J Nutr Health Aging
Volume 19, Number 1, 2015

STRATEGIES TO IMPLEMENT COMMUNITY GUIDELINES ON NUTRITION AND THEIR LONG-TERM CLINICAL EFFECTS IN NURSING HOME RESIDENTS

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Abstract: *Objectives:* Studies on implementation techniques that focus on nutrition in the setting of elderly care are scarce. The aims of this study were to compare two implementation strategies i.e., external facilitation (EF) and educational outreach visits (EOVs), in order to introduce nutritional guidelines (e.g. screening, food quality and mealtime ambience), into a nursing home (NH) setting and to evaluate the clinical outcomes. *Design:* A controlled study with baseline and follow-up measurements. *Setting:* Four NHs. *Participants:* A total of 101 NH residents. *Intervention:* The EF was a one-year, multifaceted intervention that included support, guidance, practice audits, and feedback that were provided to two NHs. The EOVs performed at the other NHs consisted of one session of three hours of lectures about the guidelines. Both interventions targeted a team of the unit manager, the head nurse, and 5-10 of the care staff. *Measurements:* The outcomes were nutritional status (Mini Nutritional Assessment-Short Form, MNA-SF), body mass index (BMI), functional ability (Barthel Index, BI), cognitive function (Short Portable Mental Status Questionnaire, SPMSQ, performed in a subgroup of communicative NH residents), health-related quality of life (EQ-5D), and the levels of certain biochemical markers like for example vitamin D, albumin and insulin-like growth factor 1. *Results:* After a median of 18 months, nutritional parameters (MNA-SF and BMI) remained unchanged in both groups. While there were no differences in most outcomes between the two groups, the cognitive ability of those in the EOV group deteriorated more than in individuals in the EF group (p=0.008). Multiple linear regression analyses indicated that the intervention group assignment (EF) was independently from other potentially related factors associated with less cognitive decline. *Conclusion:* An extended model of implementation of nutritional guidelines, including guidance and feedback to NH staff, did not affect nutritional status but may be associated with a delayed cognitive decline in communicative NH residents.

Key words: Implementation, nutrition, clinical guidelines, nursing home, cognition.

Introduction

About 19% of the Swedish population is >65 years of age, whereof ~5% live in special housing. Of those aged ≥80 years corresponding figure is 14%. The nursing home (NH) residents usually have extensive care needs since admission to publicly funded NH is always preceded by needs evaluation.

The prevalence of malnutrition in older adults who reside in NHs has been reported to be in the range of 5% to 70% (1), although effective nutritional treatment is possible (2). Malnutrition is linked to considerable harmful consequences at both the individual and societal levels (3-7). There are several causes of malnutrition, of which organisational factors are one, i.e. the inability to provide adequate nutritional care. Thus, the implementation of clinical guidelines could have the potential to improve the quality of care (8). However, few studies have explicitly focused on the methods of implementation regarding nutritional care in a NH setting. For example, in the extensive review of guideline implementation and its effectiveness by Grimshaw et al. (9), none of the included studies involved nutritional practices, and only 3% of the studies were performed in a NH or in a long-term care setting. There have been some interventional studies aimed at improving nutritional care by providing education to NH care staff (10-13). Others have reported on the introduction of a computerised decision support system (14), a change in the mealtime ambience (15), or a change in nutritional practices using an action research approach (16).

An unresolved question in implementation research is which strategies work best in certain situations and settings. Several recent Cochrane reviews have evaluated specific strategies, e.g., auditing and feedback (17), educational outreach visits (EOVs) (18), printed educational materials (19), involvement of local opinion leaders (20), or the use of computerised reminders (21). All appear to have the potential to change practices, although the effects have been moderate with a median absolute improvement between 4% and 12% (22). The most successful implementation strategies are reported to be clinical reminder systems, multifaceted interventions with two or more components, and those that involve the active participation of the users (23).

