Self-Reported Dysphagia and Psychosocial Health Among Community-Dwelling Older Adults: Results of a National Study

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ABSTRACT

BACKGROUND: The risk of dysphagia increases with age, affecting up to 33% of adults over the age of 65. Older adults with dysphagia are at increased risk for negative physical health outcomes such as aspiration pneumonia and death. However, the relationship between dysphagia and psychosocial health is uncertain in this population.

OBJECTIVE: We aimed to assess the associations between dysphagia and psychosocial health among older adults ($\geq$ 65) with self-reported dysphagia.

DESIGN: We performed a cross-sectional assessment of the National Health and Aging Trends Study (NHATS) conducted in 2019.

MAIN MEASURES: Weighted logistic and linear regression models were used to assess the relationship between self-reported dysphagia and psychosocial health using established patient-reported outcome measures including those for depression, anxiety, and social isolation previously used in NHATS analyses, while adjusting for demographics, comorbid conditions, and risk factors for dysphagia identified by purposeful selection.

KEY RESULTS: Among the 4041 adults in this cohort, almost half (40%) were between 70 and 74 years old, more than half were female (55%), and a significantly higher proportion were White, non-Hispanic respondents (78.1%, $p < 0.01$) compared with other races and ethnicities. There were 428 (10.5%) respondents reporting dysphagia symptoms within the previous month. In the multivariable model, dysphagia was associated with significantly increased odds of anxiety (OR 1.33 [1.06, 1.67]) and a significantly decreased sense of well-being (coefficient -1.10 [$-1.66, -0.54$]), but no association was detected for social isolation.

CONCLUSIONS: When accounting for factors associated with underlying physical health status, self-reported dysphagia is independently associated with negative psychosocial health and warrants attention by healthcare providers. Future studies should aim to identify causal factors and the extent to which interventions may mitigate these factors.

INTRODUCTION

The risk of dysphagia increases with age and may be attributed to oral, pharyngeal, or esophageal processes.[1] In fact, up to 33% of adults $\geq$ 65 years of age are affected.[2–5] This observed prevalence is likely due to a combination of geriatric syndromes, including physical frailty,[6] sarcopenia,[7] and impaired oral hygiene,[8] which are superimposed on chronic medical conditions that can directly affect the swallowing mechanism. When present, dysphagia in older adults is associated with adverse physical health outcomes such as malnutrition, dehydration, aspiration pneumonia, hospitalization, and death.[2,9]

While dysphagia may be particularly prevalent among those with comorbid conditions, including neurodegenerative disorders such as Parkinson's disease (PD)[10] and cancers of the head and neck,[11] and among those in acute or long-term care,[12] it is also common among community-dwelling older adults.[5] As a result, dysphagia can conflict with healthy aging, which is the process of developing and maintaining the functional ability that enables wellbeing in older age.[13] Prior studies have shown that older community-dwelling adults with dysphagia are at heightened risk for developing malnutrition and lower respiratory tract infections.[14]

There is also an established association between psychosocial burden and the presence of dysphagia, which can be linked to peri-prandial anxiety or panic, reduced food intake, and a reduction in quality of life (QOL).[15] There is an observed inverse relationship between health-related QOL and increased oropharyngeal dysphagia severity.[16] Similarly, esophageal dysphagia can be a risk factor for negative mental health outcomes, with up to 26% of adults with eosinophilic esophagitis (EoE) having anxiety/depression[17] and

impaired QoL.[18] Intermittent dysphagia has been associated with anxiety, and progressive dysphagia has been associated with chronic depression.[19] Among those with underlying chronic disorders such as PD,[20] the prevalence of dysphagia is increased. Among independent older adults, there is an observed association between swallowing dysfunction and detriment to perceived QoL.[21]

Depression, anxiety, and QoL can also be related to perceived healthy aging in older adults.[22,23] Given the conceptual connection between swallowing dysfunction and psychosocial health as well as the latter's potential to impact diet and nutrition, if present, dysphagia may also be relevant to psychosocial health in this population. Nonetheless, most studies examining the relationship between dysphagia and psychosocial function have been conducted in younger adult populations or have limited, if any, assessment of potentially confounding underlying comorbid conditions and frailty, a geriatric syndrome associated with dysphagia and poor health outcomes.[24,25] Thus, the independent relationship between dysphagia and psychosocial well-being among older adults is not fully known. We therefore investigated the relationship between dysphagia, QoL, and psychosocial factors accounting for comorbid conditions and frailty among community-dwelling older adults using a nationally representative sample of Medicare beneficiaries aged 65 or older.

