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**Title: Maintaining nutrition in aged care residents with a train-the-trainer intervention and Nutrition Coordinator**

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## **ABSTRACT**

### **Objective**

To investigate the impact of a train-the-trainer program on the nutritional status of older people in residential care.

### **Design**

Prospective, randomized controlled study.

### **Setting**

Eight nursing homes in Southeast Queensland, Australia.

### **Participants**

A total of 352 residents participated - 245 were female (69.6%). The mean age was 84.2 years and the majority (79.4%) were classified as high dependency.

### **Intervention**

Residents from four nursing homes were randomly selected for a nutrition education program coordinated by Nutrition Coordinators. Residents from the other four nursing homes (control) received usual care.

### **Measurements**

The Subjective Global Assessment was used to determine prevalence of malnutrition at baseline and six months post intervention. The Resident Classification Scale measured functional dependency. Prescribed diet, fluids, oral hygiene status and allied health referrals were obtained by chart audit.

### **Results**

Approximately half the residents were well nourished with 49.4% moderately or severely malnourished. Residents in the intervention group were more likely to maintain or improve their nutritional status compared with the control group who were more likely to experience a deterioration ( $P=0.027$ ). The odds of the control group being malnourished post test was 1.6 times more likely compared with the intervention group but this did not reach statistical significance ( $P=0.1$ ).

### **Conclusion**

The results of the study encourage the implementation of a Nutrition Coordinator program to maintain nutritional status of aged care residents. Nevertheless, malnutrition rates continue to be unacceptably high. In a rapidly aging society,

the aged care sector needs to confront malnutrition and provide better resources for staff to take measures against this problem.

**Key words:** train-the-trainer, nutrition intervention, nursing home, frail elderly

## **INTRODUCTION**

Malnutrition in older adults has been defined as insufficient dietary intake leading to an inadequate nutritional status, weight loss, and muscle wasting (1). Older adults, particularly the frail aged, are at risk of malnutrition (2, 3), which is associated with poor health outcomes such as increased risk of infection, falls, fractures and pressure ulcer development, longer recovery times and decreased quality of life (4-6). This is especially true in residential care where the prevalence of malnutrition has been reported between 35% and 85% (3, 7-8) and more recently at approximately 50% (9-10).

In Australia, more than 205,000 older people either reside in nursing homes or receive equivalent high level care in the community (11). Nursing homes, referred to as Residential Aged Care Facilities (RACFs) in Australia, are assessed on 44 accreditation outcomes which set the standard for the provision of quality care (11) - one of these outcomes is 'nutrition and hydration'. While the importance of nutrition for older people is recognised, a number of factors contribute to the risk of malnutrition in aged care residents. Many aged care residents require assistance from care staff at meal times due to frailty and loss of functional capacity. Given that it can take staff members between 30 - 45 minutes to assist a resident with a meal (12), shortage of staff may affect the nutritional status of residents (13-14). Chewing and swallowing problems can result in low dietary intake from poorly eaten meals and may necessitate the provision of soft or vitamised meals. Furthermore, many older adults suffer poor oral hygiene, lack of

teeth, gum infections, dental caries and poorly-fitting dentures which can all contribute to insufficient nutritional intake (15-16).

To prevent decline in nutritional status in the susceptible older population, the causes of malnutrition need to be addressed. While a number of studies have focused on individualised nutrition interventions, specifically oral nutritional supplementation (2, 17-20) an ideal solution to reduce the prevalence of malnutrition in aged care residents has yet to be identified. It may be important to offer a more holistic and flexible nutrition intervention to ensure adequate dietary intake (3), taking into account the multi-factorial nature of malnutrition and incorporating both the organisation's resources as well as residents' needs. Evidence indicates that the treatment of malnutrition should include dietary considerations such as fortified food, supplements and meal planning; appropriate eating assistance during mealtimes; modification of the environment to create an atmosphere conducive to eating; and assessment and monitoring of weight history and eating behavior (21).

Prevention of malnutrition in RACFs begins with care staff. Adequate staff knowledge of nutrition assessment procedures and early nutrition intervention strategies is essential; however, studies suggest that care staff lack sufficient knowledge regarding the nutritional needs of older people (14, 22). A number of studies have evaluated education programs designed to increase staff awareness of, and confidence in, screening and assessing the nutritional status

of their patients and in identifying and implementing necessary nutritional changes (23). Studies that implemented short learning sessions over a period of weeks found less improvement in staff knowledge and competency (24-25) than those studies offering sessions over a period of months (23). Nutrition education, accompanied by appropriate organizational level changes and a train-the-trainer approach, may further assist staff competency and increase the focus on residents' nutritional status (26). Train-the-trainer is a widely acknowledged educational model that uses experts to train key staff to extend the delivery of education into their own organizations (27-28). This approach has been used extensively across a number of disciplines but rarely in the provision of nutrition education at a community level (28). This study investigates the impact of implementing a train-the-trainer nutrition program on the nutritional status of older adults residing in RACFs.

