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Older Adults Receiving Rehabilitation Services Are More Likely to Get Bathing and Toileting Equipment Installed

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Importance: Adaptive equipment, such as shower grab bars and modified toilet seating, is effective but underused in the United States. To change this, a better understanding of how equipment ends up being installed is needed. We hypothesized that rehabilitation services were a major mechanism.

Objective: To examine the association between receipt of rehabilitation services and installation of adaptive equipment.

Design: Observational cohort of the National Health and Aging Trends Study in 2015 and 2016.

Setting: Community.

Participants: A total of 416 community-dwelling adults age 65 yr or older who needed bathing equipment and 454 who needed toileting equipment.

Outcomes and Measures: Study outcomes were the installation of bathing or toileting equipment. The primary independent variable was the receipt of rehabilitation services between 2015 and 2016.

Results: Among older adults who needed equipment in 2015, 34.3% had bathing equipment and 19.2% had toileting equipment installed by 2016. In multivariate logistic regression analyses, rehabilitation services were associated with installation of bathing (odds ratio [OR] = 5.07, 95% confidence interval [CI] [2.60, 9.89]) and toileting equipment (OR = 2.67, 95% CI [1.48, 4.84]).

Conclusions and Relevance: A minority of those in need have adaptive equipment installed within a year. In the current health care system, rehabilitation providers play a major role in equipment installation.

What This Article Adds: Rehabilitation providers are involved in the installation of adaptive bathroom equipment among older persons who need it. Still, most in need of equipment do not have it after a year, suggesting that further work is needed to increase access to rehabilitation providers and develop other avenues for obtaining equipment.

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Simple adaptive equipment, such as shower grab bars and modified toilet seating, is underused among community-dwelling older adults in the United States. According to Person–Environment Fit Theory and recent randomized controlled trials, supplying this equipment reduces disability and downstream health care costs among older persons with diminished physical capacity (Freedman et al., 2014; Lam et al., 2021; McGarry & Falvey, 2021; Szanton et al., 2019). However, an estimated 1 in 4 older persons in need lack bathing equipment and 1 in 2 older persons in need lack toileting equipment, representing a gap in geriatric care (Lam et al., 2021). Qualitative studies have explored why this gap exists, but little quantitative evidence exists to explain why some get equipment when they need it and others do not (Bailey et al., 2019). With projections estimating that the prevalence of disability across the United States will increase with an aging population (Centers for Disease Control and Prevention, 2009), it is important to better understand the structures and processes in the health care system that influence whether equipment is provided to inform policy and quality improvement efforts.

In the current system, rehabilitation providers are typically involved in assessing patients' capabilities, evaluating whether equipment is necessary, and initiating the process of getting equipment through a vendor. These providers include occupational therapists, physical therapists, skilled nurses, medical social workers, home health aides, and speech therapists who aim to improve, sustain, and slow declines in function (Medicare Payment Advisory Commission, 2021). In this study, we sought to provide empirical evidence for whether rehabilitation providers play a key role in eventual equipment provision to those who need it and whether poor access to rehabilitation providers explains why many lack equipment.

Method

Participants and Study Design

The National Health and Aging Trends Study (NHATS) conducts annual in-person interviews with a nationally representative cohort of U.S. Medicare beneficiaries age 65 yr or older. NHATS oversamples the oldest old and Black older adults, is administered in English and Spanish, and is publicly available at https://www.nhats.org. NHATS replenished its cohort with new participants in 2015 (unweighted response rate of 76.8%; Kasper & Freedman, 2018).

Using previously reported criteria for identifying a need for bathing or toileting home modification (Lam et al., 2021), we constructed two cohorts of community-dwelling older adults from NHATS participants in 2015. After excluding 118 people who moved into institutional settings in 2016, the first cohort included participants with an unmet need for bathing equipment (e.g., they would benefit from bathing equipment but lacked grab bars and seats in their shower; $n = 416$). The second cohort included participants with an unmet need for toileting equipment (e.g., they would benefit from toileting equipment but lacked a raised toilet seat and grab bars around their toilet; $n = 454$). Some met criteria for both bathing equipment and toileting equipment and were included in both cohorts. The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved NHATS.

Outcomes

NHATS participants were asked whether they had a grab bar in the shower, a seat in the shower, a raised toilet seat, or grab bars around their toilet. Our primary outcomes were (1) whether participants with an unmet need for bathing equipment in 2015 had any adaptive bathing devices in 2016 and (2) whether participants with an unmet need for toileting equipment in 2015 had any adaptive toileting devices in 2016.

Independent Variable

Our key independent variable was whether someone reported receiving services from a rehabilitation therapist in the previous year (yes or no). *Rehabilitation services* include those provided by a physical therapist, occupational therapist, or speech therapist and could have occurred in a hospital, nursing home, rehabilitation facility, office, or home.

