Impact of Cognition and Handfeeding Assistance on Nutritional Intake for Nursing Home Residents

M Batchelor-Murphy[1], **SM Kennerly**[2], **SD Horn**[3], **R Barrett**[4], **N Bergstrom**[5], **L Boss**[6], **TL Yap**[7]

[1]School of Nursing, The George Washington University, Washington, DC, USA.

[2]College of Nursing, East Carolina University, Greenville, NC, USA.

[3]School of Medicine, University of Utah, Salt Lake City, UT, USA.

[4]International Severity Information Systems and the Institute for Clinical Outcomes Research, Salt Lake City, UT, USA.

[5]School of Nursing, University of Texas Health Science Center at Houston, Houston, TX, USA.

[6]Memorial Hermann Northeast Medical Center, Humble, TX, USA.

[7]School of Nursing, Duke University, Durham, NC, USA.

Introduction

Older adults living in the nursing home (residents) are a high-risk population for low food intake and malnutrition due to co-morbid conditions that often impact cognition and functional ability.[1] Malnutrition in the nursing home (NH) setting has been problematic for decades, and has been linked to increased rates of weight loss, infections, falls, and pressure ulcers/injuries (PrI).[2,3] Nutrition and hydration play an important role in preserving skin and tissue viability and preventing pressure injury. Adequate calories, protein, fluids, vitamins and minerals are required by the body for maintaining tissue integrity and preventing tissue breakdown. Inadequate ydration and nutrition are the key risk factors for the development of PrIs and both play an essential role in skin and tissue viability and help tissue repair in management of PrI prevention.[4,5]

With the Omnibus Budget Reconciliation Act of 1987, nutritional health became a standard in NH care and uniform tracking of resident meal intake and weight loss through the Minimum Data Set (MDS) enacted.[2,5–7] In the MDS 2.0 (1998 – 2010), one variable for identifying nutritional problems was "(leaving) 25% or more of food uneaten at most meals"

or eating less than 75%.[1,5,8] To collect data for this variable, NHs developed their own paper-based tracking system for meal intake to document a percentage of overall estimation. Subsequent research studies demonstrated that 64–80% of all residents were at risk for weight loss and malnutrition, and those with dementia are at higher risk than those without dementia.[9–12]

Over half of NH residents have some form of cognitive impairment, and most with moderate or severe dementia.[13] Dementia is a disease that progressively robs an individual of the cognitive and physical abilities needed to complete their own activities of daily living (ADL). The last ADL lost is the ability to eat independently, increasing the reliance on NH staff to provide feeding assistance to meet residents' nutritional needs.[14,15] While the MDS identifies the residents level of ADL support needed for eating, the daily decision-making for the level of feeding assistance to provide for each meal is delegated to Certified Nursing Assistants (CNAs) and level of feeding assistance is not typically tracked. Further complicating decisions related to level of feeding assistance required over the course of a day are fluctuations in a resident's self-performance. The level of support required by a resident can vary over the course of a day, and day to day.[6,7,9,16] When providing daily care, CNAs typically know if a resident is dependent on the staff for meal assistance and the level of assistance required. However, how much and what type of assistance to provide to residents who are "set-up only" is left to the CNAs available time and individual judgement, resulting in a wide range of assistance offered. For example, CNAs may open containers for the resident, but then leave the room; or may provide handfeeding assistance for none, part, or all of a given meal. The mismatch of support to resident ability for each meal sets the stage for resident unplanned weight loss and malnutrition; in fact, the amount and quality of feeding assistance provided has been identified as the most powerful indicator of meal intake.[9] Weight loss is commonly treated with orders for high-density protein supplements, and/or snacks being added to the care plan in an attempt to improve total intake.[5–7,16] Between meal snacks have been found to be an important aspect of total food intake as well as the type of feeding assistance provided.[17] Low meal intake, requiring feeding assistance, cognitive impairment (dementia), and weight loss are all the key risk factors for developing PrIs.[18]

