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NUTRITIONAL FOLLOW-UP AFTER DISCHARGE PREVENTS READMISSION TO HOSPITAL - A RANDOMIZED CLINICAL TRIAL

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Abstract: *Objective:* To compare the effects of two individualized nutritional follow-up intervention strategies (home visit or telephone consultation) with no follow-up, with regard to acute readmissions to hospital at two points in time, 30 and 90 days after discharge from hospital. *Design:* Randomized clinical trial with two intervention groups and one control group, and monitoring on readmission at 30 and 90 days after discharge. *Setting:* Intervention in the participants' homes after discharge from hospital. *Participants: Inclusion:* Malnourished geriatric patients and patients at risk of malnutrition (MNA<24), aged 75 years and older, living at home and alone. *Exclusion:* Nursing home residents and patients with terminal illnesses or cognitive impairment. *Randomization:* Upon discharge, the patients were stratified according to nutritional status (MNA), and assigned to one of three groups: 'home visit', 'telephone', or 'control' group. *Intervention:* Individualized nutritional counselling of the patient and the patient's daily home carer by a clinical dietician one, two, and four weeks after discharge from hospital. The counselling was either in-person at the patient's homes, or over the telephone. All patients received a diet plan on discharge. The control group received standard care, but no follow-up after discharge. *Measurements:* Information on readmissions to hospital and mortality at 30 and 90 days after discharge was obtained from electronic patient records. Intention-to-treat (ITT) and per-protocol (PP) analyses were carried out. *Results:* Two-hundred and eight participants were randomized, 73 to home visits, 68 to the telephone consultation group, and 67 to the control group. The mean age of the participants was 86.1 years. Home visit participants had a lower risk of readmission to hospital compared to control participants at 30 days after discharge (HR=0.4; 95% CI: 0.2-0.9, p=0.03) and 90 days after discharge (HR=0.4; 95% CI: 0.2-0.8, p<0.01). No significant difference was detected between the telephone consultation group and the control group, at either 30 days (HR=0.6, 95% CI: 0.3-1.3, p=0.18) or 90 days after discharge (HR=0.7, 95% CI: 0.4-1.3, p=0.23). The PP analysis revealed that the risk of readmission was significantly lower in the home visit group compared to the control group and the telephone consultation group compared to the control group, and this was evident at 30 days as well as at 90 days after discharge. *Conclusion:* An individualized nutritional follow-up performed as home visits seems to reduce readmission to hospital 30 and 90 days after discharge. Intervention by telephone consultations may also prevent readmission, but only among participants who receive the full intervention.

Key words: Malnourished geriatric patients living alone, individualized nutritional counselling, follow-up after discharge, prevention of readmission to hospital.

Introduction

Malnutrition in the elderly mainly occurs in the context of diseases. The prevalence of malnutrition and the risk of developing malnutrition during hospitalization and geriatric rehabilitation is 85-90% (1, 2). Disease-related malnutrition (DRM) affects the convalescence of older individuals negatively, reduces resistance to future infections and diseases, leads to complications (3), readmissions to hospital (4), and death (5, 6). Especially, the malnourished elderly living alone suffer from poor dietary intake (7), are at increased risk of malnutrition (8), readmission to hospital, and death (9, 10).

A review of oral nutritional supplements (ONS), in form of beverage, demonstrated decreased readmission rates to hospital (11), whereas another review, including only the elderly, draws the opposite conclusion (12). A problem with ONS is that adherence varies (37% to 100%), and is negatively associated with age and acute illness (13). Hence, nutritional support among recovering geriatric patients is multifaceted (14), and should include interventions comprising multiple perspectives (15). Nutritional counselling using cognitive behavioural therapy integrates cognition, behaviour, emotions, and environmental factors, and uses a variety of strategies to optimize the elderly patients' nutritional intake (16).