METHODS

Data Source and Study Sample

We performed an analysis of the National Health and Aging Trends Study (NHATS), which is a nationally representative, age-stratified longitudinal study of Medicare beneficiaries aged 65 and older who are community dwelling.[26] Respondents were originally enrolled in NHATS in 2011 during round 1 or in 2015 during round 5 of the survey study. The data for this analysis are from the round 9 survey conducted in 2019, with sampling design weights described in NHATS Technical Paper 26[27] and multiply imputed ($K=5$) income values as described in NHATS Technical Paper 27.[28] Only community-dwelling respondents with response in round 9 and non-missing response for question 13 on the Sensory Impairments and Symptoms questionnaire were included. Specifically, this question asked, "In the last month, did (you/ SP) have problems with chewing or swallowing that caused difficulty when (you/he/she) ate?" The unweighted response rate of 96.8% of living sample persons to the round 9 survey yielded 4041 participants with non-missing response to the question of interest.[29] The study was reviewed by the Duke University Institutional Review Board, and as a secondary analysis of a large, de-identified database, it was determined to be exempt from the requirement of consent of individuals.

Measures

Based on review of the literature,[5,30] potential risk factors for dysphagia were identified including demographic (age, sex, race/ethnicity, marital status, education, income, health insurance coverage, metropolitan status) and health characteristics (comorbid diseases, falls, fall concern, hip/other fracture, use of medical device, sleep problems, pain, overall health, frailty, Short Physical Performance Battery [SPPB], body mass index [BMI], weight loss). Comorbid diseases available in NHATS consisted of heart attack, heart disease, high blood pressure, arthritis, osteoporosis, diabetes, stroke, dementia/Alzheimer's disease, and cancer. These conditions were self-reported in response to structured interviews and include previously reported conditions and new conditions diagnosed within the last year (round 9 interview). Dementia was assigned based on a diagnosis of Alzheimer's disease, responses on the Alzheimer's Disease 8,[31,32] and cognitive testing as defined by Kasper et al.[33] Frailty was assessed as described by Fried et al. and applied to the NHATS database consistent with previous reports.[34,35]

Depression was measured by the Patient Health Questionnaire 2 (PHQ2),[36] which is a valid metric to assess depression and of particular clinical utility due to its brevity; within this construct, a score of ≥ 3 indicates depression. Anxiety was assessed using the Generalized Anxiety Disorder 2 (GAD2),[37] with a score of ≥ 3 indicating the presence of anxiety. Well-being was based on 11 items within NHATS and assessed consistent with prior studies,[38] utilizing a continuous variable ranging from 0 to 41 with a lower score indicating worse well-being. The well-being section obtains information about positive and negative affect (frequency of feelings in the last month, e.g., cheerful, bored, full of life, upset), self-realization (agreement with statements about life: life has meaning and purpose, feels confident and good about self, gave up trying to improve life long ago, likes living situation), age identity (age person feels), and self-efficacy and resilience (agreement with statements: other people determine activities, I do what I want, I adjust easily to change).[38] The section draws on similar items that have appeared in MIDUS (Midlife in the U.S. A Study of National Health and Wellbeing).[39] Reference periods and response categories differ across studies that have used these items. NHATS uses "last month" as the reference period and, in general, fewer response categories. Social isolation was constructed from four items in NHATS related to living alone, talking to people about important matters, and participating in religious or other activities. This metric has been previously used to quantify social isolation within NHATS, and we dichotomized the outcome to isolated or socially integrated according to prior methodology.[40]

Statistical Analysis

Subject demographics and clinical characteristics were summarized by whether or not the subject reported experiencing dysphagia in the preceding month. This approach has been used

in other published studies utilizing NHATS data.[41] All categorical measures are reported as unweighted frequencies and percentages, and associations with dysphagia were evaluated with weighted chi-square tests. All continuous measures are reported as means and standard deviations, and associations with dysphagia were evaluated with weight simple linear regression.

