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Use of Accessible Weight Scales and Examination Tables/Chairs for Patients with Significant Mobility Limitations by Physicians Nationwide

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Background: Mobility limitations are the most common disability type among the 61 million Americans with disability. Studies of patients with mobility limitations suggest that inaccessible medical diagnostic equipment poses significant barriers to care.

Methods: The study team surveyed randomly selected US physicians nationwide representing seven specialties about their reported use of accessible weight scales and exam tables/chairs when caring for patients with mobility limitations. A descriptive analysis of responses was performed, and multivariable logistic regression was used to examine associations between accessible equipment and participants' characteristics.

Results: The 714 participants (survey response rate = 61.0%) were primarily male, White, and urban, and had practiced for 20 or more years. Among those reporting routinely recording patients' weights ($n = 399$), only 22.6% (standard error [SE] = 2.2) reported always or usually using accessible weight scales for patients with significant mobility limitations. To determine weights of patients with mobility limitations, 8.1% always, 24.3% usually, and 40.0% sometimes asked patients. Physicians practicing $\geq$ 20 years were much less likely than other physicians to use accessible weight scales: odds ratio (OR) = 0.51 (95% confidence interval [CI] = 0.26–0.99). Among participants seeing patients with significant mobility limitations ($n = 584$), only 40.3% (SE = 2.2) always or usually used accessible exam tables or chairs. Specialists were much more likely than primary care physicians to use accessible exam tables/chairs: OR = 1.96 (95% CI = 1.29–2.99).

Conclusion: More than 30 years after enactment of the Americans with Disabilities Act, most physicians surveyed do not use accessible equipment for routine care of patients with chronic significant mobility limitations.

Approximately 61 million Americans have a disability.[1] Mobility limitations—difficulties with movements involving the upper and lower extremities and hands—are the most common type of disability, affecting 18.5% of Americans ages 45–64 and 27.7% of persons ages 65 and older.[2] For more than two decades, *Healthy People*[3,4] and other reports[5] have documented health care disparities for people with disability, such as with screening and preventive services,[6–9] reproductive and pregnancy care,[10–14] and cancer diagnosis and treatment.[15,16] Although many factors contribute to these disparities, physical access barriers, such as inaccessible weight scales and examination tables or chairs, impede provision of even the most basic clinical services.[17,18]

Regulations implementing the 1990 Americans with Disabilities Act (ADA) require that the physical structures of health care settings (for example, parking lots, exterior entrances, restrooms), including physicians' offices and outpatient clinics, meet specified accessibility standards. However, the ADA does not regulate furnishings or equipment within these structures, including weight scales, exam tables/chairs, and diagnostic imaging equipment. Nevertheless, the ADA requires that patients with disability receive equitable care. Reports, primarily from patients, suggest that inaccessible equipment can contribute to substandard care and safety concerns.[17–19] For example, people who use wheelchairs describe being routinely examined in their wheelchairs rather than transferring onto exam tables.[14,19,20] Pregnant women who use wheelchairs report not being weighed during prenatal visits because practices lack accessible weight scales.[14] Using "secret shopper" methods, one study found that nearly 22% of contacted practices refused to schedule a fictional patient described as unable to independently transfer onto an exam table.[21]

Although some research has asked physicians or providers about whether they have accessible weight scales and exam tables/chairs in their practices, these studies have generally focused on specific geographic regions or health care delivery systems.[22–27] We conducted the first nationally representative survey of which we are aware exploring the extent to which outpatient physicians nationwide use accessible weight scales and exam tables/chairs when caring for patients with significant mobility limitations. In this

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survey, we defined *mobility limitations* as "chronic difficulties with movement, including difficulties walking, standing, climbing stairs, and using arms and hands." This survey goes beyond whether physicians have accessible equipment to ask how often they or their staff use accessible equipment when weighing or examining patients with chronic mobility limitations. Our goals are to assess use of accessible weight scales and exam tables/chairs and to empirically examine factors that are associated with their use.