Facilitation by support to individuals or groups to alter practices can also be used to initiate change. Facilitation is a multifaceted process that employs task-oriented practical help to more holistic approaches, i.e. changing attitudes and behaviours. Project management and relationship-building are

Received February 11, 2014
Accepted for publication April 7, 2014

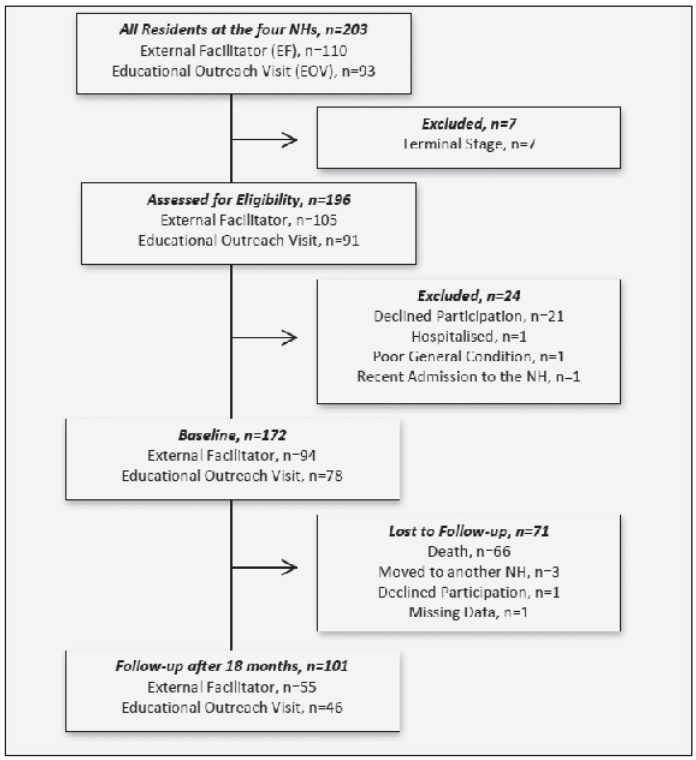
important components of facilitation (24).

The aim of this study was to compare the clinical outcomes in a NH setting of two implementation strategies, that is, external facilitation (EF) and educational outreach visits (EOVs), for the introduction of nutritional guidelines. The primary hypothesis was that EF would improve the nutritional status of the residents. The secondary objectives were to evaluate if EF would confer changes in physical or mental function.

Methods

Participants and setting: Residents living in four NHs in a medium-sized city in Sweden were enrolled (Figure 1). There were 40-48 residents in each NH, dispersed throughout 2-3 wards. The focus was primarily nursing care. The inclusion criteria were as follows: participants were required to reside in a NH and to not have a terminal illness with an expected survival <6 months.

Figure 1
Participant flow chart



Guidelines to be implemented: Nutritional guidelines were adopted by the municipality in 2000. A questionnaire survey was given prior to the study that demonstrated poor knowledge and low adherence to the guidelines (25). This result contributed to the decision to actively implement the previously adopted guidelines. These guidelines were operationalised to be adaptable to a local context. The operationalised guidelines focused on: 1) nutrition (nutritional screening, interventions, assessment/follow-up); 2) food (mealtime pattern, snacks, overnight fasting); and 3) mealtime ambience. The mealtime ambience was operationalised into more user-friendly recommendations using the Five Aspects Meal Model (FAMM). FAMM is a framework that accounts for five aspects, i.e. the room, the product, the meeting, the management control system, and the atmosphere, to produce the optimal dining experience (26).

Implementation strategies: Two strategies were compared: an educational outreach visit (EOV) strategy and an external facilitator (EF) strategy. EOVs were performed at two of the NHs, and EF was used at the other two. The EF units were an availability sample, i.e., they were included after discussions with senior managers. The EOV units were matched to the EF units based on the type of care that was provided (public or private), the focus of care (elderly with dementia or without dementia), and the number of residents taken care of. Both strategies were targeted to a team of practitioners which included the unit manager, the head nurse, and 5-10 of the ward care staff members from each NH.

The EOV was defined as "a personal visit by a trained person to healthcare professionals in their own setting" (18). The EOV was a three-hour lecture at one occasion regarding the operationalised nutritional guidelines. It also included a limited feedback on the mealtime observations and clinical measurements of the NH residents that had been obtained at the start of the investigation. After the lecture, the team members were asked to reflect on their current nutritional care routines.