The Turning for Ulcer Reduction (TURN) study was a multisite clinical trial conducted April 2008 through June 2011 with the primary aim of assessing the impact of optimal repositioning schedules (2, 3, or 4 hours) for PrI prevention. In addition to primary outcome data, data were also collected on resident nutritional status for three weeks through documentation of percent estimations of daily meal intake, supplements, and snacks; type of feeding assistance provided during meals; cognitive status; and body weight. Primary outcomes have been reported elsewhere.[19,20]

The TURN study was designed as a randomized controlled trial (RCT) with the addition of a practice-based evidence (PBE) study design. A PBE study collects detailed patient, treatment, and outcome data elements that front-line clinicians (in this case nursing home CNAs, physicians, and nurses) think could be important to understand why some residents develop pressure ulcers and others do not. Hence, data collection was designed to answer many additional research questions beyond just repositioning schedule. Therefore, the

purpose of this secondary data analysis was to examine the impact of resident cognitive status and level of feeding assistance provided on meal intake, total intake (meal intake + snacks supplements), and body weight with the TURN data.

Methods

TURN Study Design

The TURN study was implemented in twenty-seven NHs in the United States (U.S.) and Canada. Nursing home residents were enrolled in a rolling manner for up to three weeks each in order to even out workload over the course of several months to a year per site.[19] Full study protocols related to optimal repositioning intervals (2, 3, or 4h) have been reported elsewhere.[19,20] The data used for this analysis includes data collected from CNA documentation of resident intake using the *CNA Shift Documentation Record* (a TURN study form). Previously nutritional outcome data have been reported by overall mean percentage of meal intake (e.g., $75.1 \pm 21.6\%$) and also usual intake as rated by the Nutrition subscale of the Braden Scale for Predicting Pressure Sore Risk© (hereafter, Braden Scale), but did not include analysis by level of feeding assistance provided during meals.[19,20]

Setting and Sample

Nursing homes were identified in the U.S. through the Advancing Excellence Campaign, state Quality Improvement Organizations, corporate nurse executives, and other contacts of the study team. Canadian NHs in Ontario were identified by the Toronto Health Economics and Technology Assessment Collaborative. U.S. NHs (n=20) from 10 different states representing all four regions (Northeast, South, Midwest, and Southwest) were classified as rural (n = 12), suburban (n = 4), or urban (n = 4). NHs were eligible to participate if they were Medicare and Medicaid certified and ranged from 120–566 beds (5 NHs had fewer than 100 beds). The Canadian NHs (n = 7), located in the greater Toronto area, were classified as suburban (n = 5) or urban (n = 2) and ranged from 151–300 beds.

The TURN study enrolled 942 residents who were aged 65 or older, newly admitted (7 days) or long-stay (90 days), had limited mobility, no PrI on admission to the study, were cared for on high density foam mattresses, and deemed to have a Braden Scale Score© predicting moderate or high risk for developing a PrU (Braden score of 10–14).[19] Residents were excluded according to age(65 years), length of stay, mobility, and deemed by the Braden Scale to be at no risk, low risk (Braden 15 – 23), or very high risk (Braden 6–9) for developing a PrI.[19]

Institutional Review Board (IRB) approval was obtained from the University of Texas Health Science Center at Houston, the University of Toronto, and one clinical site. All NHs in the U.S. completed Federal Wide Assurances to indicate the University of Texas Health Sciences Center at Houston as the IRB of record for the study. Informed consent was obtained from each resident deemed to be competent to answer protocol-related questions. If a resident had a documented diagnosis of dementia (Alzheimer's disease or related-dementia) in their medical record, informed consent was obtained from a legally authorized representative (LAR).[19] If a face-to-face meeting was not possible with the LAR, a

telephone consent script form was used for initial consent; however, these residents were not enrolled in the study until the original signed consents were received.