METHODS

The Massachusetts General Hospital/Partners Healthcare and University of Massachusetts–Boston Institutional Review Boards approved this study.

Survey Development and Testing

Because no existing survey met our goals, we developed a new survey appropriate for physicians practicing in seven specialties: family medicine, general internal medicine, rheumatology, neurology, ophthalmology, orthopedic surgery, and obstetrics-gynecology (OB/GYN). We selected the first six specialties because they see large numbers of patients with disability. We included OB/GYN because many women see gynecologists for routine care and because prior research identified high rates of inaccessible equipment in OB/GYN practices.[10,21]

To develop the survey, we first conducted 20 in-depth, open-ended, telephone individual interviews with physicians practicing in Massachusetts across the seven specialties to learn about their experiences with patients with disability.[28–31] Second, via videoconference, we performed three focus groups with 22 physicians practicing in the seven specialties from 17 states; we recruited participants from an online social network of physicians (Sermo).[32,33] Third, drawing from these qualitative findings and the research literature, we developed the survey in an iterative approach. The University of Massachusetts–Boston Center for Survey Research (CSR) conducted eight cognitive interviews with practicing physicians to pretest the survey draft, seeking feedback about the clarity and appropriateness of the draft survey questions. We made minor modifications based on cognitive test results (for example, slightly revised question wording to improve clarity, added a "not applicable" response category). The CSR then pilot tested the survey procedures with 50 participants selected randomly from our sampling frame described below. The final survey contained 75 questions grouped into eight modules by topic, including modules about disability relating to vision, hearing, mental health, and intellectual disability (not addressed in this article; see Appendix 1, available in online article).

Sampling

We identified all board-certified US physicians in the seven specialties using commercially available data from IQVIA[34] ($N = 277{,}675$). Next, we excluded US Department of Veterans Affairs or military physicians (health care settings for active duty military or veterans are often specifically designed to accommodate patients with significant disabling injuries; thus, their experiences may not generalize to the civilian care), trainees (residents or fellows), locum tenens physicians, hospitalists, physicians lacking complete addresses or telephone numbers, and physicians board-certified in both medicine and pediatrics. After these exclusions, 172,734 physicians remained in the sampling frame. We selected simple random samples of physicians within specialties: 350 each in family practice and general internal medicine, and 140 physicians each in the five specialties, yielding 1,400 physicians (700 primary care, 700 specialists).

Survey Administration

Starting in October 2019 the CSR sent all sampled physicians a paper survey via priority mail, recruitment cover letter, information sheet, postage-paid return envelope, and $50 cash honorarium. Instructions requested that physicians complete either the paper survey (returning it to CSR in the postage-paid envelope) or Internet version, using an individualized link provided in the mailing. Both paper and electronic surveys had unique subject identification numbers, permitting CSR to make follow-up calls and send additional mailings (without incentives) to nonrespondents. CSR started reminder calls to nonrespondents three weeks after initial mailings. In early January 2020 CSR sent a second mailing to 552 nonrespondents, again telephoning nonrespondents. On March 5, 2020, CSR sent the final mailing. The novel coronavirus pandemic caused logistical challenges that extended the data collection, and CSR officially closed the survey in June 2020.

Screening questions on the survey's first page aimed to confirm that sampled physicians met eligibility criteria (that is, board certified in one of the seven specialties, actively practicing in the United States, $\geq$ 10 hours weekly providing direct patient care). Among the 1,400 sampled physicians, 175 (12.5%) were ineligible based on screening question responses; serving as residents or fellows; being retired, too ill, or deceased; having an inactive medical license; being away from practice or outside the United States for study duration; or unreachable by CSR via mail, phone, or Internet. Of the 1,225 eligible physicians, 714 completed the survey, 84.2% on paper and 15.8% electronically. We calculated the response rate using the formula from the American Association for Public Opinion Research recommended for mailed surveys of specifically named persons ("Response Rate 3").[35] For the overall survey, the weighted response rate was 61.0%, and response rates by specialty were family medicine, 61.1%; general internal medicine, 63.2%; rheumatology, 57.7%; neurology, 58.0%; ophthalmology, 63.0%; orthopedic surgery, 58.6%; and OB/GYN, 61.6%.

