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Original Article

The first nutritionDay in nursing homes: Participation may improve malnutrition awareness☆

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SUMMARY

Background & aims: A modified version of the nutritionDay project was developed for nursing homes (NHs) to increase malnutrition awareness in this area. This report aims to describe the first results from the NH setting.

Methods: On February 22, 2007, 8 Austrian and 30 German NHs with a total of 79 units and 2137 residents (84 ± 9 years of age, 79% female) participated in the NH-adapted pilot test. The NHs participated voluntarily using standardized questionnaires. The actual nutritional intake at lunch time was documented for each resident. Six-month follow-up data were received from 1483 residents (69%).

Results: Overall, 9.2% and 16.7% of residents were classified as malnourished subjectively by NH staff and by BMI criteria (<20 kg/m^2), respectively. Independent risk factors for malnutrition included age > 90 years, immobility, dementia, and dysphagia (all $p < 0.001$). In total, 89% of residents ate at least half of the lunch meal, and 46% of residents received eating assistance for an average of 15 min. Six-month mortality was higher in residents with low nutritionDay BMI (<20 kg/m^2: 22%, 20–21.9 kg/m^2: 17%) compared to residents with BMI ≥ 22 kg/m^2 (10%, $p < 0.001$). Six-month weight loss ≥ 6 kg was less common in residents with nutritionDay BMI < 22 kg/m^2 compared to residents with higher nutritionDay BMI (3.4% vs 12.4%, $p < 0.001$).

Conclusions: The first nutritionDay in NH provided valuable data on the nutritional status of NH residents and called attention to the remarkable time investment required by NH staff to adequately provide eating assistance to residents. Participation in the nutritionDay project appears to increase malnutrition awareness as reflected in the outcome weight results.

1. Introduction

The nutritionDay project aims to evaluate disease-related malnutrition through the implementation of a cross-sectional survey, performed annually in a single day. In 2006 the program was first performed in the hospital setting. Subsequently nursing homes (NHs) expressed interest in performing a similar survey. We therefore started a pilot project in Austrian (AUT) and German (GER) NHs in 2007 to test the feasibility of the project in the NH setting.

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In 2003 the Council of Europe published a resolution on malnutrition and nutritional care in acute and long term care settings.[1] The resolution was signed by 18 European countries, reflecting an increased awareness of the issue of malnutrition and its consequences.[2] The practical implementation of the resolution, however, is lagging behind the required standards, not only in the acute care setting[3–5] but also in NHs.[6] The most important aim of the nutritionDay project is to transfer the resolution's message into daily practise. For this purpose the nutritionDay project primarily uses a bottom-up approach by directly addressing units and by actively involving the units' personnel into the evaluation. Data is collected in a practical and feasible manner to enable every unit to participate. This adaption of the data collection method allows access to large number of participants and provides valuable results for top-down strategies in health care policy. As such the nutritionDay project has never considered itself as primarily an academic endeavour but as a project focused on the improvement of practical approaches, increased awareness and change of attitudes.

NHs offer long term care for not acutely ill residents with irreversible chronic conditions provided by mostly medically untrained personnel in a low-tech environment with focus on care. Each partial aspect mentioned differentiates NHs from hospitals. In addition NH residents are on average older and less mobile than hospital patients and show a projected 50–75% prevalence of cognitive impairment.[7,8] Therefore, the nutritionDay acute care questionnaires had to be modified to meet the demands of the NH environment.

The NH setting is more difficult to investigate than in acute care setting. NHs are affected by high work loads caused by cost containing strategies[9–11] and are under considerable public pressure especially with regard to nutrition-associated care problems.

Thus we decided to test the feasibility of the nutritionDay concept in a pilot run restricted to a sample of AUT and GER NHs before it is implemented on the EU-wide level. The aim of the present report was to provide access to the preliminary information gathered on nutritional status and nutritional management on more than 2000 AUT and GER NH residents and to stimulate discussions there of.

2. Methods

2.1. Background and design

The project is part of the nutritionDay (ND) initiative developed and initiated by Michael Hiesmayr and Karin Schindler of the university hospital of Vienna in cooperation with the "Representatives Council" of the European Society of Clinical Nutrition and Metabolism (ESPEN). The initiative started off with acute care evaluations in 2006.[12] NHs and intensive care units were evaluated first during the second ND run in 2007.

The study design follows all principles of the general nutritionDay design explained online at www.nutritionday.org. In short, the design is based on a one-day cross-sectional audit with a 6-month follow-up implemented by the local caregivers without external support and done with the help of four questionnaires.

In NHs the selected test day for the nutritionDay audit was February 22, 2007 and the outcome date 6 months later on August 22, 2007.

The project was specifically aimed at NHs for the elderly. To evaluate the specifics of care-dependent seniors, we decided to include residents older than 50 years only and encouraged NHs to exclude residents younger than that.

