

NUTRITIONAL STATUS AND HEALTH CARE COSTS FOR THE ELDERLY LIVING IN MUNICIPAL RESIDENTIAL HOMES – AN INTERVENTION STUDY

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Abstract: *Objective:* The aim was to study the effect of individualised meals on nutritional status among older people living in municipal residential homes and to compare the results with a control group. An additional aim was to estimate direct health care costs for both groups. *Setting:* Six different municipal residential homes in the south-east of Sweden. *Participants:* Older people living in three residential homes constituted the intervention group n=42 and the rest constituted the control group n=67. *Intervention:* A multifaceted intervention design was used. Based on an interview with staff a tailored education programme about nutritional care, including both theoretical and practical issues, was carried through to staff in the intervention group. Nutritional status among the elderly was measured by Mini Nutritional Assessment (MNA), individualised meals were offered to the residents based on the results of the MNA. Staff in the control group only received education on how to measure MNA and the residents followed the usual meal routines. *Measurements:* Nutritional status was measured by MNA at baseline and after 3 months. Cost data on health care visits during 2007 were collected from the Cost Per Patient database. *Results:* Nutritional status improved and body weight increased after 3 months in the intervention group. Thus, primary health care costs constituted about 80% of the total median cost in the intervention group and about 55% in the control group. *Conclusion:* With improved knowledge the staff could offer the elderly more individualised meals. One of their future challenges is to recognise and assess nutritional status among this group. If malnutrition could be prevented health care costs should be reduced.

Keywords: Malnutrition, nutritional status, elderly people, intervention, health care costs.

Introduction

Malnutrition is a common problem among older people living in municipal residential homes (1, 2) on admission it has been found that 33% are malnourished (3). The causes for malnutrition among the elderly are complex, involving medical, physical, physiological, psychosocial, economic and environmental factors (4). Examples of associated problems are eating difficulties (5) and loss of appetite (6). In addition, chronic diseases often lead to involuntary weight loss (7, 8). Malnutrition is associated with complications such as decreased physical ability (6), increased risk of developing pressure ulcers (9), and infections (10) and has a negative impact on mortality and morbidity (11). The economic consequences of malnutrition are considerable. Studies in a variety of patient populations have shown that malnutrition is associated with negative health outcomes and increased use of resources (12). Elia (13) estimates that the annual health care cost of malnutrition and associated diseases is over 5.9 billion € in the UK. To our knowledge, no cost study on malnutrition based on Swedish data has been published

Knowledge and attitudes regarding nutritional care among staff influence the risk of malnutrition among the elderly (14). Nutritional issues are given a lower priority compared to other nursing tasks due to a lack of confidence (15). One way to improve nutritional status among residents is to educate nursing staff about basic interventions (16).

Most intervention studies intending improve nutritional

status among the elderly have examined the effects of dietary supplements in addition to regular meals (17). Nutritional supplements have been established as treatment of malnutrition in elderly, however, an acceptable food variety in order to increase energy intake may prevent malnutrition as well as improve nutritional status (17). Few studies have examined the effect of energy- and protein enriched meals for older people. It has previously been shown that the intake of energy and nutrients increase by serving small individualised energy- and protein-enriched meals to elderly patients Lorefält et al (18). Furthermore, energy-dense meals served to elderly patients in residential homes are an inexpensive way to improve energy intake (19).

The aim was to study the effect of individualised meals on nutritional status among elderly people living in municipal residential homes and to compare the results with a control group. An additional aim was to estimate direct health care costs for both groups one year after the intervention.

Methods and Subjects

Procedure

The study was performed in the County of Östergötland situated in the south-east of Sweden. The managers of all municipal residential homes in the county were invited to an information meeting about the project in May 2005. After excluding one block of service flats and one residential home where there was an ongoing intervention, three municipal

residential homes subsequently participated in the project and constituted the intervention group. Three residential homes with an equal number of residents and health needs as the intervention group were recruited as a control group (Figure 1). A multifaceted intervention design was chosen (20) including education and support to staff. The staff received education about how to change the mealtime routines, give individualised snacks as well as on how to shape a calm and pleasant meal environment.