As the first step in a two-stage analysis, purposeful selection[42] was used for the logistic regression model to identify a final, smaller set of risk factors for dysphagia from the potential risk factors identified above. First, self-reported dysphagia was regressed on each potential risk factor, and variables with a significant result in Wald test at $\alpha = 0.25$ were selected as candidates for the second analysis. A multiple regression model was then fit on the set of selected candidate variables, iteratively removing covariates if they are non-significant at the $\alpha = 0.1$ significance level and not a confounder. Here, a confounder was defined as a variable whose removal caused a remaining coefficient to change by at least 15%. Then each variable not originally selected for consideration was separately added to the multivariable model and evaluated for inclusion at the $\alpha = 0.1$ significance level, which is based on a previously developed purposeful selection methodology[42,43] that allows for a conservative approach aimed at identifying risk factors and potential confounders rather than developing a purely predictive model. Finally, the full multiple regression model including the initial set of significant covariates and the additional set of significant variables was fit and reduced using the same type of backward selection method previously described. Since income was multiply imputed with five iterations, this process was conducted for each of the imputations and only variables that were included in all five models were retained as risk factors. For simplicity, no interactions were considered.

The second stage of the analysis was to determine levels of association between self-reported dysphagia and the psychosocial outcomes of interest. Unadjusted and adjusted regression models accounting for sampling weights were estimated for each of the following outcomes: depression, anxiety, well-being, and social isolation. Logistic regression models were estimated for depression, anxiety, and their composite; a linear regression model for well-being; and a multinomial regression model for social isolation. Although the observed well-being scores were left skewed due to the measure's ceiling and the variances were statistically unequal between the dysphagia and no-dysphagia groups due to the large sample size, we proceeded with a linear regression model without transformations for ease of interpretation. The coefficient estimates are still unbiased, but the resulting confidence intervals may be too narrow. In all models, adjustment variables included age, sex, race/ethnicity, marital status, education, imputed income, insurance, metropolitan status, number of comorbid diseases, overall health, frailty, number in social network, and the set of risk factors determined by purposeful selection. Event rates, appropriate estimates (odds ratios or regression coefficients determined with Rubin's rules[44]), 95% confidence intervals, and p values are reported for dysphagia within each model.

RESULTS

There were 4041 respondents included in the final analysis. Almost half of the respondents ($n = 898$, 40.0%) were 70–74 years of age, and more than half were female ($n = 2331$, 55.0%). The overall rate of self-reported dysphagia within the previous month was 10.6% ($n = 428$), and there were significant differences in rates of dysphagia by race/ethnicity ($p < 0.01$) among the studied population (Table 1). Respondents with self-reported dysphagia were significantly less likely to be married or living with a partner ($p < 0.01$), complete a high school degree or higher ($p < 0.01$), earn more than $27,600 ($p < 0.01$), and live in a metropolitan area ($p < 0.01$). Those with self-reported dysphagia had a significantly higher use of Medicaid insurance ($p < 0.01$) compared with those without dysphagia.

Differences were also observed among respondents' clinical conditions (Table 2). Respondents with self-reported dysphagia were significantly more likely to have unintentional weight loss (25.5% vs. 12.2%, $p < 0.001$), diabetes (36.6% vs 27.3%, $p = 0.009$), a stroke (3.3% vs 1.9%, $p = 0.09$), or Alzheimer's or dementia (15.0% vs 6.2%, $p < 0.001$). Respondents indicating 2 or more nights of trouble sleeping had significantly higher rates of self-reported dysphagia ($p < 0.001$) compared to those without trouble sleeping. Those respondents with dysphagia were more likely to describe their health as fair/poor versus good to excellent ($p < 0.001$) and were also more likely to be frail versus robust ($p < 0.001$).