Nutritional counselling after the discharge of the elderly from hospital has traditionally been carried out as in-person counselling at the elderly patients' homes. With shorter hospital stays, telephone follow-ups have been used in many health care settings, as they are easy to organize, less time-consuming, and less expensive compared to home visits (17). The question is whether telephone follow-up is suitable and effective in supporting the elderly who suffer from disease-related malnutrition.

The aim of this study was to compare the effects of two individualized nutritional follow-up intervention strategies (home visit and telephone consultation) with no follow-up, with regard to first-time acute readmission to hospital at two time points, 30 days and 90 days after discharge from hospital.

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Materials and methods

The study was a randomized clinical trial, with three randomization groups, monitoring on readmission at 30 and 90 days after discharge.

Participants

Patients were recruited from the Department of Geriatrics, Aarhus University Hospital, Denmark, between May 2011 and October 2013 and consecutively enrolled in the study, except for four weeks in the summer of 2013. The inclusion criteria were 1) malnourishment or risk of malnutrition; 2) 75 years or older; 3) living independently and alone in the area served by the hospital; 4) able to speak Danish and to communicate over the telephone. Nursing home residents and patients who suffered from terminal illnesses or cognitive impairment were excluded. The Mini Nutritional Assessment (MNA) was used to identify malnourished patients (MNA<17) and patients at risk of malnutrition (17< MNA<24) (18,19). The patients included came from two geriatric wards. At ward one, the patients suffered from a diversity of medical conditions; at ward two, most patients had been operated for hip fractures.

Randomization

At discharge, the participants were stratified according to their nutritional status (MNA). The randomization was executed electronically via the web-based, clinical-trial support system, 'TrialPartner' (Public Health and Quality Improvement, Central Denmark Region). This central computer program uses permuted block sizes, stratified the randomization according to nutritional status (MNA <17 or 17< MNA<24), and assigned the participants to the 'home visit', 'telephone consultation' or 'control' group.

Standard care

During hospital stay, all patients received standard care, which encompasses a multi-professional, comprehensive geriatric care (CGC) including nutritional care. The nutritional care comprised estimates of energy and protein needs (20), nutritional therapy and recording of food and fluid intake (21). Standard care also included discharge arrangements with the home care provider, such as meal service, food delivery, and home care. The patients received an individual diet plan, including three daily meals, three between-meal snacks, supplements, and instructions for implementing the plan according to their individual preferences.

Control group

The control group received standard care during their hospital stay, and no follow-up care from the hospital after discharge.

Intervention groups

The intervention groups received nutritional follow-up care after discharge by a clinical dietician, either as in-person counselling in the participants' homes (home visit group) or through telephone consultations (telephone group). The intervention was based on nutritional needs identified during the hospital stay and tailored to the individual preferences and circumstances. Since reduced appetite and low food intake had become part of their daily lives, the intervention focused on nutritional and meal behaviour to improve appetite and increase nutritional intake. The clinical dietician used a variety of strategies to optimize the elderly' nutritional intake and encourage them to take an active part in their own nutritional care (16). The counselling sessions were attended by the participant's home carer, who holds a key position in supporting the participant on a daily basis. In Denmark home carers are professionals educated to provide home care to healthy elderly (22). The counselling sessions took place one, two and four weeks after discharge. Home visits lasted 45 minutes, telephone consultations 15 minutes. Details of the intervention are described elsewhere (23).

Outcomes

Baseline characteristics were recorded at hospital before discharge. Outcome measures of readmission to hospital at 30 and 90 days were obtained from patients' electronic records. This electronic system includes all hospitals in the Central Denmark Region.

Statistics and power calculation

The power calculation was based on the primary outcome variable of this study, which was the change in ADL (Barthel-100 score) between discharge and eight weeks after. It was calculated that a sample size of 144 (48 in each group) would provide 90% power with an alpha value of 0.05 to detect an absolute difference of 10 points (Barthel-100 score) between home visit and control groups. Assuming that 25% were lost to follow-up, 192 should be included, 64 in each group.

