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THE RELATIONSHIP BETWEEN WEIGHT STATUS AND THE NEED FOR HEALTH CARE ASSISTANCE IN NURSING HOME RESIDENTS

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Abstract: *Objective:* The purpose of this study was to evaluate the relationship between underweight status and weight loss events on the need for health care assistance among a sample of Danish nursing home residents over 12-months. *Design:* Longitudinal, repeated measures design with three data collection points at baseline (2004) and six and 12 months post baseline. *Setting:* 11 Danish nursing home facilities. *Participants:* 441 Danish nursing home residents over the age of 65. *Measurements:* Resident Assessment Instrument (RAI-NH) data were abstracted for each participant at each of three data collection points. RAI-NH data related to facility staff ratings of residents' physical functioning (Activities of Daily Living, ADL) status and their need for health care staff assistance related to ADLs were collected at each time point in addition to the resident weight status and experience of weight loss according to three criterion (i.e., > 1%, >5% or >10% of baseline body weight at 6 or 12 months) and Body Mass Index (BMI) values. *Results:* Low BMI (< 18.5) and weight loss were both significantly associated with the need for staff assistance with ADLs during a 12-month timeframe. *Conclusion:* The results of this study suggest that elderly nursing home residents with a low BMI or weight loss may add to the substantial and costly burden of nursing home care due to the associated need for higher levels of ADL assistance.

Key words: Under-nutrition, activities of daily living, resident assessment instrument.

Introduction

Whilst health care policies and resources are increasingly focused on the problem of overnutrition and obesity in Western societies, the costly burden of under-nutrition is often overlooked. An English report found that disease-related under-nutrition costs over 10.5 billion EURO per annum - more than double the projected cost of obesity (1). At least half the cost of under-nutrition could be accounted for by the elderly (1). With an increasingly ageing population and health care resource constraints, a greater proportion of sick and debilitated individuals are cared for outside of the hospital, for example at home or in nursing homes. Many studies highlight the extent of under-nutrition among these groups of elderly (2).

With regard to nursing home residents, numerous studies have shown that a substantial proportion of long-term care residents have low Body Mass Index (BMI) values indicative of under-nutrition and/or experience unintentional weight loss (3-7). A BMI value considered indicative of under-nutrition is less than 18.5 according to the World Health Organisation (8), although some studies apply a higher criterion for the elderly (e.g. (3, 4, 7). An often used criterion for clinically significant weight loss is a loss of 5% or more of initial body weight in 30 days or 10% or more in 180 days (9). Studies from various groups and countries have reported that 10% to 38% of nursing home residents have BMI values indicative of under-nutrition and 14% to 38% experience clinically significant weight loss within one year.

Under-nutrition can affect the function of muscles and overall strength, including the ability to perform Activities of Daily Living (ADL) without assistance (10). This relationship between ADL functioning, BMI and weight loss has been demonstrated in other studies, where ADL functioning was significantly associated with either a low BMI and/or a recent weight loss episode (3,

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4, 7). In addition, Beck & Damkjær (11) found that nursing home residents with a BMI<24 had a significantly higher degree of dependency in eating, personnel hygiene and toilet use than those with BMI≥24.

The primary limitation of these aforementioned studies is that these were all descriptive, cross-sectional studies with data collection at only one point in time. Therefore, only limited conclusions can be drawn about which come first – ADL decline or low BMI and/or weight loss. Furthermore, none of these studies assessed the relationship between under-nutrition and the need for staff assistance to perform various ADLs (3, 4, 7, 11). However, in a large European study involving 4,455 recipients of home-care, clients with unintended weight loss (>5% in 1 month or >10% in 6 months) received more ADL assistance than those without unintended weight loss (12). In a separate Swedish study among 80 elderly receiving home-care assistance undernourished subjects had a greater need for daily assistance and care (13). A sub-group of participants were re-examined after 1-year and large variations in weight change, ranging from -23.4% to +14.5% of body weight, were observed. The impact of these changes on the need for daily assistance was not reported in this study (13). The purpose of this longitudinal, repeated-measures study was to evaluate the influence of underweight status and weight loss events on the need for health care assistance among a sample of Danish nursing home residents over 12-months. Unlike most previous studies, this study uses data from three time points to determine if change in weight and BMI status over time is significantly associated with change in ADL functioning and the need for staff assistance to perform ADLs during the same time period.