## **METHODS**

### **Study design**

A randomized pre-test post-test study was conducted in eight RACFs in Southeast Queensland, Australia, with malnutrition prevalence as the primary outcome measure. Based on current literature, it was estimated that baseline malnutrition prevalence would be 50% (9-10) and a reduction in malnutrition prevalence from 50% to 40% was considered a clinically meaningful effect of intervention over control. Participation of 335 residents was required in order to detect a 10% difference in malnutrition prevalence as described above with a type II error (power) of 10% (90%), type I error of 5% (two-tailed) and allowing

20% contingency for the need to adjust for confounding in multivariable models. The sample size was increased to 377 residents to allow for attrition which has been found to approximate 20% in chronically ill, older populations over a six month period (29). Residents who required any form of tube feeding or who were considered by the Director of Nursing (DON) to be in serious ill-health were excluded.

The study proposal received approval from the Human Research and Ethics Committees of both the university and industry partner. Only 20% of the residents were considered to be cognitively capable of giving informed consent. For the remainder, consent was obtained from the DON on behalf of residents in five facilities and from the next of kin/legal guardian by research staff or care staff in the remaining three facilities.

### **Nutrition Intervention**

Four of the eight RACFs were selected at random to participate in a nutrition education program that combined a community train-the-trainer model (26) with participatory research methods. The program encompassed training a staff member from each RACF to take the role of Nutrition Coordinator, in addition to the delivery of a resource package comprising the following: posters outlining malnutrition risk assessment and nutrition action strategies, an educational video covering nutrition in RACFs and a comprehensive teaching/learning guide. Prior to post-test data collection, the Nutrition Coordinators, usually Registered Nurses with an interest in nutrition, attended three educational workshops, each of five hours duration. These multidisciplinary workshops included sessions with



dietitians, speech pathologists, dental hygienists, nurses and managers in order to offer comprehensive training in all areas of nutritional care. The video included in the resource package outlined information such as the importance of nutritional status in older adults; how to screen for malnutrition and its prevalence; appropriate intervention for at-risk or malnourished residents; how to modify menus to meet individual needs; feeding and weighing issues; behavior change strategies; and why oral care is important to an adequate dietary intake. The risk assessment posters identified red flags such as residents weighing 45kg or lower; change in appetite or diet; or progressive weight loss. The Nutrition Coordinator took responsibility for liaising with their own nursing, kitchen and domestic staff and facilitating in-service sessions about the nutrition strategies they had learned in the workshops. The research team maintained contact with the Nutrition Coordinators by telephone and support visits to ensure that the nutrition education was successfully passed on to care staff at each facility.

The four control facilities received the same nutrition posters as the intervention sites but otherwise continued with their usual care practices regarding feeding, monitoring intake and weighing residents on a monthly basis.

### **Data collection**

Pre-test data collection took place over a six-week period in 2005 with research staff spending two to four days at each facility. The prevalence of malnutrition was measured using Subjective Global Assessment (SGA) (30) nutrition assessment tool which has been validated in older adults (31). The SGA consists of the resident's medical history (weight loss, dietary intake, gastrointestinal

symptoms and functional capacity) and a physical assessment of subcutaneous fat, muscle wasting and edema. Residents were allocated a SGA rating and categorized as well nourished (SGA A), moderately malnourished or suspected to be malnourished (SGA B) or severely malnourished (SGA C) (30). SGA training was provided by one of the authors (JDB) to the research team and inter-rater reliability was verified prior to the commencement of the study as well as during the data collection process (10).

Data extracted from residents' care charts included demographic data (age and sex), dietary information (prescribed diet, oral hygiene status and referrals to a dietitian or speech pathologist) and functional dependency. Functional dependency relates to the level of care required by the resident. At the time of the study, the Resident Classification Scale (RCS) was the method used to assess level of care and ranged from 1-4 for a high level of care and 5-8 for a lower level of care (11).

Post-test data collection occurred six months after the initial data collection period and was undertaken in the same manner and by the same research staff.