In contrast to the EOV, the EF approach was a long-term, multifaceted strategy. The EF provided feedback on the baseline clinical characteristics of the residents and the initial mealtime observations and encouraged critical inquiry regarding current nutritional practices to highlight a need for change. The facilitator met with the practitioners regularly every 3-4 weeks over the period of 1 year. The structure of the meetings was based on action research: 1) plan; 2) act; 3) observe; and 4) reflect (27). Two to three workplace meetings each located at the EF NHs were also held during the study period to inform and engage all of the staff. These EF-practitioner meetings aimed to increase the staff´s knowledge about nutrition and to overcome practical obstacles by building structures and setting goals for the staff. Practice audits were also performed. An example of this was the dietary assessments conducted by the staff members themselves as an internal audit, whereas an example of an external audit was the mealtime observations conducted by the facilitator. The external facilitator also had an administrative and empowering role that involved the general planning of the meetings and providing inspiration and support. The facilitator and the person who provided the EOV was the same person (AS, a researcher (PhD) and registered dietitian (RD) who has experience in nutrition projects within municipal care settings.

Data collection: The participating NH residents were interviewed and examined by one of the authors (JT). The care

staff members were interviewed as proxies when the residents were cognitively impaired or were unable to communicate. Background data were collected from the NH resident records. The outcome variables were nutritional status, functional ability, cognitive function, health-related quality of life, and biochemical markers.

Nutritional status was assessed with the Mini Nutritional Assessment-Short Form (MNA-SF), described elsewhere (28). The maximum score is 14. A score of zero to seven points indicates malnutrition, 8-11 points suggest a risk of malnutrition, and 12-14 points imply a good nutritional status. Functional assessment was performed with the ADL Barthel Index (BI) (29). The scores range from 0 to 20, with higher scores indicating greater independence. The Short Portable Mental Status Questionnaire (SPMSQ) (30) was used for cognitive assessments. The maximum SPMSQ score is 10, with higher scores indicating better cognitive ability. The SPMSQ test was performed on participants who were communicative (n=46). Health-related quality of life was evaluated with the EQ-5D (31), and index scores ranging from 0.00 to 1.00 were calculated using the UK EQ-5D Index Tariff (32). An EQ-5D index score of 1.00 indicates the best possible state of health. Negative scores were converted to 0. The tool also involves a self-assessment of health status on a visual analogue scale (VAS) that ranges from 0 to 100. One hundred is rated as the "best imaginable health state." A proxy version of the instrument was used for subjects with cognitive impairments, who were in poor general condition, or who were non-communicative for other reasons (n=73). The residents in general suffered from many concomitant diseases, in average a median of 2 diagnoses. Thus, the combined morbidity was assessed with the Charlson Comorbidity Index (CCI) (33), which yielded weighted scores from 1-6 according to the occurrence and severity of 19 various disorders, and total scores ranging from 0-37. A score of 0-1 points corresponds to a low severity of comorbidity, whereas 2-4 points indicates moderate severity, and 5-12 points indicates a high severity of comorbidity (34). Blood samples were collected after a 12-h overnight fast. Standard procedures were used for the analysis of plasma levels of vitamin D, albumin, C-reactive protein (CRP), creatinine, cystatin C, and serum levels of insulin-like growth factor 1 (IGF-1). Blood was not drawn from 41 residents for the following reasons: the resident or his or her next of kin declined, the resident was in a poor general condition, or the blood sampling was technically difficult.

Study design: This was a controlled study with baseline and follow-up measurements. It was conducted in May 2009 and June 2011 with approximately 18 months between the baseline and the follow-up measurements. The interventions were targeted at the practices of the care staff, whereas the outcomes were measured at the resident level.