In September 2005, one semi-structured group interview was conducted in each of the intervention homes, in order to make an inventory regarding nutritional problems, meal routines and the eating environment in general (Figure 1). The interviews were performed with three to ten registered nurses and assistant nurses, with special responsibility for the meals. The meal routines were similar in all homes; breakfast at 8.30-9.30 am, lunch 12.00 am, supper 5.00 pm, a snack at 7.00 pm (for those who were awake). The meal environment in the dining rooms was organised by ritualised practice.

Based on the results of the interviews a six-hour tailored education programme divided into three occasions, including theoretical and practical items, was carried out in October-November of 2005 at the intervention residential homes. The education was conducted by the project leader, a nurse with special knowledge of nutrition. The education programme included nutritional care for example nutritional needs and meal environment. The staff was also educated in how to use the Mini Nutritional Assessment (MNA), an instrument developed in order to determine risk of malnutrition (21) (Figure 1).

The staff in the control group received education in October-November 2006, solely on how to use the MNA for data collection. The training took place at each residential home, in one 2-3 hour session (Figure 1).

Measurements and costs

Anthropometry

Weight was measured using the calibrated analog scale SECA®, with the participants in a sitting position, lightly dressed and without shoes and height was estimated by a formula including the demispans distance (from the sternal notch to the root of the ring finger on the left hand) using a standard tape measure (22). Based on the values of weight and height, Body Mass Index (BMI) was calculated. Anthropometry was measured at baseline and after three months (Figure 1).

Mini Nutritional Assessment

MNA is a screening instrument developed to evaluate the risk of malnutrition in the elderly and identify those who could benefit from an early intervention (21). MNA has been validity and reliability tested among an elderly population (23) and is proven to be suitable for this group. It includes 18 items divided into four areas; anthropometric measurements, global assessments related to lifestyle, dietary questions, and subjective assessment of health and nutrition (21, 24). The MNA-score indicates three different levels of nutritional status; well-nourished (30-24 points), risk for malnutrition (23.5-17 points) and under-nourished (<17 points). MNA was measured on all residents in both groups, at baseline and after three months.

Health care consumption

To improve health care efficiency in Sweden a national cost per patient (CPP) project has been initiated. In accordance with the national project Östergötland County Council has developed a CPP-database that includes data on costs for each health care contact or each patient who has contacted health care services in Östergötland. Previous studies have proved its use in research (25, 26). In this study direct health care costs, i.e. costs for primary health care, hospital care (both in- and outpatient care) and total health care costs were calculated for 2007, the year after the intervention. The costs are described in €. The exchange rate for Euro 2007 was 9.2 to the SEK.

Figure 1
Flow chart of procedure



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Participants

Elderly people living in six different municipal residential homes, three in the intervention group and three in the control group and alive in December 2007 were included in the study. The exclusion criteria were parenteral and/or tube-feeding and terminal stage. The intervention and control group consisted of 42 and 67 individuals respectively.

Intervention

The intervention took place during three months, December 2005 - February 2006 (Figure 1). Depending on the results of the MNA the residents who were well-nourished were offered snacks between meals such as fruit and yoghurt to maintain nutritional status and to achieve an even distribution of food intake throughout the day.

In order to reach increased food intake, those who were malnourished or at risk of malnutrition according to the MNA-score, were offered an appetizer at lunch, for example soup or egg and herring. They were also offered extra individual snacks such as smoothies, bread and butter, milk and yoghurt. The snacks were distributed throughout the day according to individual needs and preference. The intervention was carried out within existing economic frameworks i.e. no extra money was added for food purchases. This was possible as staff changed the meal routines and adapted to individual wishes. Thus less food was thrown out. During the intervention period the staff in the intervention group received continuous support from the project leader.