### **Statistical methodology**

All data were entered into SPSS Version 16.0 software (2007, SPSS Inc., Chicago, IL, USA). The data were normally distributed and presented as means  $\pm$  standard deviations. Independent t-tests were used to assess any association between continuous variables and malnutrition prevalence post-test. Chi-square analysis was used to determine the level of association between malnutrition, non-continuous resident characteristics and dietary parameters. To account for

the attrition rate post-test (approximately 20%), SUDAAN (version 7.5.2A), a generalised estimating equations approach was utilized. Multivariable logistic regression was used to examine the impact of nutrition intervention compared with control on post-test nutritional status (well nourished SGA A versus malnourished SGA B and C), controlling for age, gender, pre-test nutritional status and level of care. Clustering within facility was accounted for in the study design. In all analyses, P values < 0.05 (two tailed) were considered to be statistically significant, although interpretative emphasis was on effect size, that is, clinical significance as much as on statistical significance.

## **RESULTS**

### **Stage 1 - pre-test**

Of the 377 residents who were randomly selected to participate, 352 gave consent. Twenty five residents, or their next of kin, declined participation primarily because they believed little benefit could be achieved at their time of life. Age (P=0.595) and gender (P=0.586) were not statistically significant between residents who gave consent and those who declined.

In total, 69.6% (n = 245) were female and 30.4% (n = 107) were male. The mean age of residents was 84.2 years (SD = 8.7, range 47–103). The majority of residents were classified as high-care with a RCS between 1 and 4 (79.4% n = 266) and 19.6% (n = 69) were low-care. Of the 352 residents who consented to participate, six did not undergo assessment with the SGA due to absence from the RACF at the time of data collection. Therefore, there was complete pre-test data for 346 residents (98.3% response). Approximately half the residents

(50.5% n = 175) were assessed as well nourished; 43.1% (n = 149) moderately malnourished; and 6.4% (n = 22) severely malnourished.

### **Stage 2 - post-test**

Pre- and post-test data were able to be matched at six months for 145 residents in the control group and 134 residents in the intervention group. Level of care differed between the groups ( $P < 0.001$ ) for both intervention and control groups. Level of care was found to be significantly related to malnutrition ( $X^2 (1, N=345) = 14.21, P < 0.001$ ) with high-care residents (54.3%) more likely to be malnourished than low-care residents (29.0%). There was also a significant relationship between age and malnutrition, with older residents more likely to be malnourished ( $X^2 (2, n=345) = 17.66, P < 0.001$ ).

For matched pre- and post-test data (n=279) at the bivariate level of analysis, residents in the intervention group were more likely to maintain or improve their SGA rating compared with the control group ( $X^2 1=4.9; P=0.027$ ). Intervention group residents were more likely to be receiving a high-energy, high-protein diet than those in the control group (17% and 8.3% respectively;  $P=0.03$ ). A significantly higher proportion of intervention residents (28.1%) than those in the control group (13.1%) were identified as having problems with oral mucosa or gums ( $P < 0.02$ ). Control group residents were more likely to be taking pureed meals and thickened fluids as well as requiring assistance with meals or full feeding ( $P < 0.05$ ). There were no significant differences between the intervention group (11.1%) and control (11.7%) regarding consultations with either a dietitian

or speech pathologist in the six months between pre- and post-test data collection.

Investigating the crude impact of the intervention on malnutrition prevalence post test, not adjusting for pre-test factors, those in the control group were 2.1 times more likely to be malnourished post-test compared with the intervention group (Wald chi square<sup>1</sup>=4.41, P=0.036; OR=2.1; 95%CI: 0.92-5.0). Pre-test factors were considered in a multivariable logistic regression model to determine their independent influences on post test malnutrition status (Table 1). The conclusions based on the bivariate analyses were confirmed in this model, although there was evidence of confounding of crude associations. After mutual adjustment for all variables in the multivariate logistic regression model, pre-test SGA remained a strong predictor of post-test nutritional status. In the final model, pre-test SGA rating was associated with post-test malnutrition (Wald chi square<sup>2</sup>=383.3, P<0.001) (95% CI uninformative as all of the subjects assessed as SGA C pretest remained malnourished post test). Those who were older also had a trend towards a small increased risk of being malnourished post-test (Wald chi square<sup>1</sup>=3.30, P=0.07; OR=1.02; 95%CI=0.99-1.05). In the final adjusted model, the odds of the control group being malnourished post-test was 1.6 times more likely (OR=1.6, 95%CI=0.8-3.1) compared with the intervention group but this did not reach statistical significance (Wald chi square<sup>1</sup>=2.71, P=0.1).

