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Higher Level of Obesity Is Associated with Intensive Personal Care Assistance in the Nursing Home

Cyrus M. Kosar, MA[a,*], **Kali S. Thomas, PhD**[a,b], **Pedro L. Gozalo, PhD**[a], and **Vincent Mor, PhD**[a,b]

[a]Center for Gerontology and Healthcare Research, Brown University, Providence, RI

[b]Department of Veteran Affairs Medical Center, Providence, RI

Abstract

Objectives: To examine whether higher obesity level was associated with extensive staffing assistance (from 2 or more persons) for completing activities of daily living (ADL) among older nursing home residents.

Design: Retrospective cross-sectional study.

Setting: US government–certfied nursing homes.

Participants: Medicare beneficiaries residing in a nursing home on April 1, 2015. Exclusion criteria were age less than 65 years and body mass index (BMI) below 18.5 (underweight).

Measures: Residents were divided by obesity level according to established BMI cutoffs, as follows: nonobese (BMI = 18.5–29.9) or mild (BMI = 30.0–34.9), moderate (BMI = 35.0–39.9), or severe (BMI ≥40) obesity. Level of staffing assistance for completing each of 10 ADL (bed mobility, transfer, walking in room, walking in corridor, on- and off-unit locomotion, dressing, eating, toileting, and personal hygiene) was dichotomized as below 2 and 2 or more. Robust Poisson regression was used to test whether obesity conferred excess risk for needing 2 or more staff to complete each ADL. Adjusted models included individual-level covariates and nursing home fixed effects.

Results: A total of 1,063,383 nursing home residents were identified, including 309,263 (29.0%) with obesity. Adjusted relative risks (95% confidence intervals) for 2-person assistance with bed mobility associated with mild, moderate, and severe obesity were 1.17 (1.15, 1.18), 1.28 (1.25, 1.31), and 1.40 (1.36, 1.43), respectively. Adjusted relative risks for 2-person assistance with transferring associated with mild, moderate, and severe obesity were 1.15 (1.13, 1.17), 1.24 (1.22,

*Address correspondence to Cyrus M. Kosar, MA, Department of Health Services, Policy, and Practice, Brown University School of Public Health, 121 S. Main Street, Providence, RI 029012. cyrus_kosar@brown.edu (C.M. Kosar).

VM holds stock of unknown value in PointRight, Inc, an information services company providing advice and consultation to various components of the long-term care and post-acute care industry, including suppliers and insurers. Point-Right sells information on the measurement of nursing home quality to nursing homes and liability insurers. VM was a founder of the company but has subsequently divested much of his equity in the company and relinquished his seat on board. In addition, VM chairs the Independent Quality Committee for HRC Manor Care, Inc, a nursing home chain, for which he receives compensation in the $20,000–40,000-per-year range. VM also serves as chair of a Scientific Advisory Committee for NaviHealth, a post-acute care service organization, for which he also receives compensation in the $20,000–40,000-per-year range. The other authors have no relevant conflicts of interest to disclose.

1.27), and 1.36 (1.33, 1.39), respectively. Obesity was associated with 2-person assistance for all other ADL except for eating.

Conclusions: Higher obesity level was significantly associated with assistance from 2 or more staff for completing 9 of 10 ADL. Given increasing obesity rates in nursing homes, payment mechanisms that do not adjust for obesity or comprehensively account for excess ADL assistance may need revision to prevent adverse impacts on the long-term care system.

Keywords

Obesity; adiposity; elderly; nursing homes; activities of daily living

Obesity [body mass index (BMI) ≥30] is prevalent in more than one third of adults aged 60 years and older.[1] Individuals with obesity are more likely to become disabled at an early age,[2–4] which has led to higher rates of obesity in the nursing home population.[5–8] Obesity places nursing home residents at risk for poor outcomes[9] and may impact the delivery of long-term care, for instance, through placing a greater physical burden on facility staff.[6,10,11] In response, nursing homes may need to invest in specialized equipment such as motorized lifts or devote more staffing resources to their residents with obesity. In one study of individuals admitted to nursing homes in Arkansas between 1999 and 2004, obesity was associated with needing assistance from 2 or more persons to complete activities of daily living (ADLs).[10] The prevalence of obesity since this time has increased substantially,[8] including rates of moderate and severe obesity, which were not examined in the prior study. Thus, our goal was to estimate how different levels of obesity (mild, moderate, and severe) impact the need for extensive ADL assistance in a contemporary, comprehensive sample of nursing home residents.