2.2. Centre recruitment

Participation was open to any unit that registered on the website and requested an anonymous centre and unit code. The recruitment occurred at the Austrian Society of Clinical Nutrition in Austria (AUT) via electronic information systems (e-mails, website) and in Germany (GER) via a singular postal invitation to all GER NHs. Eight AUT NHs (0.9% of a total of about 900 AUT NHs) and 30 GER NHs (0.3% of a total of 9743 GER NHs[13]) agreed to participate in the audit. Of the NHs, 42% ($n = 16$) were operated by charity organisations, 34% ($n = 13$) by the community, and 24% ($n = 9$) by private organisations. Residents not consenting to the evaluation should be listed in sheet 2, however, without documenting any further data.

2.3. Ethical considerations

The nutritionDay NH concept was approved by the ethical committee of the Medical University in Vienna. The participating centres were not required to obtain approval from their own ethical committee. However, each competent resident was asked to give his or her oral consent and each NH was required to announce the audit as pre-printed information sheet hung on a well visible place in the unit at least one week before the audit. The information sheet targeted at relatives or nominated proxies of residents who were incompetent to consent. It informed that participation could be rejected. No personal data such as first name, family name or birthday were transferred to the central coordinating centre or stored in a database.

2.4. Data collection

The questionnaires were conceptualized as simple and precise questions but without necessitating mathematical calculations and expert knowledge.

The NH nutritionDay questionnaires were primarily based on those of the 2006 run in the acute care setting. They were modified to the special needs for the NH environment by Hubert Bucher and Luzia Valentini and were finally approved by 10 additional NH experts (see Acknowledgment). The questionnaires are accessible at www.nutritionday.org (path: questionnaires – nursing homes) in currently 10 different languages. Sheet 1 addressed the unit structures, sheet 2 the individual resident characteristics, sheet 3a included general items of weight course and nutritional behaviour of each resident and sheet 3b reflected their actual nutritional intake at lunch time on February 22, 2008. Sheet 4 recorded the outcome evaluation. Sheets 1, 2 and 4 were filled in by the staff. Sheets 3a and 3b could be filled in either by the staff or the residents' relatives and whenever possible with the support of the respective resident. If possible sheet 3b should be filled in immediately after lunch to ensure accuracy. Detailed instructions and explanations for each question were provided.

The participating NHs were asked to measure rather than estimate each resident's weight and height. Since those simple procedures are time consuming in the NH environment, NHs were allowed to implement those measures within two weeks before the appointed date. The centres notified on the sheets if weight and height were measured or estimated.

The staff was asked to subjectively qualify each resident as either well-nourished, at risk of malnutrition or malnourished. To stress the subjective character of the question the staff was neither trained nor did we recommend a certain method to assess nutritional status. Nutritional status was further assessed by BMI using established Geriatric criteria recommended by ESPEN,[14] with a BMI $< 20\ kg/m^2$ defined as malnutrition. We additionally

assigned a BMI between 20 and 21.9 kg/m^2 as risk range for malnutrition.[15] We further defined weight loss of more than 6 kg within the previous 12 months (retrospective) or 6 months (prospective) as relevant weight loss. The value was taken as surrogate marker for 10% weight loss within the last 6 months, which is an established and independent criterion for malnutrition.[16] We took the 6 kg threshold for two reasons: First, to calculate a 10% weight loss accurately necessitates the presence of accurate weight loss numbers, which we cannot provide for the retrospective part of our evaluation. Second, by taking that threshold we enable comparability to results from another ongoing large NH project.[17] Cognitive status was recommended to be classified according to the criteria of the Mini Mental State (MMS)[18] and subjectively when MMS criteria were not available. Pressure ulcers were classified according to the EPUAP Pressure Ulcer Classification System[19] in grade 1 non-blanchable erythema, grade 2 blister, grade 3 superficial ulcer and grade 4 deep ulcer. Mobility was defined as 1) mobile: the resident is able to walk at least 50 m without walking helps except walking sticks, as 2) semi-mobile: locomotion is only possible with major walking helps (like walking frames) or without external help (independently) in a wheelchair and as 3) immobile: bed-ridden or locomotion only possible in a wheelchair with external support.

Daily number of drugs was strictly defined as number of different substances not as total number of pills. Psychoactive substance was used as collective term for antidepressants, neuroleptics or tranquilizers. We used current intake of antibiotics as surrogate marker for bacterial infections and current intake of opiates as surrogate marker for pain. Nutritional support was defined as enteral (oral nutritional supplements or tube feeding) and/or parenteral nutrition. Six-month outcome data included current resident location, current weight, and interim number of hospital stays.

2.5. Data entry

After the main assessment and after the outcome assessment NHs were asked to either type in the data online via the nutritionDay homepage or send the questionnaires to the nutritionDay central coordination centre in Vienna, Austria. A benchmarking report was sent to the participating centres after closure of the complete databank presenting in one column the specific centre results and in the second column the summary of the data from all units.