## **DISCUSSION**

Malnutrition prevalence in aged care residents at pre-test was found to be 49.5% (n = 171), a finding that is consistent with the level of malnutrition reported in recent studies (9-10). Over the six-month study period, nutritional status in the control group was more likely to decline than in the intervention group. This suggests that a nutrition education program, when coordinated by a staff member known to the staff of the aged care facility, was successful in maintaining nutritional status compared to the control.

Although no difference was detected at pre-test, residents in the intervention group were more likely to be receiving a high-energy, high-protein diet at post-test than the control group. This difference may reflect increased staff awareness of the importance of nutrient-dense meals in meeting the nutritional requirements of older people. In addition, research staff noted that the dietitian at one of the intervention RACFs increased prescription of oral supplements on becoming aware of the study. However, the frequency with which the residents were seen by a dietitian or speech pathologist did not change significantly from pre- to post-test, most likely due to lack of available specialists. Visits by dental hygienists or dentists were rarely noted in residents' charts at either pre- or post-test. Similarly, record of meal assistance, such as cutting food or prompting to eat, did not change significantly from pre- to post-test.

Although government-appointed accreditation review panels visit all RACFs in Australia to examine policies and practices, including nutrition and hydration, an unacceptable prevalence of malnutrition remains. Priority should be given to education programs for reviewers/surveyors related to nutrition and involuntary weight loss as concluded in a recent study in Maryland, United States (32). Nutritional care, whether in an acute, community or residential setting, often suffers from division of responsibility, with care staff tending to defer the responsibility for nutritional care to others (33). For this reason, reviewing the way in which resident care is coordinated is vital. It is likely that increased involvement by key health professionals such as dietitians and speech pathologists, spearheaded by the RN as care coordinator, could greatly contribute to maintenance of nutritional status.

Education is an important tool that may facilitate the identification and prioritization of nutritional care (28). In the current study, it was identified that care staff were more likely to attend in-service facilitated by a peer rather than more formally arranged education sessions. The Nutrition Coordinator helped to reinforce concepts provided by the educational resource package and alleviated problems arising from high staff turnover. Further, the need for organizational changes, such as in food delivery and eating environment, could be identified and encouraged by the Nutrition Coordinator.

Further follow-up of the nutrition program would allow evaluation of the long-term efficacy of the program beyond the six month time period assessed. In addition, future updates of the video and print materials are advisable in order to keep abreast of best nutrition practice. Future studies could investigate the impact of staff education on modifications made at the facility level, such as changes in meal delivery and environment.

The results of the study encourage further implementation of a train-the-trainer approach with Nutrition Coordinator to maintain nutritional status of aged care residents. Further research is warranted to ascertain whether benefits are maintained over time and whether maintenance of nutritional status is associated with improvements in quality of life and health outcomes for the residents.



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**Table 1: Logistic Regression Model using SUDAAN Investigating the Relationship of Pre Test Variables on Post Test Nutritional Status in Aged Care Residents**

Variable		N <sup>#</sup>	%	Crude OR <sup>b</sup>	OR <sup>c</sup>	95% CI <sup>d</sup>	P value <sup>e</sup>
			Malnourished post test <sup>a</sup>				
Nutrition intervention		134	37%	1	1	Referent	0.1
Control		145	55%	2.1	1.6	0.8-3.1	
Gender	Male	81	44%	1.1	1.6	0.23-1.6	0.22
	Female	198	47%	1	1	Referent	
Age		-	-	1.01	1.02	0.99-1.05	0.07
SGA rating	A	155	27%	1	1	Referent	
	B	111	67%	5.4	5.5	3.2-9.1	<0.001
	C	13	100%	f	f	f	<0.001
Level of care	low	67	30	1	1	Referent	
	high	212	55	2.5	1.97	0.64-6.07	0.16

<sup>#</sup> Descriptive statistics performed in SPSS (version 16) and are based on matched pre and post test data (N=279)

<sup>a</sup> Malnourished according to Subjective Global Assessment (i.e. SGA B and C)(ref)

<sup>b</sup> OR, crude odds ratio of post test malnutrition

<sup>c</sup>OR, odds ratio of post test malnutrition adjusted for all other variables in the table

<sup>d</sup> CI, confidence interval for true estimate of the adjusted odds ratio

<sup>e</sup> statistical significance of the adjusted odds ratio using a multivariate model of logistic regression undertaken in SUDAAN which accounts for missing data (i.e. 346 residents contributing 1 or 2 data points).

<sup>f</sup> uninformative as all pretest SGA C remained malnourished post test