Methods

Data Sources

The sources of individual-level data were Minimum Data Set (MDS) assessments[12] and the Medicare Beneficiary Summary file. The MDS is administered to all residents of Medicare- or Medicaid-certified nursing homes upon admission and in regular intervals thereafter until discharge. The assessment captures hundreds of clinical data elements including cognitive function, psychosocial well-being, physical functioning, and an array of health conditions. The Summary file contains enrollment information and demographic data for all current Medicare beneficiaries. Nursing home characteristics were obtained from the Certification and Survey Provider Enhanced Reporting data file and the Nursing Home Compare website (www.medicare.gov/nursinghomecompare).

Study Sample

Using the residential history file methodology,[13] we identified all Medicare beneficiaries residing in a nursing home on April 1, 2015. We excluded residents younger than 65 years, residents considered underweight (BMI <18.5), and residents with a BMI value that may have been miscoded (BMI >90). The final cohort included 1,063,383 nursing home residents.

Primary Exposure Variable

Data on height and weight from the MDS assessment were used to calculate BMI according to the standard formula (BMI = weight/ height^2 × 703). Residents were divided into 4 groups based on World Health Organization criteria for obesity.[14] These were nonobese (BMI = 18.5–29.9), mild obesity (BMI = 30.0–34.9), moderate obesity (BMI = 35.0–39.9), and severe obesity (BMI ≥40.0).

Outcome Variables

The MDS assessment includes an evaluation of residents' ability to complete 10 ADL. These include bed mobility, transfer, walking in a room, walking in a corridor, on- and off-unit locomotion, dressing, eating, toileting, and personal hygiene. The interest of this study is the level of staffing assistance required for completing each ADL, which is also recorded. Response options include no help, setup help only, physical assistance from 1 person, physical assistance from 2 or more people, and ADL did not occur or nonfacility staff provided ADL assistance 100% of the time. We dichotomized responses into whether or not residents required assistance for 2 or more staff. Residents who did not complete the ADL or who used nonfacility staff for assistance were excluded from the analyses described below.

Other Study Variables

Age, sex, race, and Medicaid eligibility were obtained from the Summary file. Active illnesses, including anemia, diabetes mellitus, cardiovascular disease, asthma or chronic obstructive pulmonary disease, arthritis, stroke or transient ischemic attack, and dementia, were identified from the MDS. Baseline physical function was approximated with the 28-point ADL score (higher scores indicate more impairment).[15,16] Cognitive function was captured by the Cognitive Function Scale,[17] which ranges from 1 (intact) to 4 (severe impairment). All MDS data came from the resident's admission, or quarterly or annual assessment within 45 days of April 1, 2015.

Statistical Analysis

Robust Poisson regression models were used to test whether obesity conferred excess risk for needing 2 or more persons to complete each ADL.[18] Point estimates are presented as relative risks (RRs) with 95% confidence intervals (CIs). Analyses were adjusted for covariates that capture residents' demographic profiles and that have been used in previous analyses of obesity in the nursing home population.[9,10] The set of covariates consisted of age, age-squared, female sex, nonwhite race, Medicaid eligibility, active illnesses, Cognitive Function Scale score, ADL score, and nursing home fixed effects, which account for the differential availability of specialized equipment across facilities. Data were analyzed with Stata MP 15.1 (StataCorp, College Station, TX). Null hypotheses were tested with a 2-tailed alpha of 0.05. The institutional review board of Brown University approved the study protocol.