Statistics and Ethics: The data are presented as proportions, medians (interquartile ranges) or means ± standard deviations, according to the type and distribution of the variables. T-test for independent samples or Mann-Whitney U-test was used to compare the two groups according to the type and distribution of the data. Differences within a group were investigated by t-test for dependent samples or by Wilcoxon matched pairs test. The $\chi 2$-test was used for ordinal and nominal data. Linear regression analyses were performed to investigate possible predictors of relevant outcome variables. Covariates in multiple linear regression analyses were chosen among clinically relevant variables with a trend-wise ($p < 0.10$) univariate correlation with the dependent variable. Changes in weight were used for power calculations, which estimated that 78 subjects were needed in each group to detect a difference of 2.0 kg with a standard deviation of 5.0 with 80% power (α=0.05). P-values <0.05 were considered statistically significant. Statistica, version 10 (Stat Soft, Inc., Tulsa, OK, USA), was used for all of the statistical analyses.

The study was approved by the Regional Ethical Review Board of Uppsala University. Cognitively intact residents provided their informed consent before the study began. Corresponding consent was provided by next of kin or by other surrogates for individuals with cognitive impairments after the study information was provided by a telephone call. The unit manager at each NH served as a guardian and consented to the intervention and to the study entry (35).

Results

Baseline characteristics: As shown in Figure 1, 172 residents were examined at baseline. No differences were found between the participants (n=172) and the non-participants (n=24) in terms of gender, age, and NH length of stay, as described previously (7). A total of 101 (59%) residents were included in the follow-up analyses (Figure 1). Those lost to follow up (n=71) differed from those that were re-examined at 18 months in terms of being older, having higher comorbidity score, worse ADL function and rating their health worse according to EQ-5D VAS. Table 1 illustrates the basic characteristics of the participants in the two intervention groups. At baseline, there was no difference between the two groups, except that individuals in the EOV group had a lower CCI score ($p<0.05$) (Table 1) than those in the EF group. This difference was attributed to one specific NH in the EOV group. Diagnoses of dementia were equally distributed in both groups (Table 1). More than half of the residents could not perform the SPMSQ. These residents had a worse nutritional and functional status, a lower health-related quality of life, a lower BMI, and were diagnosed with dementia more often, compared to those subjects who completed the test (data not shown).

Sixty blood samples were collected. Dementia was more common among those who did not have their blood drawn, i.e. 54% as compared to 30%, p=0.02, among those who did. Otherwise no differences in clinical characteristics were observed (data not shown). According to the biochemical markers (Table 1), plasma CRP was higher in the EF group.

Table 1
Basic characteristics of the participants (n=101) at baseline. Median (IQR) if not stated otherwise

	n	EF	n	EOV	p*
Age, years mean ± SD	55	83.8 ± 7.4	46	86.5 ± 6.9	0.06
Women, % (n)	55	71 (39)	46	74 (34)	0.74
Charlson Comorbidity Index (CCI)	55	2.0 (2.0)	46	1.0 (1.0)	0.04
Diagnosis of dementia, % (n)	55	42 (23)	46	37 (17)	0.62
No. of prescribed medications	55	9.0 (5.0)	46	7.5 (6.0)	0.14
Months in NH	55	16.7 (29.4)	46	17.6 (34.3)	0.55
Mini Nutritional Assessment-Short Form (MNA-SF, 0-14), median (IQR)	55	9.0 (3.0)	46	9.0 (2.0)	0.90
Weight, kg mean ± SD	55	63.7 ± 17.3	46	64.8 ± 13.9	0.73
Body mass index (BMI), kg/m2 mean ± SD	55	24.1 ± 5.9	46	23.8 ± 4.1	0.79
ADL Barthel Index (BI, 0-20)	55	8.0 (9.0)	46	9.5 (12.0)	0.49
Short Portable Mental Status Questionnaire (SPMSQ, 0-10)	24	4.5 (4.0)	22	6.0 (5.0)	0.30
EQ-5D VAS (0-100), mean ± SD	52	60.3 ± 19.6	43	57.6 ± 19.8	0.51
EQ-5D index (0-1)	54	0.21 (0.58)	44	0.21 (0.67)	0.84
Plasma (P)-CRP (mg/L)	30	7.6 (7.5)	30	1.9 (3.3)	0.01
P-creatinine (μmol/L)	30	72.0 (44.0)	30	76.0 (38.0)	0.95
GFR (mL/min/1.73 m2), mean ± SD	30	51.0 ± 17.9	30	52.5 ± 13.4	0.72
P-albumin (g/L)	30	32.5 (7.0)	30	34.0 (4.0)	0.06
P-IGF-1 (μg/L)	30	96.0 (35.0)	30	75.5 (45.0)	0.22
P-25-OH VitD (nmol/L)	30	34.9 (47.2)	30	35.8 (39.7)	0.57