Methods

Subjects and Setting

Resident Assessment Instrument for nursing homes (RAI-NH) data was abstracted for 441 Danish nursing home residents above the age of 65 in 11 facilities at baseline (2004) followed by 6 and 12 months post baseline, for a total of three data collection points. These data were collected by indigenous nursing home staff as part of their routine, standardized assessments and then abstracted from each participant's medical record by research staff during each of three on-site visits. In addition, participant Information about age, sex, and length of stay (LOS) was obtained from the RAI-NH. Based on five RAI-NH-items each participant was classified into seven Cognitive Performance Scale scores (MDS-CPS) from 0 (intact) to 6 (severely impaired or comatose) (14).

Measures

Resident Assessment Instrument for Nursing Homes (RAI-NH)

The RAI-NH is a standardized assessment routinely completed by nursing home staff to assess physical functioning, nutritional (e.g. height and weight), medical (diagnoses), cognitive, psychological and social status. Each item of the RAI-NH has a standardized definition and coding instructions (9, 15, 16). The data used in this study was based on the most recently completed MDS assessment, version 2.0 (www.interrai.org). Facility nurses assessed resident performance during the previous 7 days (in some cases 30 days or longer). The nursing staff measured the weight of the residents before each research staff visit.

ADL-functioning and need for health care staff assistance

Based on seven RAI-NH-items, each resident is rated by nursing home staff according to their level of dependency on staff with regard to Activities of Daily Living (ADL) for: bed mobility, transfer, locomotion on unit, dressing, eating, toilet use and personal hygiene. Each item is scored 0 (completely independent) to 4 (totally dependent); thus, the 7-item MDS-ADL scale yields a total score from 0 (rated by nursing home staff as completely independent in all 7 areas) to 28 (rated by nursing home staff as totally dependent in all 7 areas) [17]. In addition, each resident also is rated by nursing home staff as to their need for staff assistance in each ADL area using the following categories: 0 (no set up or physical help from staff), 1 (set up help only), 2 (one person physical assist) or 3 (two+ persons physical assist). This variable was dichotomised (0= no need for health care staff assistance, >0 = need for any health care staff assistance).

Weight loss and low BMI

Data about height and weight were obtained from each participant's most recent RAI assessment at each of the three data collection points (baseline, 6 and 12 months). Weight loss was defined according to three criteria: loss of 1% or more, loss of 5% or more and loss of 10% or more of the person's initial body weight in 6 or 12 months. The rationale for these criteria is based on a former study where results showed that any weight loss had a significant influence on function, hospitalisation and mortality of old Danish nursing home residents (18). A Low BMI was defined as less than 18.5 and calculated based on each participant's height and most recent body

weight [8]. Because oedema (i.e., swelling due to fluid retention) could be a confounder in relation to weight change, information about the presence or absence of oedema was obtained from the RAI-NH at each of the three data collection points.

Ethics

The Ethics Committee of Copenhagen approved the study protocol, and informed consent was given by the residents or by proxy.

Data Analyses

To compare the groups at baseline Mann-Whitney test and Pearson's chi squared test were used as appropriate. Linear regression was used to assess the relationships between age, any weight loss and ADL total scores (0-28). Pearson's chi squared test were used to assess the relationship between different weight loss groups (more than 1,5 and 10%, in, respectively 6 and 12 months) and need for health care staff assistance (0= no need for health care staff assistance, >0 = need for any health care staff assistance). . The results are presented as median (95% CI) and number (%). A p-value <0.05 was considered significant. SPSS 14.0 for Windows was used for statistical analysis.

Results

Subjects and Setting

The baseline characteristics of the participants are presented in table 1.

Table 1
Baseline characteristics of the study sample

N	441
Alive at visit 2 after 6 months (%)	383 (87)
Alive at visit 3 after 12 months (%)	325 (74%)
Age, y (SD)	85.2 (7.5)
LOS (SD)	2.5 (3.3)
% Female	80
ADL (see text for explanation) (scale 0-28) (SD)	13 (9)
CPS (see text for explanation) scale (0-6) (SD)	3 (2)
BMI (SD)	23.4 (5)
% BMI<18.5	16
Weight loss, follow-up (%)	
Loss of 1% or more at visit 2 after 6 m	154 (42)
Loss of 5% or more at visit 2 after 6 m	70 (19)
Loss of 10% or more at visit 2 after 6 m	29 (8)
Loss of 1% or more at visit 3 after 12 m	141 (46)
Loss of 5% or more at visit 3 after 12 m	89 (29)
Loss of 10% or more at visit 3 after 12 m	43 (14)