Within the multivariable model resulting from purposeful selection that accounts for demographic factors and underlying comorbid conditions including frailty (Table 3), males (OR 1.26 [1.05, 1.54]) and subjects of Hispanic ethnicity (1.56 [1.14, 2.14]) had significantly higher odds than females and non- Hispanic subjects of reporting dysphagia. Respondents who reported pain in the last month (1.44 [1.19, 1.74]) or fair/poor overall health (1.35 [1.15, 1.58]), or who were classified as frail (1.67 [1.18, 2.34]), were also at higher odds of reporting dysphagia relative to subjects who did not report pain, who reported good/excellent overall health, or who were classified as not frail/robust.

After adjusting for the variables retained by purposeful selection (Table 3), total number of comorbid diseases, and the number of individuals in a subject's social network, the presence of dysphagia was associated with a significantly increased odds of anxiety (OR 1.33 [1.06, 1.67]) and a significantly decreased sense of well-being (coefficient -1.10 [-1.66, -0.54]), which indicates reduction in the overall well-being score when dysphagia is present. The relationship

Table 1 National Health and Aging Trends Study (NHATS) respondent demographic characteristics by difficulty chewing/swallowing (dysphagia)

| Characteristic | Total (n = 4041) | Difficulty chewing/swallowing | | p-value |
		Yes (n = 428)	No (n = 3613)	
Age				0.08
65 to 69	43 (2.3%)	4 (2.4%)	39 (2.3%)	
70 to 74	898 (40.0%)	76 (36.1%)	822 (40.4%)	
75 to 79	1117 (27.0%)	99 (23.6%)	1018 (27.4%)	
80 to 84	916 (16.9%)	100 (19.4%)	816 (16.6%)	
85 to 89	645 (8.9%)	80 (10.9%)	565 (8.7%)	
90+	422 (4.9%)	69 (7.6%)	353 (4.6%)	
Female	2331 (55.0%)	239 (51.3%)	2092 (55.4%)	0.24
Race/ethnicity				<0.001
White non-Hispanic	2794 (78.1%)	277 (72.6%)	2517 (78.7%)	
Black non-Hispanic	845 (8.0%)	87 (6.9%)	758 (8.1%)	
Other non-Hispanic	104 (4.0%)	6 (2.7%)	98 (4.2%)	
Hispanic	239 (7.3%)	49 (14.4%)	190 (6.5%)	
More than one and DKRF primary, DKRF	59 (2.6%)	9 (3.3%)	50 (2.5%)	
Marital status				<0.001
Separated/divorced/widowed/never married	2123 (44.9%)	256 (55.2%)	1867 (43.7%)	
Married or living with partner	1918 (55.1%)	172 (44.8%)	1746 (56.3%)	
Education				<0.001
None-12 grade	770 (14.4%)	121 (26.3%)	649 (13.0%)	
HS/GED, vocational certificate, some college	1888 (46.7%)	186 (43.2%)	1702 (47.1%)	
Associate, bachelor, master degree or higher	1327 (36.7%)	112 (27.1%)	1215 (37.8%)	
Total income*				<0.001
< $27,600	1021 (22.1%)	144 (32.9%)	877 (20.9%)	
$27,600-$41,999	530 (13.1%)	53 (13.9%)	477 (13.1%)	
$42,000-$63,999	453 (12.3%)	46 (12.3%)	407 (12.3%)	
$64,000-$107,999	513 (16.5%)	40 (11.1%)	473 (17.1%)	
>= $108,000	338 (10.5%)	20 (4.9%)	318 (11.1%)	
Medicare part D	2808 (67.9%)	300 (70.5%)	2508 (67.6%)	0.25
Medicare gap/supplemental	2621 (67.5%)	269 (65.3%)	2352 (67.7%)	0.60
Medicaid	618 (12.2%)	98 (24.3%)	520 (10.8%)	<0.001
Tricare	266 (6.5%)	26 (7.1%)	240 (6.4%)	0.54
Long-term care insurance	1042 (24.5%)	86 (19.0%)	956 (25.1%)	0.03
Metro status	3249 (81.8%)	329 (75.4%)	2920 (82.5%)	0.03
VA payment last month	274 (6.9%)	39 (10.1%)	235 (6.6%)	0.02

*Non-imputed values only

between dysphagia, depression, and social isolation was also evaluated (Table 4), but no significant association was identified in the adjusted models.