EF=External facilitator, EOV=Educational outreach visit, SD=Standard deviation, IQR=Interquartile range, ADL=Activities of daily living, VAS=Visual analogue scale, CRP=C-reactive protein, GFR=Glomerular filtration rate calculated by cystatin C (mL/min/1.73 m2 body surface), IGF-1=Insulin-like growth factor 1, 25-OHD=25-hydroxyvitamin D; * Between-group differences; χ2-test for nominal and ordinal variables, t-test for normally distributed data, and Mann-Whitney U-test for non-normally distributed data

Table 2
Between-group differences regarding pre-post changes i.e., a comparison between the baseline and follow-up values in the EF vs. EOV groups

	EF	n	EOV	n	p*
Mini Nutritional Assessment-Short Form (MNA-SF, 0-14), mean ± SD	-0.3 ± 2.8	55	-0.3 ± 2.8	46	0.92
Body mass index (BMI), kg/m2 mean ± SD	0.1 ± 2.5	55	0.4 ± 2.6	46	0.56
Weight, kg mean ± SD	0.3 ± 6.4	55	0.9 ± 7.3	46	0.64
ADL Barthel Index (BI, 0-20), median (IQR)	-1.0 (4.0) †	55	-2.0 (6.0) †	46	0.12
Short Portable Mental Status Questionnaire (SPMSQ, 0-10), median (IQR)	-1.0 (3.0) †	24	-2.0 (3.0) †	22	0.008
EQ-5D VAS (0-100), mean ± SD	-2.0 ± 19.5	52	-5.6 ± 20.7	43	0.38
EQ-5D index (0-1), mean ± SD	-0.02 ± 0.4	54	-0.1 ± 0.4 †	44	0.11
P-CRP (mg/L), median (IQR)	0.07 (4.4)	30	1.6 (5.6) †	30	0.06
P-creatinine (μmol/L), median (IQR)	2.0 (19.0)	30	4.0 (11.0) †	30	0.29
GFR (mL/min/1.73 m2), median (IQR)	-2.5 (13.0)	30	-7.0 (8.0) †	30	0.07
P-albumin (g/L), median (IQR)	0.5 (7.0)	30	-2.5 (5.0) †	30	0.01
P-IGF-1 (μg/L), mean ± SD	16.9 ± 39.8 †	28 ‡	9.9 ± 33.7	30	0.47
P-25-OHD (nmol/L), median (IQR)	0.55 (17.8)	30	1.2 (22.0)	30	0.67
Parenteral nutrition -	-	-	-	-	-

EF=External facilitator, EOV=Educational outreach visit, SD=Standard deviation, IQR=Interquartile range, ADL=Activities of daily living, VAS=Visual analogue scale, CRP=C-reactive protein, GFR=Glomerular filtration rate calculated by cystatin C (mL/min/1.73 m2 body surface), IGF-1=Insulin-like growth factor 1, 25-OHD=25-hydroxyvitamin D; * Between-group differences; t-test for normally distributed data and Mann-Whitney U-test for non-normally distributed data; † Within-group differences, $p<0.05$; ‡ Two blood samples were excluded due to hemolysis, which may have resulted in artificially low values

Table 3
Relationship between a change in cognitive status and other relevant predictors

Predictors	Adjusted R^2	Adjusted p †
Intervention group (EF/EOV)	0.14	0.01
MNA-SF change	0.03	0.07
Sex (male/female)	0.04	0.22

† Multiple linear regression analyses with intervention group assignment, change in nutritional status, and sex as predictors of cognitive status change as defined by SPMSQ scores

Accordingly, plasma albumin tended to be lower in the EF group (p=0.06). In contrast, serum IGF-1 levels were slightly higher in the EF group (ns). About two thirds of the tested residents in the EF and EOV groups, respectively, had vitamin D levels <50 nmol/L, thus being vitamin D deficient.