2.6. Data quality

Data clearing was performed by the central coordination centre and if any data was unclear or illogical the respective unit was contacted. We received sheets 1 and 2 from all participating units and sheets 3a and 3b from 2010 (94%) and 1922 residents (90%).

2.7. Statistics and analysis

Most data are presented as proportion or mean ± sd and range (=min–max). The median value (min–max) was used for single nonparametric data sets, like months since admission. For evaluating differences between groups Student's *t*-Test was used for normally distributed numerical samples, Mann–Whitney Test for nonparametric numerical samples, χ^2-Test for nominal or ordinal samples and Kruskal–Wallis Test for differences in more than two groups of numerical samples.

We performed univariate correlation analysis with Spearman rank order coefficients. Factors rendered significant at univariate analysis were included in multivariate backward regression analysis (likelihood-quotient) and odds ratios (OR) as well as 95% confidence intervals (CI) were calculated. *p*-Values less than 0.05 were considered statistically significant.

All analyses were done with the help of a statistical program (SPSS® v14, SPSS Inc., Chicago, IL).

3. Results

Overall we received data from 2162 residents. Of those 25 residents were excluded because they either rejected to participate ($n = 11$) or were younger than 50 years of age ($n = 14$). The final sample consisted of 2137 residents (98.8% of the initial sample).

3.1. Unit characteristics

Table 1 shows the unit characteristics of the participating centres.

Striking was the high percentage of units performing routine nutritional screening ($n = 58$). Of those performing nutritional screening 66% specified to do it in recommended monthly intervals. Reported screening tools were BMI or body weight (41 units, 71%), Mini Nutritional Assessment®[20] (20 units, 34%), AKE software for nutritional monitoring in long term care®[21] (7 units, 12%), NutriRisk analysis®[22] (6 units, 10%) or other tools including blood parameters (8 units, 14%). Some units used more than one screening tool.

3.2. Residents' characteristics

Table 2 presents the residents' characteristics.

The mean BMI value was satisfactory, but in it relevant proportions of underweight/malnourished residents (BMI < 20 kg/m^2) and residents at risk of malnutrition (BMI 20–21.9 kg/m^2) were obscured by a 16.1% prevalence of obese residents. The units reported measured and not estimated weight and height in 97.4% and 81.2% of residents, respectively.

As expected the majority of NH residents were cognitively impaired and suffered from mobility restrictions. Care causing diseases were of neural origin including brain affections in 75.4% of residents ($n = 1532$), of heart or lung origin in 47.9% of residents ($n = 973$), and of musculoskeletal or bone origins in 31.6% of

Table 1
Unit characteristics.

Number of NHs	*N*	38
Number of units	*N*	79
Number of residents per unit	m ± sd [range]	29 ± 10 [12–66]
Staff/unit		
Physicians		
Permanent physicians	% yes [range *N*]	24 [0–5]
Coop. primary care physicians	% yes [range *N*]	88 [0–24]
Nursing personnel per unit	m *N* ± sd [range *N*]	15 ± 14 [5–33]
% Registered nurses	m [range]	53 [24–100]
% Aids & vocational nurses	m [range]	47 [0–76]
Dieticians	% yes [range *N*]	31 [0–2]
Physio/ergotherapists	% yes [range *N*]	74 [0–6]
Music therapists	% yes [range *N*]	38 [0–10]
Nutrition management		
Specific person mandated to nutrition?	% yes	53
Artificial nutrition according to guidelines?	% yes	80
Local guideline	% yes	63
National guideline	% yes	44
Nutrition screening	% yes	73

Coop. = cooperation with; m = mean; *N* = number; sd = standard deviation.

Table 2
Residents' characteristics.

