by Leistra and colleagues (2011) demonstrated that when patients were tube fed during the first four days of hospitalisation, their chances of meeting nutritional requirements more than quadrupled (Leistra et al., 2011). Perhaps future research could evaluate the effectiveness of intensive nutrition support and the medical management of nutrition-impact symptoms.

The average LOS of acute care patients in Australian hospitals is approximately six days (Australian Institute of Health and Welfare, 2011), during which time medical needs are likely to supersede nutritional needs. Although nutrition support may commence during hospitalisation, the short average LOS is unlikely to provide sufficient opportunity to replenish nutrient reserves in patients with ongoing sub-optimal dietary intake (Neelemaat et al., 2012). A review of randomised controlled trials found that the use of ONS post-discharge in medical and surgical patients (aged ≥65 years) demonstrated positive effects on nutritional intake and/or weight status (Beck et al., 2013). Neelemaat and colleagues found that a multi-component nutritional intervention (using ONS, food fortification, telephone counselling by a dietitian, and supplementation) was beneficial in improving functional status in elderly patients (aged ≥60 years) at no additional costs (Neelemaat et al., 2012). Previous reports indicate that lower priority is placed on nutrition by nursing staff members (Bell et al., Accepted) and that they are often busy with competing clinical duties that prevent them from always offering support (Kowanko et al., 1999). Plate waste observations highlighted issues that were easily resolved without specialised dietetic intervention. Regular monitoring of patients' food intake must therefore be embedded as routine practice in hospitals alongwith incorporating nutrition support in patients' discharge plans (Holst et al., 2011).

Limitations: The cross-sectional nature of this study does not allow for a causal relationship to be established between MNT and improved dietary intake. There are ethical issues with demonstrating causality through prospective randomised controlled trials (where a group of patients may not be offered MNT despite best practice of care). Although the small sample size is explained by this being a pilot study, it is noteworthy that at least half the patients with decreased intake were excluded as simple strategies were effective in improving dietary intake.

Strengths & significance: Much of the published literature focuses on nutritional interventions in undernourished, elderly patients (Neelemaat et al., 2012, Nieuwenhuizen et al., 2010, Milne et al., 2009, Walton et al., 2008, Milne et al., 2006, Jukkola et al., 2005). However this study demonstrates that well-nourished and younger patients are also vulnerable to nutrition-impact symptoms and inadequate dietary intake. . Adequacy of dietary intake in participants was evaluated based on individual assessment of nutritional needs along with detailed recording of intake of each food item at main meals and snacks. Both these provide reliable data and are highly labour intensive methods (Hiesmayr et al., 2009, Patel et al., 2008).

CONCLUSION

The present study found that anorexia and early satiety were the most commonly cited nutrition-impact symptoms inhibiting adequate dietary intake in acute care patients, warranting further research to evaluate the efficacy of early and intensive MNT, and medical management of patients exhibiting ongoing nutrition-impact symptoms. This study also highlights that simple interventions can significantly improve dietary intake of acute care patients eating poorly due to organisational barriers. With two large studies demonstrating an independent association between inadequate dietary intake during hospitalisation and increased risk of in-hospital mortality (Agarwal et al., In Press, Hiesmayr et al., 2009), ensuring dietary adequacy during hospitalisation is a responsibility that should be jointly shared by healthcare team members and patients themselves.

238 **Table 1: Baseline characteristics of participants consuming ≤50% of the offered meals (n= 20)**

Age (years)	Mean ± SD (range)	68 ± 17 (33 – 96)
Gender (n, %)	Male	7 (35%)
	Female	13 (65%)
Reason for admission (n, %)	Cerebral Vascular Accident	5 (25%)
	Total hip replacement	3 (15%)
	Haematoma	3 (15%)
	Motor Vehicle Accident	2 (10%)
	Spinal Lesion	2 (10%)
	Pleural Effusion/Pneumothorax	2 (10%)
	Rheumatoid Arthritis	1 (5%)
	Sacral Compression	1 (5%)
	Congestive Cardiac Failure	1 (5%)
LOS (days): Baseline	Median (Range)	5 (3 – 18)
SGA (n, %):	Not performed	3 (15%)
	Incomplete*	2 (10%)
	Well-nourished (SGA-A)	8 (40%)
	Moderately malnourished (SGA-B)	6 (30%)
	Severely malnourished (SGA-C)	1 (5%)

239 (LOS: length of stay in hospital; n: number; SD: Standard Deviation; SGA: Subjective Global
240 Assessment (Detsky et al., 1987))

241 *Medical chart documentation by the ward dietitians indicated that SGA was incomplete in two
242 patients as:

243 • One patient was not "cooperative" during the assessment;
244 • Physical component of the SGA could not be completed in the second patient due to
245 multiple fractures.

Table 2: Observations related to food and nutritional intake, feeding position and feeding assistance availability (n=20)

Observations		Baseline (Day 1)	Post-MNT (Day 7)	*p*-Value
Percentage Food Intake:	**0%**	2 (10%)	0	
	25%	14 (70%)	6 (30%)	
	50%	4 (20%)	11 (55%)	0.041 [a]
	75%	0	3 (15%)	
	100%	0	0	
Energy Requirement (Median (Range))		7200 (4300 – 10500)kJ/day		
Energy Offered (Median (Range))		9200 (5500 – 11000)kJ/day	8600 (5000 – 12300)kJ/day	0.314 [b, c]
Energy Consumed (Median (Range))		2250 (1000 – 7700)kJ/day (meeting 30% of requirements)	3600 (1200 – 7800)kJ/day (meeting 50% of requirements)	*0.005* [c]
Protein Requirement (Median (Range))		72 (43 – 106)g/day		
Protein Offered (Median (Range))		99 (65 – 145)g/day	90 (65 – 144)g/day	0.968 [b, c]
Protein Consumed (Median (Range))		25 (11 – 54)g/day (meeting 35% of requirements)	40 (8 – 112)g/day (meeting 55% of requirements)	*0.001* [c]

(g= grams, kJ= kiloJoules; MNT: medical nutrition therapy; n= number; SD: Standard Deviation)

[a] Chi-Square Test

[b] Non-significant ($p > 0.05$)

[c] Wilcoxin Signed Rank Test

Table 3: Frequency of reasons cited by participants (n= 20) for not consuming all the offered food at main meals and snacks

Meal	Reason for not eating	Frequency of cited reasons	
		Baseline n (%)	**Post-MNT n (%)**
Main meals*	Not hungry	12 (60%)	4 (20%)
	Feeling full	2 (10%)	10 (50%)
	Chewing difficulty	4 (20%)	0
	Nausea/Vomiting	2 (10%)	3 (15%)
	Ate all	0	3 (15%)
Snack**	Not offered	15 (75%)	11 (55%)
	Not hungry	5 (25%)	0
	Dislike Taste	0	4 (20%)
	Ate all	0	2 (10%)
	Feeling full	0	2 (10%)
	Nausea/Vomiting	0	1 (5%)

(MNT: medical nutrition therapy)

*Main meals: breakfast, lunch, dinner

**Snacks: Morning-tea, Afternoon-tea

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