Measures

The TURN study collected resident demographics; total and mean percent intake of meals, snacks, supplements, and assistance; total Braden Scale © and subscale scores; active disease diagnoses; nursing home location; length of stay (short- or long-stay); mobility documentation via actigraphy, and number of incontinent episodes warranting a brief change. For this analysis, data including demographics, active dementia diagnosis, body weights, and all nutritional intake and feeding assistance data were used.

Demographics.—After obtaining informed consent, resident demographic data were extracted from the medical record by the study staff including resident age, date of birth, gender, race/ethnicity, height, and weight.[19] MDS variables extracted for cognition were presence of an active diagnosis of Alzheimer's disease and/or Dementia other than Alzheimer's.

CNA Shift Documentation Record.

Meal, Snack, Supplement Intake.: To reduce research burden and integrate data collection into the normal daily workflow of the NH, intake was documented on a paper-based, investigator-developed tool for the TURN study, and completed by CNAs as part of a daily *CNA Shift Documentation Record* (See Table 1). CNAs received training on the study protocol and completion of all forms. Supervisors (licensed nurses) checked forms each shift for completeness of percent of intake for three meals and any snacks/supplements offered and level of feeding assistance documented per meal.[19] Using the existing standard of care for documenting resident meal, snack, and supplement intake was recorded in categories of Refused, 1–25%, 26–50%, 51–74%, 75–99% or 100%. Meal, snack, and supplement caloric values were standardized to allow comparison across residents.

Meals.: In accordance with each NH's interpretation of regulatory requirements and best practices for maintaining body weight, a specific dietary plan was developed by a dietician associated with the NH for each resident at the time of the study.[19,20] Individual resident meal orders for "therapeutic diets" (e.g., low-sodium, low-fat, no added sugar) and exact calories served and consumed for enrolled residents were not documented. For calculation standardization across NHs, individual meal calories were set at 500 calories to equal a total maximum of 1500 daily calories if residents consumed 100% of food offered across 3 daily meals.

Snacks.: Snacks (e.g., crackers with peanut butter, pudding, or ice cream) were provided between 1–3 times daily by the CNAs to residents who had a dietary order to have a snack. For calculation standardization across NHs, each snack was set at 200 calories per serving and the reported percentage of the snack that was consumed by the resident was documented.

Supplements.: Dietary liquid supplements were defined as products used to complement a resident's dietary needs (e.g., enteral products, meal replacement products) that the resident drank during the course of the day. Examples of this type of dietary liquid supplement include Ensure® or Glucerna®, both containing 220 calories per 8 fluid ounce serving (237ml).[21,22] Canadian nursing homes served facility prepared milk shake type supplements. All dietary liquid supplements were provided between 1–3 times daily by the CNAs to residents who had a dietary order. For calculation standardization across NHs, each dietary liquid supplement consumed by a resident was factored into the total daily caloric intake as the percentage consumed from a total of 250 calories per serving.

Level of Feeding Assistance During Meals.: CNAs documented the level of feeding assistance provided for residents each meal in three categories: eating independently, set-up only, or needs help eating. *Eating independently* was defined as the CNA not needing to provide eating support beyond tray delivery within reach of the resident. *Set-up only* was defined as the CNA being required to cut food into bite size pieces, open containers of food and/or drink items (e.g., milk cartons, pudding, or ice cream cups), and then leave the area for the resident to consume their meal independently. *Needs help eating* was defined as the CNA being required to stay with the resident during the meal to either intermittently or completely provide handfeeding assistance in order for the resident to eat. Level of assistance provided for snack or supplement intake was not recorded.

Body Weight—Body weight was extracted from the resident medical record prior to study onset and at the conclusion of the resident's study period. Timing may have varied among NHs, but weights were generally obtained upon admission and then weekly. Study staff obtained an initial weight from the time of study enrollment and any weights documented between enrollment and study conclusion. Weight change was converted statistically to no change in weight; weight gain, or weight loss of 5–10% (+/−) change within last 30 days, or >10% (+/−) in last 180 days.