General data		*n*	
Residents	*N* (%)	2137	2137 (100%)
Sex, % female	*N* (% all)	2126	1674 (79%)
Age (years)	m ± sd [range]	2137	84 ± 9 [50–106]
Weight (kg)	m ± sd [range]	2122	65 ± 16 [30–143]
Height (cm)	m ± sd [range]	2120	161 ± 9 [103–196]
Months since admission	med [range]	2117	29 [1–516]
N drugs/d	m ± sd [range]	2102	5.9 ± 3.1 [0–20]
Nutritional characteristics			
BMI (kg/m^2)	m ± sd [range]	2116	25 ± 5 [12.1–51.3]
<20 kg/m^2 – malnourished	*N* (%)	2116	353 (16.7%)
20–21.9 kg/m^2 – at risk of MN	*N* (%)	2116	295 (13.9%)
22–30 kg/m^2	*N* (%)	2116	1127 (53.3%)
>30 kg/m^2	*N* (%)	2116	341 (16.1%)
Lost >6 kg last year	*N* (%)	1950	180 (9.0%)
Eaten ≤¼ of lunch	*N* (%)	1902	177 (9.2%)
At risk of MN by staff	*N* (%)	2210	305 (14.3%)
Malnourished by staff	*N* (%)	2210	197 (9.2%)
Associated features			
Exsiccosis	*N* (%)	2137	178 (8.3%)
Contractures	*N* (%)	2137	531 (24.9%)
One	*N* (%)	2137	243 (11.4%)
Multiple	*N* (%)	2137	288 (13.5%)
Pressure ulcers all	*N* (%)	2137	170 (8.0%)
PU w/o grade 1	*N* (%)	2137	66 (3.1%)
PU grade 3	*N* (%)	2137	26 (1.4%)
PU grade 4	*N* (%)	2137	3 (0.1%)
Dysphagia	*N* yes (%)	2137	341 (16.0%)
Chewing problems	*N* yes (%)	2137	428 (20.0%)
Dementia all	*N* (%)	2116	1441 (68.1%)
Moderate impairment	*N* (%)	2116	835 (39.5%)
Severe impairment	*N* (%)	2116	606 (28.6%)
Mobility restrictions all	*N* (%)	2132	1414 (66.3%)
Semi-mobile	*N* (%)	2132	779 (36.5%)
Immobile	*N* (%)	2132	635 (29.8%)
Hospital stays last year	m ± sd [range]	2118	0.55 ± 1.0 [0–5]
≥1 hospital stay	*N* (%)	2118	792 (34.1%)
≥2 hospital stays	*N* (%)	2118	246 (11.6%)

m ± sd = Mean ± standard deviation; med = median; *N* = number; BMI = body mass index; MN = malnutrition; PU = pressure ulcers.

residents ($n = 643$). Further 7.7% of residents ($N = 14.2\%$) suffered from diseases of the endocrine system, 6.8% ($n = 138$) from disease of the digestive tract, and 5.2% ($n = 106$) had cancer. Overall, 50.6% of residents ($n = 1081$) received psychoactive substances, 8.6% ($n = 184$) opiates, and 3.7% ($n = 80$) were on antibiotics.

3.3. Malnutrition-associated features

3.3.1. Malnutrition assessed by staff vs malnutrition according to BMI criteria

To identify possible risk factors for malnutrition we performed a univariate correlation analysis first and found significant relations to age, sex, dysphagia, dementia, mobility status, and average number of drugs independently whether residents were classified as malnourished subjectively by the staff or classified by BMI criteria (Table 3). Malnutrition estimates by staff and BMI correlated with $\rho = 0.594$ ($p < 0.001$).

In a second step we entered those values significant in the univariate analyses for either malnutrition estimate in a multivariate regression model (Table 3). Most markers remained significant, only sex dropped out of the model and use of opiates became now relevant for BMI estimates.

We additionally evaluated possible effects of malnutrition like exsiccosis, contractures and pressure sores and found highly significant associations to each of them (Fig. 1). Especially remarkable was that 42% and 52% of residents with exsiccosis and pressures ulcers grade 3 and 4, respectively, had a BMI below 20 kg/m^2.

3.3.2. Characterisation of malnourished residents

Table 4 summarizes the characteristics of malnourished residents.

Daily intake of different drugs was lower in malnourished residents compared to well-nourished residents in staff estimates (5.1 ± 3.4 vs 6.0 ± 3.1, $p < 0.001$) and those classified by BMI criteria (5.1 ± 3.0 vs 6.2 ± 6.0, $p < 0.001$). Intake of antibiotics or psychoactive substances was similar in well-nourished and malnourished residents in both classification systems.

Table 3
Risk factors for malnutrition.

	Malnourished by staff				Geriatric BMI criteria			
	Well-nourished vs MN & at risk				≥22 kg/m^2 vs <22 kg/m^2			
	Univariate	Multivariate analyses			Univariate	Multivariate analyses		
		P	OR	95% CI		*P*	OR	95% CI
Age	<0.001	<0.001			<0.001	<0.001		
75–89 vs <75		0.055	1.428	0.99–2.05		0.146	1.263	0.92–1.73
>90 vs <75		<0.001	2.162	1.48–3.16		<0.001	1.809	1.30–2.52
Sex	0.002*	NS			0.005*	NS		
Dysphagia	<0.001	<0.001	1.890	1.40–2.54	<0.001	0.001	1.651	1.24–2.20
Dementia	<0.001	<0.001			<0.001	<0.001		
Moderate		<0.001	1.820	1.36–2.44		0.255	1.155	0.90–1.48
Severe		<0.001	2.246	1.62–3.12		0.006	1.490	1.12–1.98
Mobility	<0.001	<0.001			<0.001	<0.001		
Semi-mobile		0.016	1.429	1.07–1.91		0.006	1.417	1.10–1.82
Immobile		<0.001	2.106	1.53–2.90		<0.001	1.751	1.31–2.34
Months since admission	0.023 ~	NS			0.123 ~	0.036	0.998	0.99–1.00
Ø number of drugs/d	<0.001 ~	0.010	0.952	0.92–0.99	<0.001 ~	<0.001	0.911	0.88–0.94
Opiates	<0.001	<0.001	2.171	1.52–3.10	0.072	0.010	1.570	1.11–2.21
Antibiotics	0.097	NS			0.862	NS		
Psycho	0.461	NS			0.479	NS		
Hospital 2006	0.447	NS			0.272	NS		