Given the self-reported nature of both symptoms and medical conditions within NHATS, and because some respondents had dementia, we performed a sensitivity analysis to assess whether these responses might have influenced our results. After excluding those with dementia, we found that our primary conclusions were not changed (Supplementary Tables 1); i.e., there was still a significant relationship in our adjusted model between self-reported dysphagia and identified risk factors (except for Hispanic ethnicity, which was no longer significant). However, after respondents with dementia were excluded, both anxiety (OR 1.42 [1.13, 1.79]) and depression (OR 1.32 [1.03, 1.69]) were statistically significantly associated with self-reported dysphagia, as was social isolation (OR 1.72 [1.07, 2.76]) (Supplementary Table 2).

DISCUSSION

Dysphagia is highly prevalent among older adults, even among those who are community dwelling, and is associated with negative health effects.[45] These adults are at increased risk for adverse consequences, including frailty and pneumonia, and prior data have demonstrated that dysphagia is associated with deleterious mental health consequences as well.[9] However, previous studies have not systematically accounted for the potential overlapping effect that comorbid conditions and frailty may have on mental health. In our present study, we report that there are significantly increased odds of anxiety and reduced sense of well-being in community-dwelling older adults in the presence of dysphagia, even after controlling for underlying comorbid health conditions and frailty.

These findings have significant implications for healthy aging, especially as the proportion of older adults in the population is rising[46] and is expected to be over 2 billion by 2050. Addressing these issues, particularly as they relate

Table 2 National Health and Aging Trends Study (NHATS) respondent clinical characteristics by difficulty chewing/swallowing (dysphagia)

Characteristic	Total (n = 4041)		Difficulty chewing/swallowing		
			Yes (n = 428)	No (n = 3613)	*p*-value
Heart attack	89 (1.7%)		21 (4.7%)	68 (1.4%)	<0.001
Heart disease	1007 (21.5%)		150 (27.7%)	857 (20.8%)	<0.001
High blood pressure	3037 (70.7%)		334 (73.4%)	2703 (70.4%)	0.31
Arthritis	2968 (70.1%)		363 (83.3%)	2605 (68.6%)	<0.001
Osteoporosis	1371 (32.8%)		192 (43.1%)	1179 (31.7%)	<0.001
Diabetes	1219 (28.2%)		153 (36.6%)	1066 (27.3%)	0.009
Lung disease	926 (21.9%)		142 (30.9%)	784 (20.8%)	<0.001
Stroke	103 (2.0%)		20 (3.3%)	83 (1.9%)	0.09
Dementia or Alzheimer's	441 (7.1%)		87 (15.0%)	354 (6.2%)	<0.001
Cancer	263 (6.5%)		42 (11.3%)	221 (6.0%)	0.003
Number of comorbidities*	2.6 (0.03)		3.2 (0.10)	2.5 (0.03)	<0.001
Fall/balance concern	1971 (44.6%)		324 (70.9%)	1647 (41.6%)	<0.001
Fall event in last year	1401 (34.5%)		212 (49.4%)	1189 (32.8%)	<0.001
Hip or other fracture	225 (5.3%)		38 (8.7%)	187 (4.9%)	0.01
Medical device use	1371 (26.1%)		229 (44.8%)	1142 (24.0%)	<0.001
Sleep problems[†]					<0.001
Rarely/never/not a problem	1718 (44.0%)		134 (32.7%)	1584 (45.3%)	
2+ nights a week for either	1048 (26.2%)		103 (23.7%)	945 (26.5%)	
2+ nights a week for both	1264 (29.5%)		190 (43.6%)	1074 (27.9%)	
Pain in last month	2357 (57.0%)		331 (77.4%)	2026 (54.7%)	<0.001
Overall health					<0.001
Fair/poor	1006 (21.2%)		194 (43.9%)	812 (18.6%)	
Good to excellent	3032 (78.8%)		234 (56.1%)	2798 (81.3%)	
Frailty level					<0.001
Robust	273 (6.5%)		14 (2.7%)	259 (6.9%)	
Prefrail	3075 (79.2%)		265 (64.0%)	2810 (80.9%)	
Frail	693 (14.3%)		149 (33.2%)	544 (12.2%)	
Peak (pulmonary) air flow*	324.8 (3.89)		280.5 (11.90)	329.8 (3.89)	<0.001
Short physical performance battery (SPPB) score					<0.001
Very low	918 (16.4%)		155 (29.3%)	763 (14.9%)	
Low	919 (19.3%)		93 (19.8%)	826 (19.3%)	
Moderate	1070 (29.1%)		75 (20.4%)	995 (30.1%)	
High	747 (26.0%)		38 (13.8%)	709 (27.4%)	
Unintended weight loss	676 (13.5%)		120 (25.5%)	556 (12.2%)	<0.001
BMI category					0.27
Underweight	150 (3.1%)		22 (3.4%)	128 (3.1%)	
Normal weight	1252 (29.1%)		142 (33.0%)	1110 (28.6%)	
Overweight	1426 (36.5%)		140 (36.1%)	1286 (36.6%)	
Obesity	1153 (30.4%)		110 (25.5%)	1043 (31.0%)	
Number in social network*	2.4 (0.04)		2.3 (0.10)	2.4 (0.04)	0.35