LOS = Length of stay, ADL = Activities of Daily Living, CPS = Cognitive Performance Scale; a) See description and definition of terms in the text

Weight loss and dependency in ADL functions

Body weights were obtained from 431 (98%), 366 (96%) and 306 (94%) at the three assessment points, respectively. Nearly half of the residents experienced weight loss within the 6 and 12 months (see table 1). Overall the baseline characteristics of the residents (age, sex, LOS, oedema, cognitive, functional and nutritional status) did not differ between the different weight loss categories. The only difference at baseline was in LOS between those with or without a weight loss above 5% in 12 months (2 (1-3) vs. 1 (1-2) y, p=0.044). There was no association between age at baseline (visit 1) and weight loss at any time, or between age at baseline and loss of ADL-functions. There was a significant association between weight loss and loss of ADL-functions only between baseline and 12 months later (ß=-0.13, p=0.024).

Weight loss and level of health care staff assistance needed

The results regarding the need for any health care staff assistance (> 0) in the 7 ADL items for the different groups of weight loss are presented in Tables 2.

Low BMI

Baseline characteristics (age, sex, length of stay, cognitive and functional status), in groups with BMI <18.5 and BMI ≥18.5, are presented in Table 3. There was a difference in age and Total ADL-score between the two groups. At baseline the difference in ADL-score was reflected in the need for health care staff assistance (Table 4).

Discussion

In the present study results showed that a low BMI and weight loss among old (65+ y) nursing homes residents was significantly associated with the need for staff assistance with ADLs during a 1-year timeframe based on a 7-item RAI-NH measure of ADL functioning. An ADL-score based on RAI-NH items has been used in multiple studies which have shown a significant association between ADL dependency and nutritional status (3, 4, 7, 18-20). Specifically, it is known that residents who are eating dependent tend to be at high risk for under-nutrition and weight loss (3, 21, 22). The amount of weight loss considered clinically significant among elderly people is much debated (23). We chose to use weight loss criterion of 1% or more in 6 and 12 months; of 5% or more in6 and 12 months; and of 10% or more in6 and 12 months to determine if the significant association between weight loss, ADL function and the need for health care assistance existed using different weight loss criteria. The results indicated that any weight loss, regardless of magnitude, may have a negative association with ADL functioning and the associated need for health care assistance.

Table 2

Prevalence (%) of Resident Needing any Health Care Staff Assistance, in Different Weight Loss Groups (m=months) at baseline and follow-up (after 6 and 12months)

	Follow up at 6 months						Follow-up at 12 months					
	No loss	Loss>1%	No loss	Loss>5%	No loss	Loss>10%	No loss	Loss>1%	No loss	Loss>5%	No loss	Loss>10%
Bed mobility	30vs.37	39 vs.49	31vs.39	47 vs. 56	33vs.41	43 vs. 60	35 vs. 42	32 vs.41	33vs.39	37 vs. 48	32vs.39	45 vs. 55
Transfer	48vs.50	49 vs.59 **	47vs.51	53vs.69***	48vs.52	53vs.73 **	51 vs. 59	44 vs. 53	46vs.54	51 vs. 63	47vs.55	52 vs. 64
Locomotion - unit	45vs.42	40vs.52***	43vs.44	46vs.59***	43vs.45	43vs.63***	46 vs. 49	42 vs. 49	43vs.46	46vs.55*	44vs.47	48vs.6**
Dressing	74vs.81	77 vs.84	75vs.81	78 vs.85	75vs.81	80 vs. 90	76 vs. 82	69 vs. 78	72vs.78	75 vs. 85	72vs.79	76 vs. 88
Eating	29vs.36	38 vs.48	31vs.38	40 vs.56 *	32vs.40	40vs.60 *	32 vs. 43	31vs.50*	28vs.41	40 vs. 58	30vs.43	43 vs. 64
Toilet use	54vs.64	55 vs.72 +	53vs.65	59 vs.77	53vs.48	63vs.80***	57 vs. 73	47 vs. 63	52vs.67	54 vs. 72	52vs.67	57 vs. 79
Hygiene	70vs.73	69 vs.78 **	68vs.73	75 vs.84	69vs.74	80vs. 93+	70 vs. 77	66 vs. 76	67vs.74	72vs.84+	68vs.75	68vs.88 *