Baseline characteristics of continuous variables are presented as means with standard deviations (SD) and dichotomous variables as numbers and percentages. The risk of readmission (30 and 90 days) was analysed using the Cox proportional hazard regression model. Only readmission or death would terminate the follow-up period. The readmissions are presented as numbers and percentages, hazard ratios (HR) with 95% confidence intervals (CI). A p-value ≤ 0.05 was considered statistically significant. Intention-to-treat (ITT) and per-protocol (PP) analyses were carried out. The ITT analysis included all study participants, whereas the PP analysis included participants in the intervention groups that received all three planned counselling sessions and the control group.

Table 1
Baseline characteristics (n=208)

	Home visit (n=73)		Telephone (n=68)		Control (n=67)	
		Range		Range		Range
Mean age, years (SD)	86.4 (5.5)	77–103	85.6 (5.3)	75–97	86.3 (6.2)	75–100
Women (%)	57 (78)		61 (90)		55 (82)	
Length of stay, days (SD)	8.1 (4.1)	2–27	7.5 (4.5)	3–29	7.7 (3.8)	2–27
Nutritional status						
MNA, mean (SD) *	17.1 (3.2)	10–23.5	17.3 (3.7)	6.5–23	17 (3.9)	8–23.5
MNA<17 (%)	34 (47)		30 (44)		30 (45)	
MNA: 17 to 23.5(%)	40 (53)		38 (56)		37 (55)	
Weight kg, mean (SD)	64 (14)	39–110	61 (14)	30–101	62 (13)	39–110
BMI score, mean (SD)	23 (4)	15–39	23 (4)	14–37	23 (4)	14–38
Comorbidity (%) #						
Low	38 (52)		35 (52)		32 (48)	
Moderate	29 (40)		30 (44)		27 (40)	
Severe	6 (8)		3 (4)		8 (12)	
Diagnosis at admission						
Hip fracture, n (%)	31 (42)		29 (43)		28 (42)	
Pneumonia, n (%)	7 (10)		6 (9)		7 (10)	
Urinary tract infection, n (%)	4 (5)		6 (9)		6 (9)	
Cardiovascular disease, n (%)	6 (8)		7 (10)		3 (4)	
Traumatic falls/fracture, n (%)	4 (6)		7 (10)		2 (3)	
COPD, n (%) **	6 (8)		3 (4.5)		3 (4.5)	
Other infections, n (%) §	3 (4)		3 (4.5)		3 (4.5)	
Dehydration, n (%)	1 (1)		0		4 (6)	
Cerebral disease, n (%)	2 (3)		0		2 (3)	
Other, n (%) ∞	9 (12)		7 (10)		9 (13)	
Dental status						
Original teeth, n (%)	16 (22)		21 (31)		17 (25)	
Partial dentures, n (%)	28 (38)		23 (34)		20 (30)	
Complete dentures, n (%)	29 (40)		24 (35)		30 (45)	
Help after discharge						
Help from community nurse, n (%)	45 (62)		46 (68)		45 (67)	
Help from home care, n (%)						
Daily	65 (89)		60 (88)		60 (90)	
Weekly	3 (4)		3 (5)		3 (4)	
No home care	5 (7)		5 (7)		4 (6)	
Daily nutritional support	57 (78)		52 (75)		53 (79)	
Meals on wheels	51 (70)		54 (79)		51 (76)	
Eat alone	67 (92)		62 (91)		63 (94)	
Eat one daily meal at a centre for elderly, n (%)	4 (5)		4 (6)		7 (10)	

* MNA = Mini Nutritional Assessment; # Comorbidity = Charlton's Comorbidity Index; ** COPD= Chronic Obstructive Pulmonary Disease; § Other infections = sepsis, skin infections, gastroenteritis; ∞ Other = Pain, malnutrition, cancer, constipation, osteoporosis

Blinding

Owing to the nature of the interventions, it was not possible to blind the participants and the clinical dietician to the intervention. The principal investigator obtained baseline characteristics before randomization, and was not in contact with the participants after that time.