The staff in the municipal residential homes that formed the control group made no changes to meal routines.

Ethical considerations

All residents or their next of kin gave informed consent after receiving verbal and written information about the study. They were also informed that they could withdraw from the study anytime without explanation. After the study period the elderly in the control group received the same meal programme as the intervention group. The study was approved by the Research Ethical Committee in Linköping Dnr: 77-05 T60-09.

Statistics

The participants' age, number of diagnoses, drugs, body weight (i n and control group at baseline and after 3 months),

weight change and BMI (intervention and control group at baseline and after 3 months) were given as mean and standard deviation. Differences in these characteristics between the intervention and control group were tested by the Student's unpaired t-test. Length of stay at the municipal residential home was given as median together with range and was tested for differences between the intervention and control group by the Mann-Whitney's U-test. Differences between the intervention and control group regarding the MNA categories, well-nourished, risk of malnutrition and malnourished, were tested by χ^2 -test. A significance level of 5 % was used in all tests. Cost data was presented as median values (intervention and control group one year after intervention) for total health care costs and for different health care levels. Overall, the data presentation as well as analyses were performed in total and stratified by men and women. Calculations were done using the Statistical Package for the Social Sciences (SPSS), Version 18.0 for Windows.

Results

Baseline

At baseline, there were no differences between the intervention group and the control group regarding age, length of stay at the residential homes, number of diagnoses or number of drugs per person (Table 1). In the intervention group, 16 (38%) were men and 26 (62%) were women. In the control group there were 22 (33%) men and 45 (67%) women (Table 1). Furthermore, there were no differences in body weight and BMI between the intervention and control group, neither in total nor between men and women. Nutritional status showed that 8 (19%) of the participants in the intervention group were well nourished, 23 (55%) at risk of malnutrition, and 11 (26%) were undernourished. In the control group 15 (22%) were well nourished, 40 (60%) at risk of malnutrition, and 12 (18%) were undernourished. The differences were not statistically significant (Table 2).

After 3 months

At the three month follow-up, the number of residents who were malnourished had decreased in the intervention group and increased in the control group. In the intervention group the mean body weight increased by 2.7 kg while in the control group weight decreased by 0.6 kg, $p < 0.0001$. BMI increased by

Table 1
Background factors for intervention and control group divided between men and women

Variable	Total			Men			Women		
	Intervention group n=42	Control group n=67	p	Intervention group n=16	Control group n=22	p	Intervention group n=26	Control group n=45	p
Age mean±SD	83.1±7.6	85.6±9.0	n.s.	84.5±7.3	85.6±10.2	n.s.	82.3±7.8	85.5±8.4	n.s.
Number of diagnoses per person mean (range)	1.9 (1-5)	1.8 (0-5)	n.s.	1.8 (1-4)	1.9 (1-4)	n.s.	1.9 (1-5)	1.8 (0-5)	n.s.
Number of drugs per person mean (range)	5.0 (0-10)	5.8 (0-17)	n.s.	5.4 (3-7)	5.7 (2-8)	n.s.	4.8 (0-10)	5.8 (0-17)	n.s.
Months lived in the residential homes mean (range)	28.6 (1-118)	23.4 (1-139)	n.s.	37.2 (1-118)	18.5 (1-61)	n.s.	23.4 (1-90)	25.5 (1-139)	n.s.

Table 2
Nutritional variables for intervention and control group divided between men and women