Results

Among the 1,063,383 Medicare beneficiaries identified as nursing home residents on April 1, 2015, a total of 309,263 (29.0%) met obesity criteria. The prevalence of mild, moderate,

and severe obesity were 16.0%, 7.1%, and 5.8%, respectively. The characteristics of residents by obesity level are summarized in the upper panel of Table 1. Average age declined with obesity level, with a mean of 82.8 (standard deviation [SD] = 11.2) years for residents without obesity compared to 79.2 (SD = 11.5), 76.4 (SD = 11.6), and 71.6 (SD = 11.7) years among residents with mild, moderate, and severe obesity, respectively. The proportion female was 66% among residents without obesity compared to 67%, 71%, and 75% among residents with mild, moderate, and severe obesity, respectively. The proportion eligible for Medicaid was 51% among residents without obesity and rose to between 58% and 63% among residents with obesity. Residents with obesity were more likely to have physical comorbidities while being less likely to have neurologic conditions or cognitive deficits. For instance, the prevalence of diabetes, cardiovascular disease, respiratory illness, and arthritis was higher among residents with obesity than among residents without obesity while the prevalence of stroke and dementia was lower. Correspondingly, residents with obesity demonstrated lower (better) ADL and Cognitive Function Scale scores.

On average, nursing home residents with obesity resided in facilities with fewer beds, lower occupancy rates, higher percentages of individuals financed by Medicaid, that were for-profit, located in a rural area, and that demonstrated lower quality ratings (lower panel of Table 1).

Table 2 shows the rates of ADL assistance from 2 or more persons by obesity level and the adjusted relative risk for 2-person assistance associated with obesity. The proportion of residents without obesity using assistance from 2 or more persons for bed mobility was 37.0%, 39.9% among residents with mild obesity (RR = 1.17, 95% CI = 1.15, 1.18), 42.4% among residents with moderate obesity (RR = 1.28, 95% CI = 1.25, 1.31), and 47.8% for residents with severe obesity (RR = 1.40, 95% CI = 1.36, 1.43). The proportion of residents without obesity using 2-person assistance for transferring was 41.6%, 43.5% among residents with mild obesity (RR = 1.15, 95% CI = 1.13, 1.17), 45.4% among residents with moderate obesity (RR = 1.24, 95% CI = 1.22, 1.27), and 50.6% for residents with severe obesity (RR = 1.36, 95% CI = 1.33, 1.39). Obesity conferred a similar effect on level of assistance for the other ADL related to mobility (walking in room, walking in corridor, locomotion on unit, and locomotion off unit; see Table 2).

The proportion of residents without obesity using 2-person assistance for dressing was 12.8%, 14.4% among residents with mild obesity (RR = 1.20, 95% CI = 1.17, 1.24), 15.5% among residents with moderate obesity (RR = 1.40, 95% CI = 1.35, 1.45), and 18.8% for residents with severe obesity (RR = 1.67, 95% CI = 1.60, 1.73). The proportion of residents without obesity using 2-person assistance for toileting was 31.1%, 33.8% among residents with mild obesity (RR = 1.17, 95% CI = 1.15, 1.19), 35.9% among residents with moderate obesity (RR = 1.28, 95% CI = 1.25, 1.32), and 40.6% for residents with severe obesity (RR =1.45, 95% CI = 1.41, 1.49). The rate of 2-person assistance with personal hygiene also increased with obesity level, however, assistance for the eating ADL was not associated with obesity.

Discussion

In this study of 1,063,383 older adults residing in nursing homes, the prevalence of obesity was 29.0%. Moderate and severe obesity was prevalent among 7.1% and 5.8% of residents, respectively. We find that even after adjusting for many other comorbidities and demographic factors, the degree of obesity increases the risk of requiring 2 staff members to provide assistance in virtually all self-care and mobility activities, greatly increasing staff requirements.