Ethics

Informed, written consent was obtained from the participants before their discharge from the hospital. The study was approved by the Danish Data Protection Agency, journal no. 2014-41-3221, and the Ethical Committee of Central Denmark Region, journal no. M-20100201. Trial registration: Clinical. Trials.gov, NCT01345032.

Results

Patient recruitment and flow

The study included 208 participants. The randomization assigned 73 participants to home visits (HV), 68 to the telephone consultation group (TG) and 67 to the control group (CG) (Figure 1). There was no difference among the three groups at baseline (Table 1).

Readmission to hospital

ITT analysis

The proportion of patients readmitted to the hospital because of acute illness 30 days after discharge was 11% among patients assigned to HV, 16% among TG and 25% in CG participants. Cox regression analysis revealed that HV participants had a lower risk of first-time, acute readmission within 30 days of discharge, compared to CG participants (HR= 0.4, 95% CI: 0.2-0.9, p=0.03). The risk of readmission among the TG was not significantly different compared to the CG (HR= 0.6, 95% CI: 0.3-1.3, p=0.18). Ninety days after discharge, 18% of the patients assigned to HV had been readmitted compared to 29% of the TG, and 39% of the CG. The risk of first-time, acute readmission before follow-up 90 days after discharge was also lower among the HV participants compared to the CG (HR=0.4, 95% CI: 0.2-0.8, p<0.01), but not among the TG participants compared to the CG (HR=0.7, 95% CI: 0.4-1.3, p=0.23) (Table 2).

PP analysis

The PP analysis included participants undergoing the complete intervention programmes and the control group (n=166). At 30 days after discharge, the readmission rates for participants assigned to HV were 4%, for the TG 7% and for the CG 25%. Cox regression analysis of PP data revealed that the risk of first-time, acute readmission 30 days after discharge was reduced among the HV group, compared to the CG (HR=0.1, 95% CI: 0.03-0.6, p<0.01) and the TG compared to the CG (HR=0.2, 95% CI: 0.07-0.8, p=0.02). At 90 days after discharge, the readmission rate for participants assigned to HV was 11%, TG 22%, and CG 39%. The risk of readmission at follow-up 90 days after discharge was lower in the HV group compared to CG (HR=0.2, 95% CI: 0.1-0.6, p<0.01) and the TG compared to CG (HR=0.5, 95% CI: 0.2-1.0, p=0.05) (Table 2).

Adherence to the intervention

Participants assigned to intervention were scheduled for nutritional counselling three times, but 42 participants did not complete all three interventions (HV=20, TG=22) (Figure 1). The missing interventions were due to readmission to hospital (HV=7, TG=7), fatigue or pain (HV=6, TG=4), relatives wanting to stop the intervention (HV=2, TG=3), patients objecting to too much contact with health care professionals (HV=3, TG=2), participants wanting to stop the intervention without any specific reason (HV=0, TG=4), death (HV=2, TG=0), and participants who moved to nursing homes (HV=0, TG=2).

The home care staffs' adherence to the counselling sessions was very poor. Only 31 (26%) of the home care staff took part

Table 2
Patients readmitted to hospital 30 and 90 days after discharge from hospital

	Home visit (n=73/53)			Telephone group (n=68/46)			Control group (n=67)	
	n/N (%)	Hazard ratio (95% CI)	p-value	n/N (%)	Hazard ratio (95% CI)	p-value	n/N (%)	Hazard ratio (95% CI)
30 days								
ITT (n=208)	8/73 (11)	0.4 (0.2-0.9)	0.03	11/68 (16)	0.6 (0.3-1.3)	0.18	17/67 (25)	1 (ref.)
PP (n=166)	2/53 (4)	0.1 (0.03-0.6)	<0.01	3/46 (7)	0.2 (0.07-0.8)	0.02	17/67 (25)	1 (ref.)
90 days								
ITT (n=208)	13/73 (18)	0.4 (0.2-0.8)	<0.01	20/68 (29)	0.7 (0.4-1.3)	0.23	26/67 (39)	1 (ref.)
PP (n=166)	6 /53(11)	0.2 (0.1-0.6)	<0.01	10/46 (22)	0.5 (0.2-1.0)	0.05	26/67 (39)	1 (ref.)