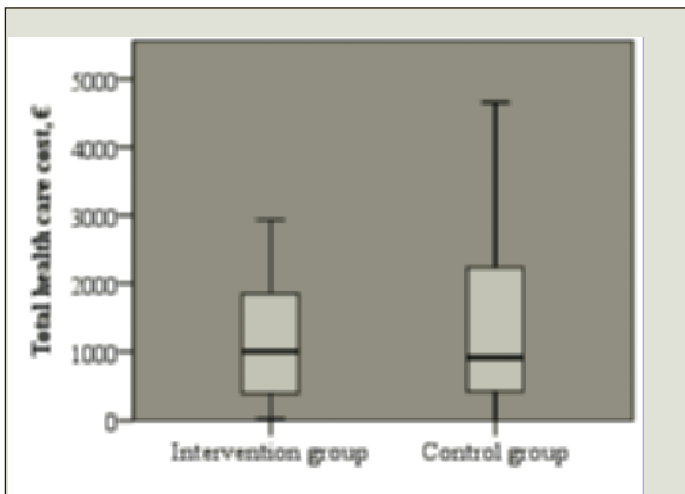
Variable	Total			Men			Women		
	Intervention group n=42	Control group n=67	p	Intervention group n=16	Control group n=22	p	Intervention group n=26	Control group n=45	p
Body weight kg									
Baseline	67.9±15.0	63.9±13.9	n.s	72.8±20.3	68.7±12.5	n.s	64.8±9.9	61.5±14.0	n.s
After 3 months	70.6±15.2	63.2±14.5	0.01	75.7±20.5	68.5±13.4	n.s	67.5±10.2	60.7±14.5	0.05
Weight change in kg	+2.7±3.9	-0.6±4.9	0.0001	+2.8±4.6	-0.2±6.3	n.s	+2.7±3.5	-0.9±4.2	0.001
BMI baseline	25.1±4.9	23.8±4.6	n.s	25.1±6.2	23.8±3.2	n.s.	25.2±4.2	23.9±5.2	n.s.
BMI after 3 months	25.6±4.9	23.7±4.9	0.05	25.5±6.5	23.8±3.4	n.s.	25.7±3.8	23.7±5.5	n.s.
MNA score baseline n (%)			n.s.			n.s.			n.s.
Well-nourished	8 (19.0)	15 (22.4)		5 (31.3)	4 (18.2)		3 (11.5)	11 (24.4)	
Risk of malnutrition	23 (54.8)	40 (59.7)		8 (50.0)	16 (72.7)		15 (57.7)	24 (53.3)	
Malnourished	11 (26.2)	12 (17.9)		3 (18.8)	2 (9.1)		8 (30.8)	10 (22.2)	
MNA score after 3 months n (%)			0.01			n.s.			0.05
Well-nourished	9 (21.4)	3 (4.5)		4 (25.0)	1 (4.5)		5 (19.2)	2 (4.4)	
Risk of malnutrition	28 (66.7)	45 (67.2)		11 (68.8)	18 (81.8)		17 (65.4)	27 (60.0)	
Malnourished	5 (11.9)	19 (28.4)		1 (6.3)	3 (13.6)		4 (15.4)	16 (35.6)	

0.5 kg/m² in the intervention group and decreased by 0.1 kg/m² in the control group, p<0.05 (Table 2).

Health care cost

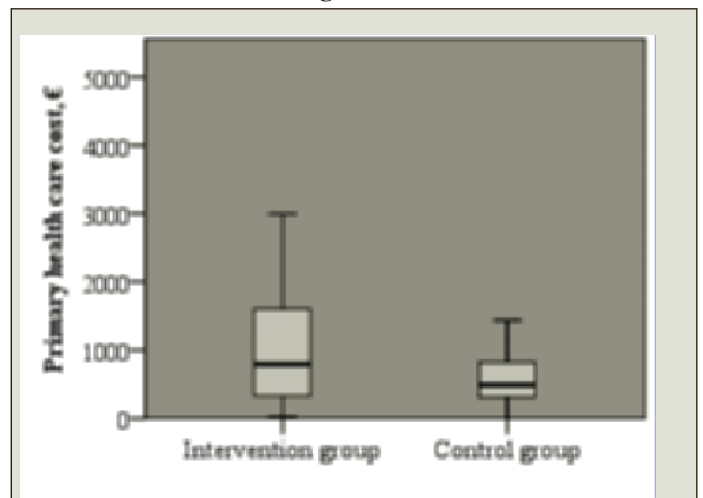
The year after the intervention, the total direct health care cost as median was about €1005 in the intervention group and €921 in the control group (Figure 2 A). The median cost among men was €758 in the intervention group and €632 in the control group (Figure 3 A). For women the cost was €1049 and €1013, in the two groups respectively (Figure 3 B). For primary health care the median cost was €790 in the intervention group and €487 in the control group (Figure 2 B). Analogous figures for hospital care (inpatient as well as outpatient hospital care) were €0 and €98 (Figure 2 C).