Univariate analysis: ~Kruskal–Wallis; remaining with χ^2-tests; *male gender protective multivariate analysis: backward model with likelihood-quotient including all statistically significant parameters of first column; only parameters remaining in the model are shown, sex dropped out in the multivariate analysis. OR = odds ratio; 95% CI = 95% confidence interval; Psycho = psychoactive substances; Hospital 2006 = number of hospital stays in the previous year 2006; BMI = body mass index.

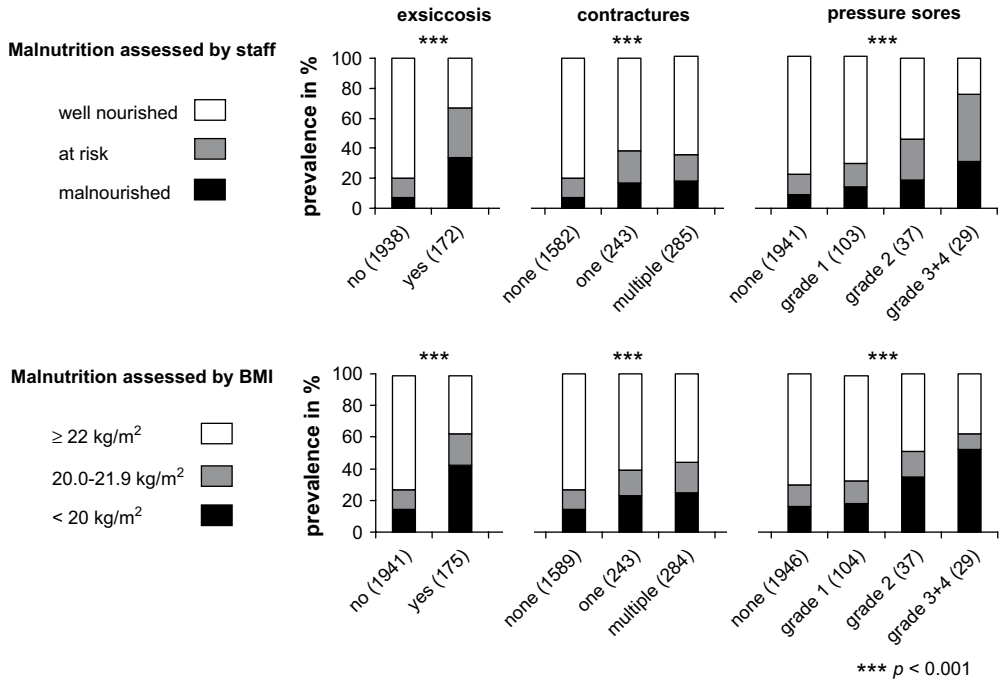

Fig. 1. Possible detrimental effects of malnutrition. The figure depicts conditions (exsiccosis, contractures, pressure sores) in which malnutrition itself possibly contributed to causing or aggravating the respective condition. Number in brackets denotes sample sizes.

3.3.3. Weight loss in the previous year and intake of lunch

We further evaluated if weight loss of more than 6 kg in the previous year or amount of lunch eaten on nutritionDay was associated to staff estimates of malnutrition, BMI criteria, or any malnutrition-related parameter but we could not find any such association.

3.4. Nutritional support

In total, 217 (10.2%), 127 (5.9%) and 25 (1.2%) residents were on oral nutritional supplements (ONS), tube feeding (TF) or parenteral nutrition (PN), respectively. Thirty residents (1.4%) received a combination of at least two nutritional support therapies and additional 25 residents (1.2%) were on other forms of nutritional support, like subcutaneous feeding. The remaining 1771 (82.9%) residents did not receive any nutritional support.

Residents receiving ONS compared to residents receiving TF were on average older (88 ± 8 vs 81 ± 19 years, $p < 0.001$; 46% vs 20% >90 years), had a lower BMI (20.3 ± 3.5 vs 22.9 ± 3.7, $p < 0.001$; 49% vs 20% <20 kg/m^2) and had a higher prevalence of malnutrition by staff estimates (37% vs 8%, $p < 0.001$). The majority of residents on TF were immobile (91%), had dysphagia (84%) and/or chewing problems (77%). Additionally, 69% on TF were severely demented. The prevalence of pressure sores ≥grade 2 was significantly higher in residents receiving ONS (10%) or TF (10%) compared to residents not receiving nutritional support (2%, $p < 0.001$).