Analysis

Using SAS 9.2 for all analyses, descriptive statistics were calculated to describe the study sample. To calculate mean resident intake, the repeated measures for meal, snack, and supplement intake were calculated as midpoints. Midpoints used were 12.5% for intake documented between 1–25%; 38% if intake 26–50%; etc. Intake documented as Refused or NPO were calculated as 0% and intake documented as 100% was calculated as such. Mean scores were then calculated in the usual manner (sum of observation values) as the numerator, and number of meal observations as the denominator. Missing meal, snack, or supplement data were excluded in the denominator count, not calculated as zero.

For each study resident, the mean daily intake was calculated over all the days the resident was in the study, with one mean intake per resident utilized in further analyses. Although residents were clustered within facilities, after controlling for individual variables, residents within a facility were not highly correlated. This was checked prior to further analyses.

Two-sample t-tests were used to determine significant differences in total calories consumed among those residents receiving snacks/supplements or not, separately for those with and

without dementia (Table 4). Analysis of variance tests (ANOVA) were used to determine significant differences among the three levels of feeding assistance for the two groups separately (residents with dementia and without dementia) (Tables 2 and 3).

Results

Sub-Sample and Cognition

For the secondary data analysis, enrolled residents were only included if they were (1) long-stay residents, (2) had complete co-morbid condition information, (3) had documentation regarding level of feeding assistance, (4) and a pre- and post-bodyweight for comparison of weight loss/gain during the study period (N = 786). These residents were divided into two groups: residents with dementia (n = 592) and residents without dementia (n = 194). The percent of residents with dementia is typically over 45% in both the U.S. and Canada, and comprised 75.3% of this subsample.[23,24]

Impact of Cognition and Level of Feeding Assistance: Meal Intake, Meal Intake Over the Course of the Day, Total Intake with Snacks and Supplements, and Percentage of Residents with Weight Changes

Meal intake.—When examining overall daily meal intake, residents in both groups who were provided set-up only assistance consumed significantly less of their meals than residents who were independent or needed help (See Table 2). Residents *with* dementia who were provided set-up only help consumed an average of 68% (p < .0001) of their meals, compared to 80% of meals for independent residents and 78% of meals for those who needed help. Residents *without* dementia who were provided set-up only help consumed an average of 73% (p = 0.0044) of their meals, compared to 85% of meals for independent residents and 77% of meals for those who needed help.

Over the Course of the Day.—Overall, residents without dementia consumed more food on average than residents with dementia, regardless of level of feeding assistance provided. All residents consumed a larger percentage of their meals at breakfast than at other meals regardless of the degree of feeding assistance. The number of residents with dementia being perceived as needing help or set-up fluctuated only slightly from 513 to 517 residents over the course of the day (See Table 3). Those who were set-up only consumed significantly less food for all three meals: breakfast (74%; p = 0.0046), lunch (65%; p < .0001), dinner (65%; p < .0001).

Residents without dementia needing help or set-up only fluctuated only slightly over the course of the day. These residents consumed significantly more food for breakfast if independent (89%; p = 0.0366), less food for lunch if they needed help (71%; p = 0.1413), and at dinner if they were set-up only (70%; p = 0.006).

Total Intake with Snacks and Supplements.—Offering snacks or supplements to residents significantly increased total daily intake (p < .0001) within each group (with and without dementia; See Table 4). There were no significant differences in intake with or without supplements between groups (p > 0.44).

Percentage of Residents with Weight Changes.—There were no significant differences in the percentage of subjects with body weight changes within or between residents with or without dementia (See Table 5). Data trends are described for clinical interest. More residents with dementia experienced weight changes (n = 29; 4.90%) than residents without dementia (n = 3; 1.55%)

Among residents with dementia, the largest percentage of those who lost weight were those who needed help eating (3.85%). Overall, 2.87% of residents with dementia lost body weight during the study.

Some residents with dementia gained weight (n = 12; 2.03%). Fewer residents gained rather than lost weight. The greatest percent of residents with dementia who gained weight ate independently (6.1%).