Figure 2A



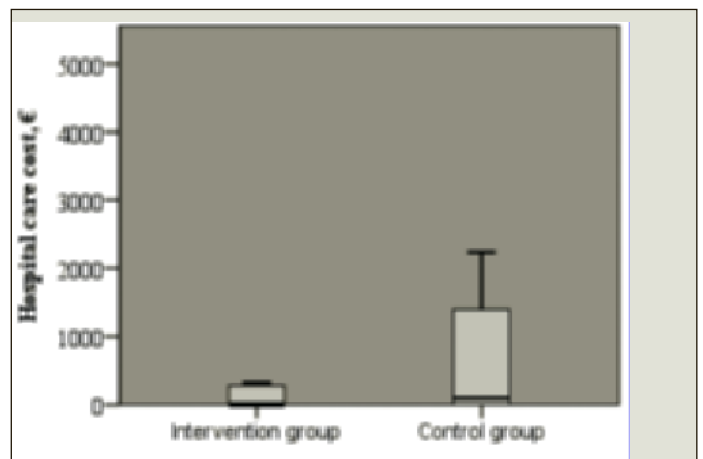
Total health care costs in € (median) for 2007 divided between intervention and control group

Figure 2B



Primary health care costs in € (median) for 2007 divided between intervention and control group

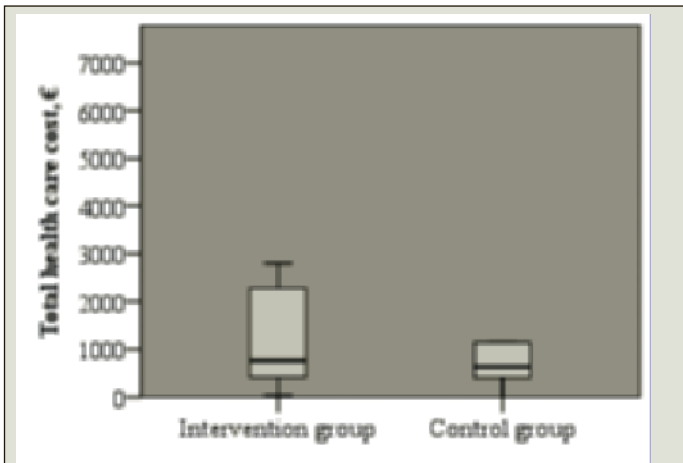
Figure 2C



Hospital health care costs for € (median) for 2007 divided between intervention and control group

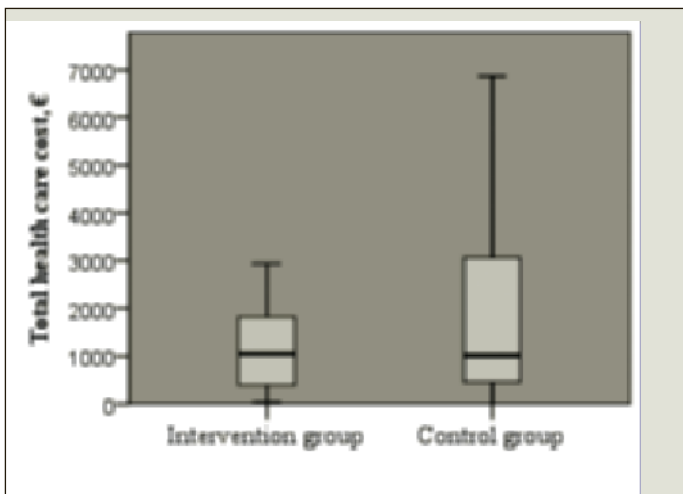
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Figure 3A