Follow-up at 18 months: Between-group (EF vs. EOV) as well as within-group differences according to the baseline-follow-up changes are displayed in Table 2. No significant differences in baseline-follow-up changes between the groups were observed, except for in cognitive status. In the sub-group where SPMSQ was performed, it was observed that the EOV group experienced a more rapid decline in cognitive ability than the EF group (Table 2). A trend toward greater deterioration for functional status and the EQ-5D index in the EOV group was also observed (Table 2).

Significant deteriorations within the EOV group were found for functional and cognitive status, as well as for the EQ-5D index (p<0.05). However, the deterioration in the EQ-5D index in the EOV group was mainly attributed to one of the NHs. Deterioration within the EF group was also observed in functional and cognitive abilities, whereas quality of life appeared to be stable during the implementation period.

Four residents, two in each group, were diagnosed with dementia during the implementation period. Thus, at follow-up, 45% and 41% had dementia in the EF group and EOV group, respectively (p=0.68). As for the levels of the biochemical markers, the plasma albumin concentrations decreased more in the EOV group than in the EF group (p=0.01). Plasma CRP was still higher in the EF group. A total of five residents (one in the EF group and four in the EOV group) displayed changes in CRP exceeding 20 mg/L across the observation period which indicated clinically meaningful changes in medical status.

Regression analyses: In order to more thoroughly examine the fact that the outcome of cognitive status varied between residents in the EF and EOV settings, we next performed regression analyses to identify potential confounding of this effect. The five residents with pronounced changes in CRP levels (see above), and one resident with a 7-point decrease in the SPMSQ score were excluded from the regression analyses. By univariate linear regression analyses, the intervention group assignment (EF/EOV) and gender showed a trend-wise (p<0.10) correlation to a change in cognitive status. None of NH units, age, change in MNA-SF, BMI, weight, plasma CRP levels, functional status (BI), quality of life (EQ-5D), or prescription of drugs with potential psychotropic effects (e.g., antidepressants, sedatives, cholinesterase inhibitors) did (data not shown). In the final multiple linear regression model, the implementation modality, gender together with change MNA-SF were included. The inclusion of the latter covariate was based on previous reports of a relationship between nutritional status and cognition, (4, 7). Moreover, residents whose MNA-SF scores increased preserved their cognitive ability to a greater extent than those who had a stable or a worse nutritional status, i.e., -0.7 ± 2.0 vs. -2.1 ± 1.8 (p=0.02). In this final model, the intervention group assignment (EF) remained associated with a change in cognitive status, whereas gender did not (Table 3). A change in nutritional status showed a trend-wise correlation toward a change in cognitive status (p=0.07, Table 3). The adjusted R2 value for the model was 0.20 (Table 3).

Discussion

The objective of this study was to compare two implementation strategies (EOV and EF) for the introduction of nutritional guidelines in a NH setting. No differences between the groups could be observed in nutritional variables such as weight, BMI or MNA-SF. Somewhat surprisingly, changes in cognitive status differed between the groups after the guideline implementation, as the EOV group displayed a more pronounced cognitive decline than the EF group. A somewhat greater deterioration in functional status (BI) and quality of life (EQ-5D) was also observed in the EOV group compared to the EF group, but these differences did not reach statistical significance.

Individuals in the EOV group tended to be older than those in the EF group, and they also tended to have higher baseline SPMSQ scores (Table 1). These potential differences may have contributed to the greater deterioration in cognition in the EOV group.

Nutrition outcomes were remarkably stable in both groups. This result might be explained by the fact that EOV and EF were equally effective (or non-effective). The inclusion of a pure control group may have yielded a different result. However, the inclusion of a strict control group would have been difficult for ethical reasons, especially with the knowledge that nutritional practices in general are inadequate. Moreover, several national as well as local initiatives to improve nutritional care among the elderly have recently been undertaken, which might have influenced awareness of the importance of good nutritional routines. Although the nutritional status was stable, changes in MNA-SF showed a trend-wise association with a change in cognition in the multiple linear regression analyses (Table 3). This finding is in agreement with previous reports on the associations between nutritional status and cognition (4, 7).