Discussion

Residents living in the NH often have multiple chronic conditions that impair cognition and functional ability. This loss can lead to increasing risk for malnutrition and weight loss when impaired function decreases dietary intake.[1,5] These residents are complex and challenging for all care providers. The majority of care delivery burden falls on CNAs, who must balance promoting independence for self-feeding while providing adequate support for those who require assistance.[25] Matching the level of assistance provided to a person with dementia needs and capabilities per meal is key; yet, learning the skills to make these decisions are not included in basic CNA training curricula.[1,25–28]

These findings support earlier studies that have indicated NH residents with dementia are at greater risk for low intake compared to residents without dementia.[9,12,29] Documenting overall meal intake percentage is common in clinical practice; this study is novel in asking CNAs to document the level of feeding assistance provided for each meal. Residents with dementia more often need help with eating in the form of verbal and visual cueing, focus on eating may wander to other environmental stimuli, and residents' attention may need to be redirected to eating. In later stages, physical assistance and feeding may be required.[30] Residents who are independent with meals or those deemed to require help with meals consume more food than residents deemed to be set-up only. Possible reasons for this include that CNAs may overestimate a resident's ability to manage meals independently and/or they may have competing demands during mealtimes that don't allow for spending adequate time with individual residents to ensure meals are completed.[31] Another potential explanation could be a lack of understanding for how to manage feeding behaviors such as not opening the mouth or turning the head way.[29,32] The majority of residents in this secondary analysis that required feeding assistance were residents with dementia (59.92%); feeding behaviors are often interpreted by CNAs as care resistance and feeding attempts cease or persistence just exceeds available time.[33,34]

This secondary data analysis indicates that residents with dementia required more assistance at the end of the day. This finding reiterates that residents with dementia are more vulnerable to low meal intake than residents without dementia and more of these residents require

assistance with the evening meal compared to breakfast. Resident energy level and fatigue at the end of the day are possible factors, as well as sun-downing or other behavioral issues that may impact meal intake.[34] This finding has potential implications for required staffing ratios in the NH the day (7am–3pm) and evening (3pm–11pm) shifts where all three meals are delivered to residents. NHs are required to have more staff present for day shift when most ADLs are completed with residents, and less staff for the evening shift – yet, evening shift documentation residents requiring more assistance with the evening meals than breakfast or lunch. Many studies have found that staff patterns may contribute to assistance not being provided to residents who required assistance.[35] Assisting residents with meals in the most time intensive of the ADLs, but providing feeding assistance improves resident, snack, and supplement intake.[35–37]

This secondary data analysis did not find significant differences in body weight for either group given the short time frame (21-days). While only residents with two weights available for comparison were included in this sub-sample, the time frame between each weight is unknown and potentially variable (e.g., missed weekly weight). The clinical interest lies in the data trend that between categories (weight gain or loss) residents were nearly equal in total percentage of weight loss and weight gain. Between groups, however, residents with dementia showed more weight changes than residents without dementia reinforcing the need for meal eating support.

Limitations.

The TURN study was not designed to specifically answer the research question posed for this secondary data analysis; therefore, while CNAs were trained to complete data collection forms regarding meals, and a licensed staff member observed that forms were complete, there were no specific attempts to alter feeding processes in the facility. The goals of the TURN study were different; feeding was not the central focus. Instead, TURN focused on creating a recognition of other variables (covariates) that would more fully have informed the study findings. Other limitations regarding the resident sample include the unknown impact of resident degree of cognitive decline, functional ability, medical co-morbidities, and medications. Meal, snack, and supplement intake, while standardized, is still an estimation of intake rather than a precise caloric intake measure. Limitations regarding the staff include self-reporting of feeding assistance offered and unknown staffing levels during TURN study data collection period. The present study draws attention to the need to more fully understand the need for appropriate meal support on quality resident outcomes.

Acknowledgments

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Take Away Points

- When a NH resident has a diagnosis of dementia, they are at greater risk for low meal intake than residents who are cognitively intact.