+ p<0.1, * p<0.05, ** p<0.01, *** p <0.001, CHI-squared test, prevalence visit 1 vs. visit 2

Table 3

Baseline Characteristics (percentage or median (95% CI)) of Residents with BMI, respectively <18.5 or higher

	BMI <18.5	BMI ≥18.5
Prevalence (%)	16	84
Age (y)	87 (84-90)	85 (85-86) *
Sex (% w)	85	79
LOS (y)	1 (1-3)	1 (1-2)
Total ADL-scorea)	17 (12-20)	9 (7-11) ***
CPS scorea)	3 (2-3)	3 (2-3)

* p<0.05, *** p<0.001 BMI<18.5 vs. BMI ≥18.5, Mann-Whitney test; LOS = Length of Stay, ADL = Activities of Daily Living, CPS = Cognitive Performance Scale; a) See description and definition of terms in the text

Table 4

Prevalence (%) of Resident with BMI, respectively <18.5 or higher. Needing any Health Care Staff Assistance at Visit 1

	BMI <18.5	BMI ≥18.5
Bed mobility	57	40 *
Transfer	70	52 *
Locomotion - unit	65	44 ***
Dressing	92	81 *
Eating	55	39
Toilet use	78	66 *
Hygiene	82	75

+ p<0.1, * p<0.05, ** p<0.01, BMI<18.5 vs. BMI ≥18.5, CHI-squared test

Based on the information in the RAI-NH, each resident can be placed into one of seven main categories – the RUG-III (Resource Utilization Group) classification system –The ADL score is used in all determinations of a residents' placement in a RUG-III category. In an American field test of the RUG-III system (25). Four ADL items (level of physical dependency and need for staff assistance for: eating, bed mobility, transferring, toileting) included in the RAI-NH, accounted for 30% of the variance in total nursing cost among all residents, and 37% of the variance in nursing cost among residents without special nursing needs. Additionally, the mean nursing cost for each ADL increased with increasing levels of dependency.

Even though weight loss may be negatively associated with ADL dependency, this does not translate into a causal relationship such that a weight gain of the same magnitude would necessarily be positively associated with an improvement in ADL functioning. A controlled intervention trial would be necessary to determine the causal link, if any, between improved weight status and associated changes in ADL dependency for elderly nursing home residents, who often have a myriad of other health conditions that contribute to their overall functional status. A recent review of the literature on the effects of oral nutritional interventions on weight change and functional outcomes in older nursing home residents showed some evidence for a positive effect of oral nutritional interventions on physical functioning (26). Strength training also has been shown to be an effective intervention for improving physical functioning in older people (27), the benefits of which may be enhanced further through a combination of strength training and nutritional supplementation. In fact, given the level of dependency and medically complexity of nursing home residents, it is likely that a multi-component intervention involving strength training, nutritional intervention and adequate staff assistance to promote oral intake would be necessary to improve both nutritional status and physical function. Even though a nutrition intervention may be time consuming for the staff (28, 29), this may be cost-effective if nutrition and hydration status improves such that other poor clinical outcomes are prevented (e.g., hospitalizations, infections, wound healing).

This study has a few notable limitations. First, we relied on nutritional data recorded by the clinical staff. It was beyond the scope of the project to verify the accuracy of these data by repeating any of the nutritional status measurements. However, the prevalence of weight loss in this study was comparable to findings in other studies using the same criteria (3, 6, 7). Secondly we used the World Health Organisation criteria for undernutrition, even though some studies suggest it should be higher (3, 4, 7). Thirdly, as mentioned previously, we cannot determine the direction of the relationship between

weight loss, low BMI and the need for staff assistance. Overall, residents who are physically dependent in one ADL area are often dependent in several others so having a higher ADL total score is a marker for a more impaired resident overall and, thus, one who requires more staff assistance and time in many care areas, including eating. Staff assistance with eating is often sub-optimal for nursing home residents, which can contribute further to under-nutrition and weight loss (28). In relation to this, Woo and colleagues (22) found that higher staff levels were associated with a reduced risk for BMI<18.5. However, this and other studies showing similar relationships between weight and functional status are observational or cross-sectional studies, not controlled intervention trials. A major strength of this study is that we were able to calculate changes in weight, BMI and physical function over a 12-month period based on three assessment points, which allowed us to examine the relationship between these measures over time. The results of this study suggest that elderly nursing home residents with a low BMI or weight loss may add to the substantial and costly burden of nursing home care due to under-nutrition and an increased need for health care assistance.

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