Interestingly, ONS or PN did not affect nutritional intake at lunch time. In total, 66% of the ONS group, 67% of the PN group and 65% of the group not receiving any nutritional support ate all, and 9%, 8%, and 9% ate one quarter of lunch or less. When TF was provided, it was given as major or sole source of nutrition in the majority of residents. Overall, 20.4% of residents received less than 500 kcal/d, 11.0% between 500 and 1000 kcal/d, 54.3% between 1000 and 1500 kcal/d and 14.2% more than 1500 kcal/d. The median duration of TF was 19 months with a maximum of 98 months. Except for 7 residents PN was given as part of a combined nutritional support therapy.

3.5. Lunch on the nutritionDay and eating assistance

Data on the actual intake at lunch on nutritionDay documented by means of plate symbols is available from 1922 residents (89.9%): 65.2% ate all, 24.0% half, 6.5% a quarter, 2.7% nothing, and in 1.6%

Table 4
Characteristics of malnourished as compared to well-nourished residents.

In malnourished residents compared to well-nourished residents the prevalence of		Staff classification		BMI classification	
			MN ($n = 197$) vs WellN ($n = 1608$)		MN ($n = 353$) vs WellN ($n = 1468$)
exsiccosis…	was…	10 fold	(30% vs 3%)	4.2 fold	(21% vs 5%)
pressure sores grade 2 and more…		4.0 fold	(8% vs 2%)	4.0 fold	(8% vs 2%)
dysphagia…		3.4 fold	(37% vs 11%)	2.5 fold	(30% vs 12%)
immobility…		2.4 fold	(58% vs 24%)	1.8 fold	(46% vs 25%)
contractures…		2.3 fold	(45% vs 20%)	1.7 fold	(36% vs 21%)
severe dementia…		2.0 fold	(47% vs 24%)	1.8 fold	(43% vs 24%)
chewing problems…		1.9 fold	(28% vs 15%)	2.1 fold	(33% vs 16%)
residents >90 years…		1.5 fold	(40% vs 27%)	1.4 fold	(38% vs 27%)

NH staff subjectively classified the nutritional status of each resident. BMI criteria for malnutrition (MN) as <20 kg/m^2 and ≥22 kg/m^2 for well nourishment (WellN). Residents at risk of malnutrition were not considered in the evaluation.

intake was not known. Reasons for not having eaten everything were provided from 566 residents: Inability to eat that much ($n = 231$, 41%), was not hungry ($n = 182$, 32%), cannot eat without help ($n = 77$, 14%), did not like the taste or smell ($n = 71$, 12.5%), was too tired ($n = 65$, 12%), had swallowing problems ($n = 34$, 6%), had nausea/vomiting ($n = 34$, 6%), meat or vegetables were too hard ($n = 28$, 5%).

Overall, 56% of residents were not helped with eating, 11% received eating assistance for less than 10 min, 25% for 10–20 min, and 8% for more than 20 min.

3.6. Outcome evaluation

Exactly 6 months after nutritionDay, on August 22, 2007, the NHs documented the current location of the respective residents, their actual weight and the number of hospital stays within the last 6 months.

Outcome data were reported from 1483 residents (69%). Of those, 1248 (84%) were still in the NH, 41 (3%) were discharged and 194 (13%) had passed away.

3.6.1. Non-survivors ($n = 194$)

The mortality rate was 22% in residents with a nutritionDay BMI < 20 kg/m^2, 17% in residents with a nutritionDay BMI between 20 and 21.9 kg/m^2, and 10% in residents with a nutritionDay BMI ≥ 22 kg/m^2 ($p < 0.001$). Additionally, mortality was associated with lunch intake on nutritionDay: 42% – ate nothing, 25% – a quarter, 18% – half, and 9% – all ($p < 0.001$).

The multivariate analysis with adjustment for age, sex, BMI, lunch intake, mobility, and dementia, however, attenuated the influence of BMI as independent predictor of mortality ($p = 0.137$), whereas eating nothing (OR 2.4, $p = 0.019$), eating a quarter (OR 2.2, $p = 0.003$) or eating half (OR 1.6, $p = 0.014$) at lunch time remained significant together with semi-mobility (OR 2.0, $p = 0.002$) and immobility (OR 2.7, $p < 0.001$), as well as dementia (OR 1.5, $p = 0.049$).

3.6.2. Survivors ($n = 1289$)

NHs reported the outcome weight of 1190 surviving residents. We defined relevant weight loss and relevant weight gain as losing or gaining more than 6 kg during the follow-up period.

Fig. 2 demonstrates that, interestingly, residents with a low nutritionDay BMI (<22 kg/m^2) had a lower prevalence of relevant weight loss than residents with a higher nutritionDay BMI (≥22 kg/m^2) (3.4% vs 12.4%, $p < 0.001$). Additionally, relevant weight gains were more frequent in the low nutritionDay BMI group compared to the higher nutritionDay BMI group (10.4% vs 7.2%, $p < 0.001$). Similarly, residents classified as exsiccated on nutritionDay had a lower prevalence of relevant weight loss (7.6% vs 10.2%) and a higher prevalence of relevant weight gain (16.7% vs 7.7%, $p < 0.031$) than normally hydrated residents.