- This secondary data analysis highlights results that are counter intuitive to the belief that the most likely to experience low food intake are those who are dependent for care and require assistance with feeding

- This study illuminates that the residents who are most at risk for low meal intake are those who require set-up only; residents eat more food if they are independent or dependent on staff.

- NH staff should closely monitor resident intake in *all* residents deemed to require set up only assistance, as they are particularly at-risk for lower daily intake.

- Early detection of low meal intake can lead to earlier intervention, creating an opportunity for staff to provide more handfeeding or other support for these groups of vulnerable residents.

Table 1.

Certified Nursing Assistant Shift Documentation Record

Resident documentation by meal (breakfast, lunch, dinner)	
Meal Intake	• Tube feeding • NPO (Other than TF) • Refused • 1–25% • 26–50% • 51–74% • 75–99% • 100%
Level of Feeding Assistance	• Eats independently • Set-Up Only • Needs Help Eating
Dietary Liquid Supplement	• Refused • 1–25% • 26–50% • 51–74% • 75–99% • 100%
Snack Intake	• Refused • 1–25% • 26–50% • 51–74% • 75–99% • 100%

Table 2:

Impact of Cognition and Level of Feeding Assistance Provided on Total Meal Intake

	Residents with Dementia (n = 592)			Residents without Dementia (n = 194)		
	n (%)	Meal Intake (%)	P Value	n (%)	Meal Intake (%, SD)	P Value
Level of Feeding Assistance						
Independent	82 (14%)	80%		43 (22%)	85%	
Set-up Only	120 (20%)	68%	<.0001	70 (36%)	73%	0.0044
Needs Help	390 (66%)	78%		81 (42%)	77%	

Table 3:

Impact of Cognition and Level of Feeding Assistance on Mean Meal Intake Over the Course of the Day

MealType	Level of Feeding Assistance	Residents with Dementia (n = 592)			Residents without dementia (n = 194)		
		n	MeanIntake	P Value	n	MeanIntake	P Value
Breakfast	Independent	79	83%		41	89%	0.0366
	Set-up Only	125	74%	0.0046	74	80%	
	Needs Help	388	80%		79	81%	
Lunch	Independent	75	82%		44	80%	
	Set-up Only	125	65%	<.0001	71	74%	
	Needs Help	392	77%		79	71%	0.1413
Dinner	Independent	75	78%		43	83%	
	Set-up Only	122	65%	<.0001	71	70%	0.006
	Needs Help	395	76%		80	75%	

Table 4:

Impact of Cognition on Total Daily Intake when Snacks/ Supplements are Offered

	Residents with Dementia (n = 592)		Residents without dementia (n = 194)	
	Total Calorie Mean (SD)	P Value	Total Calorie Mean (SD)	P Value
Total Calories Consumed				
Meals Only	1142 (320.4)	<.0001	1159 (292.9)	<.0001
Meals + Snacks/Supplements	1305 (347.7)		1315 (325.7)	

Table 5:

Impact of Cognition and Level of Feeding Assistance on Percentage of Residents with Weight Change (loss/gain)

	Level of Feeding Assistance	Residents with Dementia (n = 592)			Residents without dementia (n = 194)		
		No Weight Change (n)	Weight change (n)	% with Weight change (%)	No Weight Change (n)	Weight Change (n)	% with Weight Change (%)
Weight Loss	Independent	81	1	1.22%	43	0	0%
	Set-up Only	119	1	0.83%	69	1	1.43%
	Needs Help	375	15	3.85%	80	1	1.23%
	Total	**575**	**17**	**2.87%**	**192**	**2**	**1.03%**
Weight Gain	Independent	77	5	6.1%	43	0	0%
	Set-up Only	119	1	0.83%	69	1	1.43%
	Needs Help	384	6	1.54%	81	0	0%
	Total	**580**	**12**	**2.03%**	**193**	**1**	**0.52%**