Covariates

Andersen's (1995) model of health behavior posits that the use of health services (e.g., the purchase of equipment) depends on the environment, population characteristics, and perceived and evaluated health status. Study covariates therefore spanned demographics, socioeconomic status, and health status domains in 2015 and included potential confounders such as age, medical comorbidity, and dementia. Demographics encompassed age, race and ethnicity, sex, and marital status. Socioeconomic status included formal education and Medicaid status. Health status consisted of self-rated health, previous-year hospitalization, dementia, medical comorbidity, and history of hip or knee surgery. We grouped dementia into probable, possible, and no dementia (Kasper et al., 2013) and medical comorbidity by quartile on the basis of NHATS cohort status in 2015 (with higher quartiles indicating more chronic medical conditions).

NHATS also asks whether a therapist recommended bathing or toileting equipment. These recommendations were included as a potential mediator of the association between receipt of services and eventual equipment installation.

Data Analyses

To examine rehabilitation services' association with equipment installation, we conducted a series of unadjusted and adjusted logistic regression analyses with the installation of bathing and toileting home modification serving as our dichotomous outcomes. We examined any rehabilitation services as the primary predictor and inpatient, outpatient, and home rehabilitation services as predictors in a secondary analysis. Adjusted regression analyses included the demographics, socioeconomic status, and health status variables. To support a causal explanation of the association between receipt of rehabilitation services and equipment installation, we examined whether therapist recommendations for equipment functioned as a mediator. We used SAS survey procedures (Version 9.4) to account for sampling design and nonresponse and calculate population-weighted adjusted estimates.

Results

Equipment Installation Status in 2016

Using nationally representative weights, among community-dwelling older adults with unmet bathing and toileting equipment needs in 2015, only 34.3% (unweighted $n = 151$) and 19.2% (unweighted $n = 96$) had bathing or toileting equipment installed by 2016.

Logistic Regression Analyses

In the unadjusted logistic regression analyses, receipt of rehabilitation services was associated with the installation of both bathing and toileting equipment in 2016 (bathing equipment installed, odds ratio [OR] = 3.47, 95% confidence interval [CI] [1.84, 6.54]; toileting equipment installed, OR = 2.45, 95% CI [1.35, 4.44]). In the multivariate analyses accounting for demographics, socioeconomic status, and health status variables, rehabilitation services remained associated with equipment installation (bathing equipment installed, adjusted OR [aOR] = 5.07, 95% CI [2.60, 9.89]; toileting equipment installed, aOR = 2.67, 95% CI [1.48, 4.84]; Table 1). Inpatient rehabilitation, outpatient rehabilitation, and in-home rehabilitation were likewise associated with the installation of both bathing and toileting equipment (Table 2). Consistent with a partial mediating effect, including therapist recommendations in the full regression models weakened the association of rehabilitation services with equipment installation (bathing equipment installed, aOR = 3.73, 95% CI [1.81, 7.70]; toileting equipment installed, aOR = 2.17, 95% CI [1.10, 4.28]; Table 3).

Discussion

Consistent with our hypothesis, community-dwelling older persons who work with rehabilitation providers are much more likely to have equipment installed. In our adjusted multivariate model, receipt of rehabilitation services was the strongest factor associated with the installation of bathing and toileting equipment, and this effect was mediated by therapist recommendations to install equipment. Rehabilitation providers thereby appear instrumental in helping older adults modify their home environment to maximize function and reduce disability. Still, these services' reach remains limited among older persons with diminished physical capacity. Among older adults who needed bathing and toileting equipment, only 1 in 4 received rehabilitation services, and a minority had bathing equipment or toileting equipment installed 1 yr later (1 in 3 and 1 in 5, respectively).

In the United States, grab bars and toilet and shower seats are not considered durable medical equipment (DME) and are therefore not covered by traditional Medicare Part B and almost all Medicare Advantage Plans (Jacobson et al., 2019). Consequently, the usual process of getting equipment involves (1) an older adult or caregiver believing that equipment would be beneficial, typically through working with an occupational or physical therapist; (2) purchasing the equipment privately from a vendor; and then (3) installing it or finding someone to do so, such as a contractor or local charitable resource (Lifespan of Greater Rochester, 2021). In the rare case in which a person is enrolled in a qualifying Medicare Advantage Plan, reimbursement of bathroom equipment is similar to other DME and requires a prescription from a health care provider, which a vendor submits in a claim to the insurer for payment. These prescriptions are often issued after a recommendation from an occupational or physical therapist for specific equipment. The final cost to covered patients is difficult to predict because coverage varies by insurance plan (Centers for Medicare & Medicaid Services [CMS], 2020) and typically does not include equipment installation. Moreover, as of January 1, 2023, the CMS discontinued the use of Certificates of Medical Necessity for DME, with unclear implications for how this will affect the reimbursement process for non-DME bathing and toileting equipment in Medicare Advantage plans (CMS, 2022).