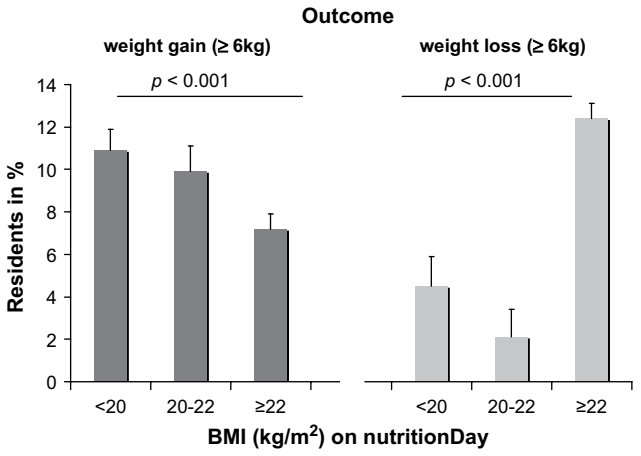

Fig. 2. Outcome weight difference to nutritionDay weight. Relevant weight losses were highest in the well-nourished group whereas relevant weight gains were most often observed in malnourished and at risk residents.

The amount of lunch eaten on nutritionDay was not related to outcome weight loss ($p = 0.758$) nor did residents classified by staff as malnourished or at risk of malnutrition lose more weight than well-nourished residents. Residents on psychoactive substances had a higher prevalence of relevant weight loss than residents who were not on psychoactive substances (12% vs 8%, $p < 0.033$). Residents who were not admitted to an acute care hospital within the follow-up period had a lower prevalence of relevant weight loss (≥6 kg) compared to residents with one hospital stay or more than one hospital stay (7% vs 22% vs 33%, $p < 0.001$). We found no significant relations between weight course and age ($p = 0.799$), dysphagia ($p = 0.971$), chewing problems ($p = 0.971$), cognitive status ($p = 0.193$) or mobility problems ($p = 0.258$).

4. Discussion

In this pilot test of the nutritionDay project in NHs, we evaluated data from 38 voluntarily participating NHs including 79 units, with a total of 2137 residents. This preliminary implementation aimed to test the feasibility of the nutritionDay NH concept by gathering results from German speaking countries: Austria (AUT) and Germany (GER). The project also provided valuable new information regarding nutrition considerations in the NH setting. One such result was that the implementation of the nutritionDay itself might have brought about behavioural changes in the participating units. The outcome results strongly suggest that malnutrition awareness had been raised: Residents who were underweight on nutritionDay had the highest rate of weight gain and the lowest rate of weight loss among the BMI groups within the 6-month follow-up period.

We anticipated that our pilot test may have a positive bias since we relied on voluntary participation, and because only better organised and interested NHs may have agreed to participate. Our results indeed showed indications for a positive recruitment bias. For example, in 73% of units routine nutritional screening was already being performed, nutritional support was implemented according to guidelines in 80% of units, and body weight was being measured (not estimated) in 97% of residents.

Overall, the observed prevalence of malnutrition was 16.7% of residents with an additional 13.9% of residents at risk for becoming malnourished. This is well within the range of the internationally observed 10–70% prevalence of NH malnutrition.[23–25] A recent Dutch NH evaluation implemented by Meijers and colleagues[17] reports a 19.2% prevalence of malnutrition in a comparable NH sample size of 2061 residents covering 39 NHs, or 10.3% of total Dutch NHs. Unfortunately, there is very little nutrition-related data available from NH residents in AUT or GER.[26–28] Most recently Tannen and colleagues[28] found a 15.1% prevalence of BMI below 20 kg/m^2 in 2393 GER NH residents in a survey conducted in 2007. Similar malnutrition prevalence in previous studies compared to our results, however, makes it unlikely that our study had an unusually high recruitment bias. In addition, a retrospective evaluation of 6–12–month weight loss of 6 kg or 10% of actual weight was similar between Meijers et al.'s study (6.8%, last 6 months),[17] Tannen et al.'s survey (7.9%, last 6 months)[28] and our results (9%, last 12 months).

One of the most interesting results of our pilot test was the high rate of weight gains and low rate of weight loss during the follow-up period in residents with an initially low nutritionDay BMI value.