ITT= Intention-to treat analysis; PP= Per-protocol analysis

in one counselling session, 13 (12%) in two, and six (6%) in three counselling sessions.

Figure 1
Flow chart

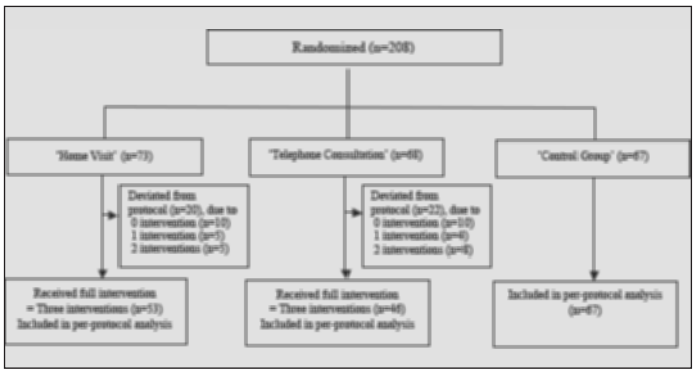
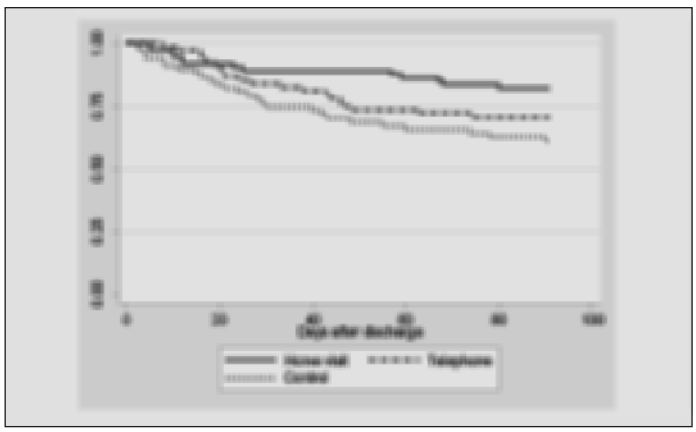
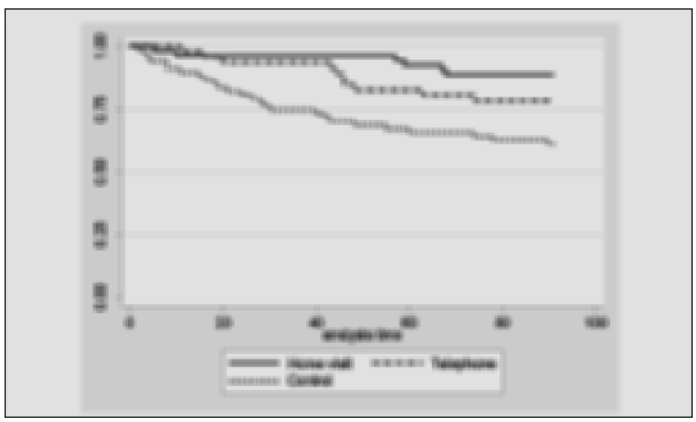


Figure 2A and B
Risk of readmission 90 days after discharge from hospital

2A. Intention-to-treat analysis



2B. Per-protocol analysis



Discussion

The main finding in this randomized clinical trial is that individualized nutritional follow-up, implemented as home visits to malnourished geriatric patients after discharge from hospital, significantly reduces the rate of readmission to hospital. Nutritional follow-up by telephone was only efficient for participants who received all three counselling sessions.