On the basis of our findings, we conclude that receiving care from rehabilitation providers such as occupational and physical therapists is a critical step on the pathway to obtaining bathroom safety equipment. Working with a therapist and receiving a recommendation for equipment were more influential than education, self-rated health, or hospitalization in eventual equipment installation, likely because working with a therapist helps people realize that equipment would be beneficial. However, we found that most older adults with an unmet need for bathroom safety modifications did not receive services from a rehabilitation provider. Alternative approaches are therefore needed to reach older adults with adaptive equipment needs. One possibility includes increased screening for functional impairments in primary care for older adults (McGarry & Falvey, 2021). Systematically screening older adults at high risk for functional impairment and disability (e.g., those recently hospitalized) could improve appropriate referrals to occupational or physical therapists who can provide more specific recommendations on which equipment is necessary. Reforming Medicare policy may also help. Current Medicare policy generally restricts home assessments to those who are homebound or have skilled nursing needs, which limits opportunities for clinicians to refer older people to appropriate services or for people to self-refer themselves when concerned about function (McGarry & Falvey, 2021).

Our study has several strengths. We examined a national cohort of Medicare beneficiaries; applied a robust algorithm to identify only those who need adaptive equipment; and accounted for characteristics spanning demographic, socioeconomic status, and health status domains that may have confounded the relationship between rehabilitation services and unmet need for home modifications. Our study also has some limitations. Although we controlled for many characteristics and considered mediating factors, we cannot prove causality. Receipt of rehabilitation services in the first place may partly be a marker of a person's willingness and capacity to take steps to improve their function; those

Table 1. Logistic Regression Analyses Examining the Association of Rehabilitation Services With Installation of Bathing and Toileting Equipment

	Bathing Equipment Installed				Toileting Equipment Installed			
	Unadjusted Model (n = 415)		Adjusted Model (n = 388)		Unadjusted Model (n = 454)		Adjusted Model (n = 412)	
Predictors	**OR**	**95% CI[a]**	**aOR**	**95% CI[a]**	**OR**	**95% CI[a]**	**aOR**	**95% CI[a]**
Rehabilitation (2016)								
Any rehabilitation services, yes	3.47	[1.84, 6.54]**	5.07	[2.60, 9.89]**	2.45	[1.35, 4.44]**	2.67	[1.48, 4.84]**
Demographics (2015)								
Age, yr (ref. = 65–74)								
75–84			2.07	[1.19, 3.59]*			1.65	[0.85, 3.21]
≥85			1.65	[0.74, 3.68]			1.42	[0.59, 3.42]
Race and ethnicity (ref. = White, non-Hispanic)								
Black, non-Hispanic			0.76	[0.34, 1.67]			0.67	[0.35, 1.28]
Hispanic or other			1.10	[0.49, 2.47]			0.57	[0.19, 1.67]
Sex, female (ref. = male)			1.15	[0.57, 2.34]			0.54	[0.26, 1.12]
Marital status (ref. = married or living with a partner)								
Separated or divorced			1.31	[0.58, 2.98]			2.85	[1.21, 6.75]*
Widowed or never married			1.06	[0.52, 2.18]			2.32	[0.88, 6.15]
Socioeconomic status (2015)								
Education (ref. = college degree)								
High school degree or equivalent or less			1.18	[0.58, 2.44]			1.38	[0.59, 3.26]
Some college or vocational training			0.61	[0.23, 1.62]			1.23	[0.41, 3.74]
Medicaid, present			0.59	[0.29, 1.23]			0.93	[0.37, 2.35]
Health status (2015)								
Self-rated health (ref. = excellent)								
Very good			0.77	[0.18, 3.29]			0.52	[0.06, 4.70]
Good			0.60	[0.14, 2.64]			0.70	[0.12, 4.12]
Fair			0.66	[0.15, 2.87]			0.99	[0.17, 5.75]
Poor			0.87	[0.17, 4.55]			0.73	[0.09, 5.74]

(*Continued*)

Table 1. Logistic Regression Analyses Examining the Association of Rehabilitation Services With Installation of Bathing and Toileting Equipment (*Cont.*)