The association between the EF intervention strategy and cognitive stabilisation must be interpreted with caution. An obvious confounder could be the incidence of somatic disease. This was the reason that residents with pronounced changes in plasma CRP concentrations, which most likely indicated reduced or increased disease activity, were excluded in the regression analyses. Another confounder could be a change in psychotropic treatment (data not shown), but this co-variate was not associated with a change in cognitive status in the regression analyses. There could also be other confounding factors that were not identified. Nevertheless, it cannot be ruled out that there was a true association between the implementation model and the cognitive outcome. In that case,

the EF model yielded an outcome of great potential importance, since a major goal of NH care is to maintain the cognitive health of the residents. It has previously been demonstrated that staff education can have an impact on cognition in older adults (13, 36, 37).

The EF process was a long intervention, which might have provided more in-depth knowledge and insights to the staff, thus making the staff members more inclined to change their practices. Thus, the EF process may have promoted a more person-centred care (PCC). PCC is a model that is characterised by personhood, maximising choice, and autonomy, as well as nurturing relationships (38). Factors like individual preferences and choices of the residents were emphasised in the current study, especially in order to improve the mealtime ambience. Gibbs-Ward and Keller reported that an optimal mealtime experience requires individualised care, which in turn promotes autonomy, as well as dietary intake, and a better quality of life (39). In addition, the staff at the EF units decided to make mealtime ambience a priority for change, and thus, the EF strategy was amenable to the staff's motivation. Out of the guideline recommendations, mealtime ambience was given considerable focus during the implementation process. The EOV model, on the other hand, was only one lecture at one occasion, where mealtime ambience, in accordance with the FAMM model (26), was one of many aspects that was discussed.

There are several limitations of this study that must be acknowledged. For example, no socioeconomic data were collected. Furthermore, the included nursing homes were not randomised, a condition that might have biased the results. A clustered randomised controlled trial may have been a more appropriate design. However, such an approach faces considerable challenges in terms of logistics and resources. As this was a project with the goal of quality improvement within a municipality, it appeared beneficial to include motivated units and to use matched control units. Power calculations based on expected weight differences between the residents in the EOV and EF units indicated that 156 subjects were needed. Approximately 200 residents were eligible from start, but only about half could took part in the follow-up examination. Of course, this drop-out rate jeopardised the power of the study. In addition to the small number of residents in the study, an even smaller group of participants was able to perform the SPMSQ test. This inevitably resulted in a selection of only communicable residents.

In implementation research, both the performance of the staff (process measures) and the outcome of care (outcome measures) can be measured. In this study, the outcome of care was the focus. Visible effects on patients' health are often difficult to achieve due to a limited time span for observation and due to other confounding factors. Thus, there are reasons to also study the care processes, i.e., to determine whether the staff actually changed their methods and were adherent to the guidelines. Such observations would also provide a better understanding of the measured outcomes.

Conclusion

This study indicated that the use of two different strategies to implement nutritional guidelines in a NH setting did not result in any differences in nutritional status or physical function among the NH residents over an observation period of 1½ years. However, despite a cautious interpretation, it was still observed that the external facilitator approach was associated with delayed cognitive deterioration in the NH residents who underwent cognitive testing before and after the intervention. A possible explanation for the differences in cognitive effects due to the external facilitation process could be the promotion of person-centered care, where individual preferences are the focus, which contributes to social and mental stimulation. This hypothesis needs to be addressed in future studies.

Acknowledgments: We would like to thank Jonas Selling for his support with the statistical analyses and Marianne Sellgren at the Health and Social Welfare Office, Uppsala Municipality, for her considerable commitment to this project. Finally, we would like to acknowledge the staff and residents at the nursing homes that are included in this study for their positive approval during the data collection.

ClinicalTrials.gov Identifier: NCT01861366

Ethical Standards: The experiments comply with the current Swedish laws, (Dnr: 2009/053).

Conflict of Interest: There are no conflicts of interest to declare regarding the content of this manuscript.

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