Outcome Measures and Variables

Most variables used in the analyses came directly from responses to individual survey questions. We created our two main outcome measures as described below. Also described below, small numbers required us to collapse response categories for race/ethnicity and practice type.

Weight Scale Measure. Participants who reported routinely weighing their patients with significant mobility limitations also reported the type of scale ("roll-on scale," Hoyer lift) used measured on a Likert scale (1 = always, 2 = usually, 3 = sometimes, 4 = rarely, 5 = never). We considered participants to use accessible weight scales if they reported that they "always" or "usually" used either of the types of scales. For our analyses, we dichotomized this variable as (1) always/usually uses accessible weight scale, and (0) does not usually/always use accessible weight scale.

Exam Table/Chair Measure. Participants reported whether they used a lift device or an automatic height-adjustable table for transferring patients measured on a Likert scale (1 = always, 2 = usually, 3 = sometimes, 4 = rarely, 5 = never). We considered participants to use accessible exam table/chairs if they reported that they "always" or "usually" for either of these questions (QB3_2 and QB3_3). For our analyses, we dichotomized this variable as (1) always/usually uses accessible exam table/chair, and (0) does not usually/always use accessible exam/table chair.

Race/Ethnicity. Too few participants reported being Black or Hispanic for us to analyze these groups separately. We therefore combined them with participants reporting "Other" race/ethnicity.

Practice Type. Most physicians served in private, community-based practices, while substantial numbers practiced in academic teaching hospitals. Small numbers reported working in community hospitals, tribal hospitals, community health centers, rural clinics, and other settings. We therefore grouped these diverse facilities as "other" practice types.

Analyses

We performed all analyses using SAS 9.4 (SAS Institute, Cary, North Carolina) and SUDAAN 11.0.3 (RTI International, Inc., Research Triangle Park, NC), using weights provided by the CSR to obtain population level estimates. As described above in presenting our sampling approach, we drew a simple random sample of physicians within specialties; therefore, the sampling weight is the inverse of the probability of selection. Within specialty all physicians had the same weight, but the weights varied across specialties. We created a nonresponse weight as the inverse probability of response to account for survey nonresponse by sampled physicians. The final adjusted weight was the product of the sampling weight and nonresponse weight.

As noted above, the full survey sample included 714 participants. For the findings reported here, we analyzed two subsets of these 714 respondents: 399 participants for the weight scale analyses, and 584 participants for the analyses of exam tables/chairs (Figure 1). Our intention was to analyze only those physicians who saw patients with mobility limitations and who reported routinely recording patients' weights in the weight scale analysis. We excluded from weight scale analyses respondents who indicated they did not see patients with mobility limitations ($n = 90$) or did not routinely record weights ($n = 189$) or had missing values ($n = 28$). For the exam table/chair analyses, we excluded physicians who saw no patients with mobility limitations ($n = 98$) or had missing values ($n = 32$).

We conducted separate analyses for weight scales ($n = 399$) and exam tables/chairs ($n = 584$). The tables present weighted percentages with associated standard errors (SEs) and p values from weighted analyses assessing the significance of differences in the group distributions with two-sided chi-square tests.

We produced adjusted odds ratios (ORs) and 95% confidence intervals (CIs) from separate multivariable logistic regressions evaluating the relationship of the independent variables to the dichotomous outcomes defined above (that is, accessible weight scales or exam tables/chairs, yes/no). After considering the additional impact of adding each of the variables into the model, we built our final model to include participant gender, race/ethnicity, urban/rural location of practice, participant professional characteristics (years since graduating medical school and primary specialty), barriers to using accessible equipment (lack of funds, lack of physical space, and risk of being sued under ADA), and practice characteristics (practice type and whether a safety net practice, based on percentage of patients with Medicaid or uninsured). We also generated C-statistics to indicate the goodness of fit of the models. Results from the final model described above are reported here; results from the other five stepped multivariable models appear in Appendix 2 (available in online article). We viewed two-sided $p < 0.05$ as statistically significant.