In a study, consisting of three individualized nutritional counselling sessions in the participants' homes, one, three, and eight weeks after discharge, the readmission rates tended to be in favour of the control group, when monitoring at 12 and 26 weeks after discharge (OR at 26 weeks =1.62, 95% CI: 0.85-3.10). The participants were 65 years and older and identified as being at nutritional risk, according to the level 1 screening, NRS-2002 (24). To our knowledge no other individualized nutritional intervention studies in the elderly population have reported readmission rates.

A systematic review and meta-analysis of ONS showed no effect on readmissions in older individuals (65+ years) six months after discharge (OR=1.07, 95% CI: 0.71-1.61) (12), whereas another systematic review and meta-analysis showed reduced readmission rates among recipients of ONS, compared to standard care (effect size -0.18, 95% CI -0.31- -0.04). Among the latter, only 75% of the participants were 65 years and older (11). A study of 445 hospitalized older people (ages 65 to 92 years), home-dwelling and with unspecified nutritional statuses, found a significantly decreased risk of readmission at six months with ONS intervention (HR=0.68, 95% CI: 0.49-0.94). The participants were randomized to six weeks of ONS or placebo (25). The monitoring period in the present study is shorter (three months) compared to the other studies (six months), and therefore the studies are not directly comparable. The readmission rates in the present study may have been higher if the follow-up period had been longer. On the other hand, more participants may have died. The participants in the present study also differ from those in the other studies in age and nutritional risk. Our participants were older and lived alone. Their nutritional statuses were identified according to the MNA, which is a more comprehensive nutritional assessment than NRS-2002 level 1.

In-person or telephone counselling

In contrast to home counselling, telephone counselling is restricted to verbal communication. The dietician cannot observe 'the whole picture' such as the participant's environment, how he or she moves about, their body language and facial expressions, which may lead to different levels of communication. During the intervention period, relatives and the clinical dietician reported that a few participants became confused when talking on the telephone. Subsequently, intervention was stopped in these cases. It may be reasonable to conclude that telephone counselling is only efficient for those who are able to discuss their nutritional and health situations

over the telephone.

How to perform the individualized intervention

The clinical dietician encouraged the participants to increase food and liquid intake in a variety of ways. In addition to the food-related advice, the clinical dietician also addressed personal and environmental factors in the counselling process (15), and identified hurdles that were difficult to overcome. Early signs of deterioration of health were identified. For example, when both poor appetite and constipation were present, the clinical dietician talked to the participant about diets including fibre or other aids to improve bowel function, such as adequate liquid intake, and recommended contacting their GP or community nurse. The clinical dietician supported the elderly in the process of problem solving and encouraged individual decision-making. Health-promoting behaviour was also encouraged, for example, drinking additional ONS, eating with the family, visiting neighbours, preparing meals, establishing a healthy circadian rhythm, including a good night's sleep or a walk. At the next contact, the clinical dietician resumed issues from the previous contact and asked for the participant's solutions to the problems. Such approaches these may encourage the elderly to play a more active role in own nutrition and health care.

During their hospital stays, all participants received CGC, and after discharge the hospital-based clinical dietician could contact physicians and other health-care professionals directly for support and advice, which in combination with individualizing the intervention seems to be essential in follow-up care after discharge from hospital (26).

Regular in-person contact from a clinical dietician the first month after discharge seems to prevent readmission not only while the intervention takes place, but also three months after discharge. This indicates that detection of early signs of nutritional problems and providing the necessary support can prevent readmissions to hospital. For people who live alone and without contact with competent health care professionals problems and complications may escalate and become unmanageable at home. Consequently, the only solution is readmission to hospital. A recent paper analysing admissions of patients aged 80, found that patients inappropriately admitted were significantly more likely to be living alone (27).