Obesity in midlife has been linked to multiple comorbid conditions and disability, leading to nursing home entry at younger ages.[2–4] Thus, it is unsurprising that in our sample, residents with obesity were younger and had more physical illnesses and lower rates of dementia. Residents with obesity were more likely to reside in low-resourced and low-quality facilities. Although these nursing homes typically have lower staff-to-resident ratios,[19] we find that more obesity among residents means that more residents will need assistance from multiple staff members in completing self-care and mobility ADL. The estimated probability of needing 2 or more persons to compete ADL was 13% to 72% higher among residents with obesity. Relative risk estimates were largest for residents with a moderate or severe obesity level. The absolute differences in extensive staffing assistance between residents with and without obesity were also large. For instance, 48% of residents with severe obesity required extensive staffing assistance compared to 37% of residents without obesity (see Table 2). Thus, our findings will prove useful to nursing homes and may potentially inform decisions related to staffing allocation and budget planning. However, the MDS does not include data on the amount of time nursing staff spend on ADL assistance and whether more than 2 staff members provided assistance. Thus, we are unable to estimate the number of additional personnel or nursing hours needed to treat residents with obesity. This topic should be pursued in futures studies.

It is important to note that in unadjusted analyses of some ADL, such as walking and locomotion, obesity did not appear to be associated with 2-person assistance. However, the effects of obesity became evident in adjusted models after controlling for the confounding effects of dementia and poor cognition because dementia is associated with both low BMI and higher levels of ADL impairment and assistance. Disentangling that effect is crucial to arrive at the proper policy interpretation of our study; that is, facilities serving a disproportionate share of patients with obesity require higher staffing, and payment risk adjustment that accounts for obesity level may be needed.

Although there are a few exceptions, obesity typically does not factor into nursing home payment schemes including Medicare’s Resource Utilization Group (RUG) system. Although the RUG level and associated reimbursement does depend on ADL impairment and ADL assistance, only 4 ADL are factored into the formula. Thus, some of the care for residents with obesity goes uncompensated because obesity is associated with needing extensive assistance to complete nearly all ADL. The amount of uncompensated care associated with obesity could be substantial. The cost of bathing alone has been estimated to be 3 times higher for residents with obesity, increasing the total cost of care by 3%.[20,21]

Another study reported that the obesity epidemic will lead to an additional $68 million of Medicaid costs.[22]

The fact that residents with obesity are more concentrated in poorer, substandard nursing homes serving a disproportionate share of Medicaid-financed residents indicates that obesity may represent a barrier to admission to high-quality facilities. Indeed, both nursing home and hospital administrators have cited patient size as a factor increasing the difficulty of nursing home placement.[23,24] Without compensation for staffing and other resources used to treat residents with obesity, higher quality facilities may be less likely to admit these patients. Ultimately, this places a greater burden on lower-tier, resource-strained nursing homes, contributing to the spiral of poor quality and high turnover across these facilities.

The study's results were consistent with those published in a previous study examining the effects of obesity on ADL assistance among individuals admitted to nursing homes in Arkansas between 1999 and 2004.[10] Our findings are an important addition to the literature because we use recent data for the entire country and separately examine the effects of moderate and severe obesity, which are becoming more prevalent among nursing home residents.[8]

Despite the study's representative sample, rich set of control variables, and use of facility fixed effects, there are several limitations worth noting. First, the accuracy of BMI decreases given short stature, which is more common among older adults. Second, our findings may not be generalizable to nursing home residents younger than 65 years. Additionally, our results are subject to residual confounding because our study design is cross-sectional.

Conclusion

In summary, nursing home residents with obesity were substantially more likely to require assistance from 2 or more persons for completing 9 of 10 ADL. Because the prevalence of obesity is rising among the elderly and among nursing home dwellers, payment mechanisms that do not risk-adjust for obesity or comprehensively account for excess ADL assistance may need revision to prevent adverse impacts on the long-term care system.