*Reported as mean (SE)

†Sleep questions including "In the last month how often did it take more than 30 minutes to fall asleep?" and "In the last month on nights when you woke up before you wanted to get up, how often did you have trouble falling back asleep?" "Either" refers to respondent checking 2+ nights a week for only one of the questions, not both, and "both" means the subject check 2+ nights a week for both questions

to an age-associated decline in swallowing function, was previously highlighted as an area of clinical priority, including for gastroenterologists.[47] More generally, maintaining function among older adults also requires attending to the broader social determinants of health, such as environmental and societal factors, as well as individual variables that can interact with the presence of dysphagia, including physical function and physiologic and metabolic health as well as psychosocial well-being.[48]

In this study, we assessed the relationship between psychosocial health and self-reported dysphagia. Among the cohort in NHATS, the prevalence of dysphagia was over 10%, which is consistent with previous estimates.[5,6] We found that established sociodemographic factors[49] were associated with self-reported dysphagia, including lower achieved education, lower total income, and not being married or not having a partner. In our multivariable model, we also identified a non-significant trend toward an association between self-reported dysphagia and metropolitan area of residence, which may be related to other findings indicating a relationship between dysphagia and social determinants of health such as transportation access and

Table 3 Risk Factors for Dysphagia by the Purposeful Selection Model

Effect	Level	OR (95% CI)	T	p value
Age	65 to 74	1.26 (0.98, 1.62)	1.78	0.08
	75 to 79	0.91 (0.67, 1.22)	−0.63	0.53
	80 to 84	1.02 (0.74, 1.40)	0.11	0.91
	85 to 89	0.98 (0.74, 1.30)	−0.14	0.89
	90+	Reference		
Male		*1.26 (1.05, 1.54)*	*−2.45*	*0.01*
Race	Black non-Hispanic	0.86 (0.57, 1.30)	−0.71	0.48
	Hispanic	*1.56 (1.14, 2.14)*	*2.77*	*0.01*
	Other non-Hispanic, more than one, DKRF	0.57 (0.29, 1.12)	−1.63	0.10
	White non-Hispanic	Reference		
Highest education level	Associate, bachelor's, or master's degree or higher	0.92 (0.70, 1.21)	−0.59	0.56
	HS/GED, vocational certificate, some college	0.88 (0.68, 1.14)	−0.95	0.34
	None-12 grade	Reference		
Total income	<$27,600	1.10 (0.81, 1.51)	0.63	0.53
	$27,600–$41,999	1.06 (0.72, 1.57)	0.31	0.76
	$42,000–$63,999	1.35 (0.94, 1.95)	1.63	0.11
	$64,000–$107,999	1.00 (0.67, 1.49)	−0.00	1.00
	≥$108,000	Reference		
Medicaid		1.20 (0.96, 1.49)	1.61	0.11
Long-term care		0.93 (0.77, 1.14)	−0.69	0.49
Metropolitan resident		0.85 (0.67, 1.07)	−1.37	0.17
Heart attack (new)		*1.44 (1.07, 1.93)*	*2.44*	*0.02*
Heart disease		0.91 (0.80, 1.03)	−1.52	0.13
High blood pressure		0.86 (0.72, 1.03)	−1.63	0.10
Osteoporosis		1.12 (0.94, 1.33)	1.29	0.20
Lung disease		1.08 (0.95, 1.24)	1.20	0.23
Cancer (new)		1.17 (0.89, 1.53)	1.15	0.25
Dementia or Alzheimer's		*1.19 (1.01, 1.41)*	*2.04*	*0.04*
Fall/balance concern		*1.44 (1.23, 1.69)*	*4.46*	*<0.001*
Fall event in last year	Yes	1.12 (0.94, 1.34)	1.27	0.20
Sleep problems*	2+nights a week for both	1.17 (0.96, 1.42)	1.58	0.11
	2+nights a week for either	0.88 (0.71, 1.09)	−1.15	0.25
Pain in last month	*Yes*	*1.44 (1.19, 1.74)*	*3.78*	*<0.001*
Overall health	*Fair/poor (vs. good/excellent)*	*1.35 (1.15, 1.58)*	*3.66*	*<0.001*
Frailty level	*Frail*	*1.67 (1.18, 2.34)*	*2.93*	*0.003*
	Prefrail	0.94 (0.70, 1.26)	−0.43	0.67
	Not frail	Reference		
Unintended weight loss		1.07 (0.87, 1.30)	0.62	0.54
BMI category	Obesity	0.77 (0.57, 1.05)	−1.65	0.10
	Overweight	*1.29 (1.01, 1.64)*	*2.06*	*0.04*
	Underweight	0.59 (0.33, 1.05)	−1.80	0.07
	Normal	Reference		