Actively involving the participants

The reduced readmission rates in the present study are similar to the results of other studies using an individualized approach that actively involves the patients in the intervention, rather than implementing a passive approach, where things are done by others. A Cochrane review on discharge planning from hospital to home concluded that a discharge plan tailored to the individual patient reduced readmission to hospital among older people (28). A review of disease management programmes for older patients with heart failure, including education, support, self-management, and active involvement of the patients in the programmes also showed these to be effective in reducing readmission (29). In an RCT on care-transition interventions lasting 28 days following discharge (30), readmission rates were also reduced. The authors concluded that patients benefitted from the new skills and tools acquired while recovering from acute illness. Additionally, actively involving elderly hip fracture patients in their nutritional care increased their daily intake of energy and protein (31). A recent review and meta-analysis also documented increased intake of energy and protein after individualized nutritional counselling among nutritionally at-risk, older patients, following discharge from acute hospitalization (32).

Adherence to the intervention

About 30% of the participants in the intervention groups did not complete all three planned counselling sessions. Some were readmitted to hospital, had moved to nursing home or died. Others indicated reasons such as 'fatigue or pain', 'too much contact with health care professionals', 'relatives want to stop the intervention', or 'no specific reason'. Within the first month after discharge from hospital, the elderly often have many contacts with health care professionals, i.e. home care staff, physiotherapist, GP, and follow-up care from the hospital that sometimes can be too overwhelming. Health professionals need to take this into account and involve the patient's perspective in their provision of health care.

Home care staff adherence to the intervention

Home care staff adherence to the intervention was very poor. The purpose of their participation in the counselling sessions was to supply the knowledge needed in the specific care situation. Limited interest, negative attitudes, and lack of knowledge are the most frequent barriers to provide adequate nutritional care (33, 34). A recent study of nursing home staff found that registered nurses displayed a more positive attitude towards nutritional care, compared to nurse aids. Additionally, a relationship between positive attitudes and knowledge was documented (35). A report from the Council of Europe recommends continuing education programmes on nutritional care for all home care providers (36). Despite the home care staff's poor adherence in our study, the readmission rates were reduced in the intervention groups. Increasing the home care staff's nutritional knowledge and continuous support from dieticians and/or nurses may improve the attitude towards active participation in nutritional care.

Strength and limitations of the study

Food intake

During hospital stay the patients' individual daily intake of calorie and protein was recorded. Documentation of the participants' intake after discharge is complex, and was beyond the scope of this study. This is a limitation of the study. Thus, we are not able to suggest that a reduction in readmissions is the

result of increased food intake or a result of other parts of the customized intervention.

Intervention

A strength of this study is that the complex intervention is based on a tested frame of reference and a detailed description, that improves the transparency of the study (16).

Blinding

Given the nature of the intervention, it was not possible to blind the participants and the clinical dietician, which may also be a limitation of the study.

Study design

A strength of the study is the set of strategies in the study design to prevent bias and confounding. One strategy is randomization that assigned the participants to one of three randomized groups. Two intervention methods are compared with no intervention. This enhances the disentangling of the effect of the individual elements of the complex, tailored interventions. Restriction is another strategy, which in this study means including only elderly citizens who live alone. This makes the study population more homogeneous. Individuals who live alone are at greater risk of malnutrition compared to individuals who live with another person. Restriction is an effective way to prevent study confounding (37).

Power calculation

The present study was powered to detect a difference in ADL change between the home visit group and the control group. The lack of statistically significant results of the phone consultation may be due the sample size involved.

Conclusion

Individualized nutritional follow-up performed as home visits seems to reduce rates of readmission to hospital within 30 and 90 days of discharge. Intervention by telephone consultation may also reduce readmissions, but only among participants who comply with the interventions.

Conflict of interest: There is no conflict of interest to declare.

Ethical Standards: The study comply with current law in Denmark.

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