	Bathing Equipment Installed				Toileting Equipment Installed			
	Unadjusted Model (n = 415)		Adjusted Model (n = 388)		Unadjusted Model (n = 454)		Adjusted Model (n = 412)	
Predictors	**OR**	**95% CI[a]**	**aOR**	**95% CI[a]**	**OR**	**95% CI[a]**	**aOR**	**95% CI[a]**
Hospitalized in prior year, yes			1.02	[0.50, 2.10]			0.91	[0.47, 1.79]
Dementia or Alzheimer's (ref. = no dementia)								
Probable			3.03	[1.13, 8.14*]			1.18	[0.58, 2.37]
Possible			1.84	[0.63, 5.38]			0.90	[0.42, 1.94]
Medical comorbidity, quartile (ref. = 1st quartile)								
2nd			1.41	[0.57, 3.48]			0.71	[0.23, 2.21]
3rd			1.02	[0.38, 2.76]			1.25	[0.42, 3.72]
4th			1.62	[0.72, 3.65]			1.41	[0.43, 4.55]
Hip or knee surgery history, present			1.01	[0.50, 2.03]			0.90	[0.48, 1.71]

Note. SAS survey procedures accounted for sampling design and nonresponse to calculate population-weighted adjusted estimates. aOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio.
[a]Intervals based on 95% Wald confidence limits.
*$p < .05$. **$p < .01$.

Table 2. Logistic Regression Analyses Examining the Association of Rehabilitation Sites With Installations of Bathing and Toileting Equipment

	Bathing Equipment Installation						Toileting Equipment Installation					
	Unadjusted Model			Adjusted Model			Unadjusted Model			Adjusted Model		
Rehabilitation (2016)	*n*	OR	95% CI[a]	*n*	aOR	95% CI[a]	*n*	OR	95% CI[a]	*n*	aOR	95% CI[a]
Inpatient rehabilitation services, yes	415	8.08	[3.37, 19.37]**	388	9.73	[3.56, 26.59]**	454	3.01	[1.46, 6.21]**	412	2.84	[1.31, 6.19]**
Outpatient rehabilitation services, yes	415	2.98	[1.46, 6.08]**	388	4.90	[2.19, 10.96]**	454	1.96	[1.05, 3.65]*	412	2.32	[1.18, 4.56]*
Home rehabilitation services, yes	415	4.05	[1.69, 9.71]**	388	4.14	[1.72, 9.95]**	453	2.85	[1.38, 5.92]**	411	2.73	[1.24, 6.05]*

Note. The unadjusted model includes only a single rehabilitation site. SAS survey procedures accounted for sampling design and nonresponse to calculate population-weighted adjusted estimates. aOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio.
[a]Intervals based on 95% Wald confidence limits.
*$p < .05$. **$p < .01$.

Table 3. Mediating Regression Analyses Comparing the Association of Rehabilitation Services With Installation of Bathing and Toileting Equipment Before and After Adjusting for Therapist Recommendations

	Bathing Equipment Installed				Toileting Equipment Installed			
	Adjusted Model 1 (*n* = 415)[a]		Adjusted Model 2 (*n* = 388)[b]		Adjusted Model 1 (*n* = 454)[a]		Adjusted Model 2 [a] (*n* = 412)[b]	
Predictors for the Primary Regression Analyses	aOR	95% CI[c]	aOR	95% CI[c]	aOR	95% CI[c]	aOR	95% CI[c]
Rehabilitation (2016)								
Any rehabilitation services, yes	5.07	[2.60, 9.89]**	3.73	[1.81, 7.70]**	2.67	[1.48, 4.84]**	2.17	[1.10, 4.28]*

Note. aOR = adjusted odds ratio; CI = confidence interval.
[a]Adjusted Model 1 includes the covariates listed in Table 1.
[b]Adjusted Model 2 includes the covariates listed in Table 1 and adds therapist recommendation to install grab bars or seats for bathing or toileting to test for mediation. Note that therapist recommendations to install equipment were themselves associated with the outcome of having equipment installed in the adjusted regressions (bathing equipment installed, aOR = 3.79, 95% CI [1.19, 12.11]; toileting equipment installed, aOR 1.99, 95% CI [0.65, 6.11]).
[c]Intervals based on 95% Wald confidence limits.
*$p < .05$. **$p < .01$.

who refuse services might not accept equipment even if they started rehabilitation. In addition, equipment provision alone is not enough; future research will need to examine the downstream clinical and utilization consequences of equipment provision to inform effective Medicare policy.

Implications for Occupational Therapy Practice

This study has several implications for occupational therapy practice:

- Occupational therapists should systematically assess the home environment of older people given the considerable unmet need for equipment in this population.
- Occupational therapists should make recommendations when they believe equipment would be beneficial because their recommendations appear to be highly influential in getting equipment installed for those who would benefit.
- Many older people in need never see an occupational therapist, and some do not get equipment even after receiving a recommendation for it; to have an impact on the activities of daily living among older persons in the United States, occupational therapists should look out for opportunities to partner locally with other professionals to improve access to rehabilitation and to help with equipment installation.

Conclusion

Addressing the need for adaptive equipment often takes more than a year for those with impaired functioning. In the current system, rehabilitation services, such as those provided by occupational therapists (Smallfield & Elliott, 2020), help address a major unmet need for adaptive home modifications among older adults.

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