These results may be due to increased awareness through the active participation in the nutritionDay project. Interestingly, such effects are well documented in behavioural psychology and are referred to as the Hawthorne effect.[29] The term describes a significant positive effect that turns out to have no causal basis in the theoretical motivation for the intervention, but is apparently due to the effect on the participant of knowing themselves to be studied in connection with the outcomes measured.[30–32] Nevertheless, we cannot fully exclude that those results are simply due to good nutritional routines in the participating NHs. However, two further results undermine the Hawthorne effect hypothesis. First, there was a high prevalence of relevant weight loss (12.3%) in residents with BMI $\geq$ 22 kg/m^2. Units with good nutritional routines should have been aware that weight losses are to be kept at minimum independent of actual weight or BMI. Second, residents classified as exsiccated on nutritionDay had also a higher percentage of relevant weight gains than the remaining residents. Units with optimised nutrition management would have had exhausted all rehydration and nutrition options at the nutritionDay leaving no room for additional improvements during the follow-up period.

We like to point to some additional results:

1) In total, about 60% of residents with a BMI below 20 kg/m^2 were not identified as malnourished by the staff. This may be attributed to staff relying on their own judgement, and not objective measure, to identify malnourished residents.[6] In our study, however, we are cautious to interpret these results, since the discrepancy may also be explained by the staff correctly distinguishing between the dying and the malnourished resident. Our pilot test data set did not allow for this differentiation. Additionally, some residents may have had a life-long low BMI. Overall, correlational analyses and regression models showed similar results for malnutrition classification by staff and by BMI criteria.
2) Polypharmacy is generally considered a risk factor for malnutrition, as shown in the German Hospital Malnutrition Study in 1886 hospital patients.[33] Interestingly, in our study a higher drug intake was protective against malnutrition in both staff and BMI estimates. The number of described drugs for a patient is usually used as surrogate marker of disease severity.[33] Meijers and colleagues[17] found an increasing malnutrition prevalence together with increasing comorbidities in hospital patients but not in NH residents, which corresponds with our results. In our sample, malnourished and well-nourished residents received 5 and 6 different drugs per day, respectively. Thus the difference in the number of medications given per day was very small and polypharmacy will continue to be monitored in future implementations of the nutritionDay NH project.
3) The results of the pilot test of the nutritionDay in NH showed a lower than expected prevalence of tube-fed residents: 5% vs our expert estimation of 10%. The majority of tube-fed residents were younger than 90 years, immobile, had dysphagia and/or were severely demented. TF in severe dementia is controversial since it is often seen as a TF contraindication from an ethical standpoint (e.g. Korner et al.[34]). However, the medical service of the insurance companies (MDK) evaluated 687 tube-fed GER seniors in 2002[2] and found unjustified TF indications in only 3% of tube-fed residents. ONS did not interfere with the amount of lunch intake in our sample, but depending on the time they are given, ONS may affect food intake rather at dinner time.
4) About half of the residents required assistance with the lunch meal for an average of 15 min. Projected onto an average unit size of 30 residents who take three meals daily, that accounts for 675 min or 11.25 h daily, which corresponds to 1.4 full time positions. Tannen and colleagues recently reported that 44% of GER residents are completely or partially dependent on eating assistance.[28] Furthermore, Akner and Floistrup showed that nursing staff spends 40% of the daytime working hours on nutrition-related issues.[35] Time needed for adequate eating assistance is considerable and should be taken into account when making decisions to cut personnel for cost containment purposes.
5) The outcome results show that a higher than expected prevalence of residents with a BMI below 20 kg/m^2 die. Interestingly, residents who ate less than the full lunch meal at nutritionDay also had a higher 6-month mortality rate than those residents who ate the whole meal. This finding will need further clarification in future implementations of the nutritionDay project in NHs.

5. Conclusions

The pilot run of the nutritionDay in NHs showed that the audit is feasible in NHs and that it is meaningful. Although we cannot exclude a possible positive recruitment bias due to the voluntary participation of NHs, we found internationally and nationally comparable NH malnutrition rates. We believe that active participation itself led to positive action and increased malnutrition awareness.

Future implementations of the nutritionDay could be performed in representative samples of NHs selected on the request by operating or governmental organisations. Given the suggested awareness impact observed in our pilot project it would be useful to see whether improvement takes place in less self-motivated environments as well.

Conflict of interest

All authors stated having no conflict of interest related to the authorship of the submitted paper. DV is currently head of the scientific information department of Pfrimmer Nutricia, Germany. Her involvement in the present project, however, is based on her previous and ongoing academic research in Geriatric nutrition which is associated to the Institute of Nutrition at the University of Bonn, Germany. Pfrimmer Nutricia was neither involved in the study design nor in the collection, analysis and interpretation of data.

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MH and KS conceptualized the nutritionDay in Europe concept; LV and HB modified it to the needs of nursing homes, RS, DV, HL, and CCS provided significant scientific advice to the project. RS, DV, and LV were responsible for centre recruitment. KSt, JT, MHa and RS organised the implementation, data management and communication with NHs, CS was in charge of online data entries. MM, LV, and RS did the data analysis. All authors provided their expertise in the interpretation and discussion of the results and made substantial suggestions on the manuscript.

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