Total health care costs in € (median) for 2007 for male in intervention and control group

Figure 3B



Primary health care costs in € (median) for 2007 for female in intervention and control group

Discussion

In this intervention study we showed that, in a relatively short period of time (3 months), individualised meals improve body weight and nutritional status without increasing meal costs among older people living in municipal residential homes. This was possible due to a tailored education programme in nutritional care including training on how to use MNA and act upon the results. This is in accordance with Riviere et al. (27) who showed that a nutritional education programme for staff increased body weight and improved nutritional status (MNA) among elderly people and that the effects remained after one year. However, in the present study body weight in the intervention group increased by 2.7 kg while in Riviere's study (27) the body weight increase was 0.7 kg while the mean body weight in the control groups in both studies decreased in a similar way. The increased body weight among the participants in the present

study may depend on meal routines being adjusted for each person but might also be an effect of the support from the project leader throughout the study period. In our study, nutritional status improved due to the intervention as the residents who were malnourished in the intervention group at baseline became only at risk of malnutrition while the opposite occurred in the control group i.e. the participants changed from being in risk of malnutrition to malnourished. The conventional way to improve nutritional status among elderly people at risk of becoming malnourished or who are malnourished is to give factory produced protein- and energy supplements. This is an effective and accepted method which produces weight gain among older people (17). However, our results imply that it is also possible to maintain nutritional status among frail elderly by offering individualized meals. Furthermore, Simmons et al (28) showed that an intervention with snacks was more cost-effective compared to a supplement intervention between meals. At times it can be difficult to encourage older people to eat sufficiently. One way to prevent too low intake is to offer food of the person's own choice. If the meal portion is too large and served too frequently the elderly may not be able to eat it all with the result that nutrient intake will be insufficient (2). High food wastage is also associated with insufficient energy and protein intake (29). Importantly, the elderly who are well-nourished experience better health and better quality of life than those who are malnourished (30). Thus there is much to gain by improving nutritional status for the elderly.

Direct health care costs were estimated for the year after the intervention in both the intervention and control group. This is a relatively short period of time after the intervention, however considered necessary as the study population was very old. Median values were used in the cost analyses due to the skewed data. Primary health care is the first level of care and should be the first choice for a relatively healthy population. It is thus reasonable to study the cost for primary health care and hospital care. We found that the cost of health care on different health care levels, i.e. primary health care and hospital care, differed between the intervention and control group in the 75th percentile as well as slightly in the median (Figure 2 B, C). This indicates that those in the intervention group, who had improved in nutritional status, probably to a larger extent had been cared for in primary health care.

This study included older people living in municipal residential homes, but malnutrition may well start before they move into these homes, i.e. when living in their own housing. A study by Sahlen et al. (31) showed that preventive home visits by well educated and motivated staff can postpone mortality. In Sweden the National Board of Health (32) has invested financial resources to develop quality care for the elderly, focusing on for instance nutrition.

The multifaceted intervention model used in this study did not allow us to deduce which part of the intervention that accounted for the increase in body weight in the intervention group. This fact could be regarded as a limitation in study design, however

multifaceted intervention models have proven to be successful (33).

Despite the small sample size, we have produced improvement in nutritional status through an intervention within an existing economic framework. Knowledge on how to measure and interpret nutritional status and continuous guidance can provide major improvements in nutritional status even in a short period of time.

Conclusion

Elderly people, in need of municipal care, require good quality nutritional care. Through improved knowledge the staff in municipal residential homes can offer individualised meals and thus improve the nutritional status among this population. Thereby direct health care costs may be reduced and quality of life probably increases among the elderly. Our results imply that it is possible to maintain nutritional status among frail elderly people by offering individualised meals.

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