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Table 1

Study Cohort Characteristics by Level of Obesity

	Nonobese	Obese		
	BMI <30.0 (n = 754,120; 71%)	**Mild, BMI 30.0–34.9 (n = 170,870; 16%)**	**Moderate, BMI 35.0–39.9 (n = 75,958; 7%)**	**Severe, BMI >40.0 (n = 62,435; 6%)**
Resident characteristic				
Age, y, mean (SD)	82.8 (11.2)	79.2 (11.5)	76.4(11.6)	71.6(11.7)
Age >80 y, n (%)	506,079 (67)	91,984 (54)	32,279 (42)	15,618 (25)
Female sex, n (%)	494,429 (66)	114,616(67)	53,964(71)	46,784 (75)
Nonwhite race, n (%)	135,073 (18)	31,004(18)	14,227 (19)	12,455 (20)
Medicaid-eligible, n (%)	380,856 (51)	99,604 (58)	46,432 (61)	39,203 (63)
Anemia, n (%)	228,089 (30)	50,061 (29)	22,734 (30)	19,761 (32)
Diabetes mellitus, n (%)	219,791 (29)	75,656 (44)	39,943 (53)	37,799 (61)
Cardiovascular disease, * n (%)	75,224 (35)	19,855 (39)	9,707 (43)	8,744 (46)
Asthma/COPD, n (%)	150,120 (20)	40,810 (24)	21,639 (28)	22,296 (36)
Arthritis, n (%)	63,593 (29)	16,586 (33)	7,855 (35)	6,853 (36)
Stroke or TIA, n (%)	128,409(17)	30,951 (18)	13,094(17)	8,865 (14)
Dementia, † n (%)	429,913 (57)	82,537 (48)	29,956 (39)	15,451 (25)
ADL, ‡ mean (SD)	17.2 (6.5)	16.3 (6.6)	16 (6.4)	16.1 (6.1)
ADL >23, n (%)	122,393 (16)	21,124(12)	7,583 (10)	5,398 (9)
CFS Score, n (%) Intact	212,837 (28)	68,142 (40)	37,875 (50)	40,884 (66)
Impaired, Mild	166,104 (22)	40,457 (24)	17,856 (24)	12,239 (20)
Impaired, Moderate	269,354 (36)	47,671 (28)	16,225 (21)	7,614 (12)
Impaired, Severe	100,910 (13)	13,566 (8)	3,539 (5)	1,383 (2)
Facility characteristic				
Occupancy rate, mean (SD)	84.6 (12.5)	84.3 (12.7)	83.8 (12.9)	83 (13.2)
Number of beds, mean (SD)	141.8 (90.1)	139.1 (88.3)	137.7 (84.4)	136.6 (80.8)
For-profit facility, n (%)	514,966 (69)	116,256 (69)	52,674 (70)	45,828 (74)
Region, n (%)				
Northeast	178,723 (24)	38,694 (23)	16,217 (22)	12,336 (20)
Midwest	207,791 (28)	53,235 (32)	24,883 (33)	21,151 (34)
South	261,004 (35)	57,727 (34)	25,812 (34)	21,518 (35)
Pacific	94,643 (13)	18,754(11)	7,985 (11)	6,601 (11)
Rural, n (%)	177,435 (24)	44,781 (26)	20,310(27)	16914(27)
% Medicaid, mean (SD)	61 (20.4)	62.1 (19.7)	62.7 (19.3)	63.6 (18.7)
Star rating, § n (%)				
1–2	271,434 (36)	62,899 (37)	29,284 (39)	25,801 (42)
3	148,464 (20)	34,015 (20)	15,270 (20)	12,497 (20)
4–5	326,880 (44)	72,229 (43)	30,631 (41)	23,522 (38)

CFS, Cognitive Function Scale; COPD, chronic obstructive pulmonary disease; SD, standard deviation; TIA, transient ischemic attack.,

[*] Includes coronary artery disease or heart failure.

[†] Includes Alzheimer's disease.