*Sleep problems are defined as the frequency in the prior month (i) when it took >30 min to fall asleep and (ii) when there was trouble falling back to sleep after waking up

home boundedness.[50] While not significant associations, dysphagia trended to having a relationship with Medicaid insurance as well as several health conditions, for example, sleep disorders and hypertension. Further investigation into these areas, including with larger datasets that could be better powered, may be warranted. While it is not possible within our current study to assess how these factors directly impact each other or whether they are part of a causal pathway, it is notable that health conditions such as dementia, frailty, self-reported pain, and worse self-reported overall health were also associated with the presence of dysphagia. Indeed, causal relationships in these findings cannot be concluded. However, after adjusting for comorbid diseases, physical function and performance, and

frailty, we identified an association between anxiety and self-report dysphagia in older adults.

Among older adults, the geriatric syndrome frailty is also an important condition associated with adverse outcomes.[24,51] Chronic comorbid conditions have been linked with anxiety and sense of well-being.[52,53] Previous studies have also shown a relationship between the impact swallowing dysfunction has on quality of life and mental health in the setting of individual conditions, such as PD,[54] stroke,[55] and EoE.[17] Our findings are broader, revealing the influence of swallowing dysfunction on mental health among older adults independent of an underlying etiology, comorbid disease, and frailty.

Indeed, while self-reported dysphagia does not necessarily capture objective correlates, the sensation of dysphagia

Table 4 Relationship Between Self-Reported Dysphagia and Psychosocial Health

Outcome	Event rate n (%) Mean (SD) n	Unadjusted		Adjusted	
		Estimate (95% CI)	*p* value	Estimate (95% CI)	*p* value
Depression/anxiety (*n*=3995; 3231)	654 (14.5)	1.92 (1.69, 2.17)	<.001	1.28 (1.05, 1.56)	0.02
Depression (*n*=4004; 3238)	463 (10.5)	1.85 (1.61, 2.13)	<.001	1.24 (0.97, 1.57)	0.08
Anxiety (*n*=4012; 3238)	365 (8.0)	2.07 (1.74, 2.45)	<.001	1.33 (1.06, 1.67)	0.01
Well-being (*n*=3875; 3250)	34.7 (31.6, 36.9)*	−2.71 (−3.33, −2.09)	<.001	−1.10 (−1.66, −0.54)	<0.001
Social isolation (*n*=3873; 3250)					
Socially isolated	820 (20.9)	1.92 (1.37, 2.70)	<.001	1.55 (0.96, 2.52)	0.08
Socially integrated	3053 (79.1)	Reference		Reference	

Estimates for well-being are coefficient values; estimates for all other outcomes are odds ratios. Adjustment variables are age, sex, race/ethnicity, marital status, education, income, insurance, metropolitan status, number of comorbid diseases, overall health, frailty, number in social network, and risk factors determined in Table 3

*Median (IQR)

is present in a significant proportion of patients even in the absence of test-proven oropharyngeal or esophageal pathology.[56] Yet the quality-of-life impact of dysphagia, even in the absence of physiologic dysfunction, has been underevaluated.[57] The perception of dysphagia without an identifiable etiology may still lead to substantial morbidity and negatively influence patient quality of life.[58] Evidence supports the presence of co-existing visceral hypersensitivity as a source of dysphagia in patients that could be exacerbated by concomitant stress related to other social aspects of life, including social isolation.[58,59] Furthermore, patients with normal oropharyngeal swallow on objective testing and with self-report dysphagia still report signs and symptoms of aspiration and have reduced dietary intake and reduced activity.[6,16] While we did not find any significant association between dysphagia and depression or social isolation, which have been described previously,[24,40] the relationship we identified between dysphagia and psychosocial well-being on healthy aging remains important. Interestingly, in our sensitivity analysis that excluded patients with reported dementia, we found that anxiety, depression, and social isolation were independently associated with self-reported dysphagia. This could reflect the fact that dementia patients may have more social interaction, including as reported by proxy, due to their medical needs. Further, the presence of dementia may confound an assessment of depression. These findings are provocative and may be worthy of future study.

As indicated previously, this study relies on self-reported dysphagia assessed as a binary outcome. While other measures, including validated instruments,[60] exist to quantify the degree of dysphagia, other population-based prevalence assessments have used similar single yes/no questions when evaluating associations with impaired quality of life in responders answering affirmatively; in contrast to our study, prior assessment rarely also assessed for comorbid diseases and frailty.[21,61,62] Our study has other limitations as well. As with other cross-sectional studies, we are limited in our

ability to draw any causative conclusions about the interactions observed or their directionality. We also found that dysphagia was not linearly distributed across the ages studied, peaking in the mid-70 s, which may suggest differential mechanisms related to self-reported dysphagia across the age ranges captured in this cohort. Further, we cannot identify whether dysphagia is oral, pharyngeal, or esophageal in nature among NHATS respondents and there is also the potential for recall bias among respondents. Additionally, there is a chance that reported symptoms are attributable to incipient conditions that would contribute to dysphagia. For example, neurodegenerative disorders were not specifically evaluated, though we did evaluate for stroke, dementia, and other underlying comorbid conditions. Understanding these issues in greater detail could be the focus of future study, particularly as it would help with identifying potential interventions.

However, dysphagia was related to anxiety and reduced well-being, independent of comorbid diseases and geriatric conditions, such as frailty, among community-dwelling older adults. While the direction of change in well-being is similar to the relationship between self-reported dysphagia and anxiety, the clinical relevance of a 1.1 point reduction in well-being score is yet to be determined. In fact, the use of a purposeful selection model may result in a more conservative estimate of the relationship between dysphagia and the evaluated psychosocial outcomes due to the inclusion of more covariates. While the status of objective, physiologic swallowing function was not assessed, this relationship between dysphagia and anxiety and well-being suggests that addressing dysphagia may have notable impacts on healthy aging. While there was not a statistically significant association between self-reported dysphagia and depression, the results were in the same direction with a similar odds ratio with anxiety, which was statistically significant. Thus, attention to screening and managing dysphagia may present a meaningful opportunity to improve QoL, promote healthy

living, and reduce health vulnerability among older, community-dwelling adults.

In conclusion, we identified that among a national cohort of community-dwelling older adults, dysphagia is prevalent and associated with the presence of anxiety and reduced quality of life, independent of evaluated chronic comorbid disease and conditions, including frailty. These findings affirm previous results and advance our understanding of the independent relationship between self-reported dysphagia and psychosocial health after evaluating for underlying comorbid conditions in this at-risk population. While limited by study design and patient self-report, these results suggest the substantial clinical impact of these symptoms and provide evidence of the importance of the swallowing function for healthy living and aging among older adults.

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Declarations:

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