[‡] Refers to the Morris 28-point scale of independence in ADL (28 ¼ total dependence)

[§] Refers to the Nursing Home Compare overall rating of the Nursing Home during April 2015

Table 2

ADL Assistance from 2 or More Facility Staff by Level of Obesity

Obesity Level	Bed Mobility		Transfer	
	n/N (%)	aRR (95% CI)	n/N (%)	aRR (95% CI)
Nonobese: BMI <30.0	279,298/753,920 (37.0)	Referent	310,773/746,871 (41.6)	Referent
Mild: BMI 30.0–34.9	68,197/170,807 (39.9)	1.17(1.15, 1.18)	73,677/169,243 (43.5)	1.15 (1.13, 1.17)
Class II: BMI 35.0–39.9	32,191/75,912 (42.4)	1.28(1.25, 1.31)	34,120/75,158 (45.4)	1.24(1.22, 1.27)
Class III: BMI >40.0	29,804/62,383 (47.8)	1.40 (1.36, 1.43)	31,018/61,242 (50.6)	1.36(1.33, 1.39)
	Walk in Room		Walk in Corridor	
Nonobese: BMI <30.0	30,339/397,622 (7.6)	Referent	28,117/381,422 (7.4)	Referent
Mild: BMI 30.0–34.9	6,913/90,259 (7.7)	1.16(1.10, 1.22)	6,307/85,986 (7.3)	1.17 (1.10, 1.23)
Class II: BMI 35.0–39.9	3,065/39,081 (7.8)	1.37 (1.27, 1.47)	2,754/36,672 (7.5)	1.36(1.25, 1.47)
Class III: BMI >40.0	2,571/29,222 (8.8)	1.56 (1.44, 1.70)	2,069/26,313 (7.9)	1.44(1.31, 1.59)
	Locomotion on Unit		Locomotion off Unit	
Nonobese: BMI <30.0	20,876/735,118 (2.8)	Referent	14,085/690,766 (2.0)	Referent
Mild: BMI 30.0–34.9	5,215/166,701 (3.1)	1.17(1.10, 1.24)	3,581/158,268 (2.3))	1.21 (1.12, 1.30)
Class II: BMI 35.0–39.9	2,415/73,917 (3.3)	1.34 (1.23, 1.45)	1,663/70,602 (2.4)	1.34(1.21, 1.48)
Class III: BMI >40.0	2,409/59,696 (4.0)	1.52 (1.39, 1.66)	1,711/57,180 (3.0	1.55 (1.39, 1.72)
	Dressing		Eating	
Nonobese: BMI <30.0	96,056/753,380 (12.8)	Referent	3,411/753,596 (0.5)	Referent
Mild: BMI 30.0–34.9	24,502/170,706 (14.4)	1.20(1.17, 1.24)	684/170,774 (0.4)	1.13 (0.96, 1.34)
Class II: BMI 35.0–39.9	11,733/75,877 (15.5)	1.40 (1.35, 1.45)	302/75,915 (0.4)	1.20 (0.95, 1.52)
Class III: BMI >40.0	11,690/62,334(18.8)	1.67 (1.60, 1.73)	251/62,409 (0.4)	1.14(0.87, 1.51)
	Toileting		Personal Hygiene	
Nonobese: BMI <30.0	233,771/752,730 (31.1)	Referent	65,103/753,572 (8.6)	Referent
Mild: BMI 30.0–34.9	57,654/170,579 (33.8)	1.17 (1.15, 1.19)	16,568/170,725 (9.7)	1.21 (1.17, 1.25)
Class II: BMI 35.0–39.9	27,236/75,815 (35.9)	1.28 (1.25, 1.32)	7,991/75,900 (10.5)	1.34 (1.28, 1.40)
Class III: BMI >40.0	25,272/62,317 (40.6)	1.45 (1.41, 1.49)	8,226/62,363 (13.2)	1.72 (1.64, 1.80)

aRR, Adjusted Relative Risk; CI, confidence interval., Models were adjusted for age, age-squared, female sex, nonwhite race, Medicaid eligibility, active illnesses (anemia, diabetes mellitus, cardiovascular disease, asthma or, chronic obstructive pulmonary disease, arthritis, stroke or transient ischemic attack, and dementia), Cognitive Function Scale score, ADL score, and nursing home fixed effects., aRRs are considered statistically significant when the 95% CI does not include the value 1.