RESULTS

We present analyses relating to weight scales first (Table 1) and exam tables/chairs second (Table 2) because during office visits patients are typically weighed before they are examined. The left column of both Tables 1 and 2 shows the distribution of participants (column percentages with SEs) by personal, professional, and practice characteristics and perspectives (for example, about funding and space for acquiring equipment, risk of being sued, staff injuries) in each of the two analyses. Participants were primarily male, White, and urban, and had practiced for 20 or more years,

Table 1. Participant Characteristics and Associations with Using Accessible Weight Scale for Patients with Significant Mobility Limitations Who Cannot Use a Standard Scale

Participant characteristics	Overall* ($n=399$) Col % (SE)	Uses accessible weight scale* No ($n=310$) Row % (SE)	Yes ($n=89$)	OR (95% CI)†
All participants		77.4 (2.2)	22.6 (2.2)	
Gender (*p* value‡)		**0.08**	**0.75**	
Male	62.1 (2.6)	80.3 (2.7)	19.7 (2.7)	REF
Female	37.9 (2.6)	71.9 (4.0)	28.1 (4.0)	0.90 (0.45–1.77)
Race/ethnicity (*p* value‡)		**0.32**	**0.43**	
White	67.4 (2.5)	77.6 (2.7)	22.4 (2.7)	REF
Asian	15.6 (1.8)	70.1 (6.1)	29.9 (6.1)	1.78 (0.73–4.34)
Hispanic/African American/Other	17.0 (2.1)	82.3 (5.2)	17.7 (5.2)	1.01 (0.44–2.31)
Urban/rural (*p* value‡)		**0.10**	**0.20**	
Urban	86.8 (1.9)	79.1 (2.3)	20.9 (2.3)	REF
Rural	13.2 (1.9)	66.1 (7.4)	33.9 (7.4)	1.77 (0.73–4.26)
Years since graduating medical school (*p* value‡)		**0.005**	**0.05**	
< 20 years	32.9 (2.6)	67.1 (4.5)	32.9 (4.5)	REF
≥ 20 years	67.1 (2.6)	82.1 (2.6)	17.9 (2.6)	0.51 (0.26–0.99)
Specialty (*p* value‡)		**0.83**	**0.67**	
Primary care	71.4 (1.5)	77.1 (2.8)	22.9 (2.8)	REF
Specialty	28.6 (1.5)	78.1 (3.6)	21.9 (3.6)	0.87 (0.45–1.67)
Practice type (*p* value‡)		**< 0.0001**	**< 0.0001**	
Private practice in the community	58.6 (2.7)	89.1 (2.2)	10.9 (2.2)	REF
Academic teaching hospital	18.1 (2.0)	57.0 (6.0)	43.0 (6.0)	6.25 (2.83–13.83)
Other	23.3 (2.3)	62.9 (5.6)	37.1 (5.6)	4.40 (2.06–9.37)
Owner or co-owner of practice (*p* value‡)		**< 0.0001**		
Yes	36.8 (2.6)	92.8 (2.3)	7.2 (2.3)	NA
No	63.2 (2.6)	68.8 (3.2)	31.2 (3.2)	NA
Number of physicians in practice (*p* value‡)		**0.0003**		
Very small (1–3)	29.5 (2.5)	89.1 (3.1)	10.9 (3.1)	NA
Small (4–11)	49.2 (2.7)	74.4 (3.4)	25.6 (3.4)	NA
Large (≥ 12)	21.3 (2.1)	66.7 (5.3)	33.3 (5.3)	NA
Number of nurse practitioners or physician assistants in practice (*p* value‡)		**0.0002**		
0	22.0 (2.3)	85.7 (3.9)	14.3 (3.9)	NA
1–2	36.6 (2.8)	86.4 (3.3)	13.6 (3.3)	NA
≥ 3	41.4 (2.8)	65.5 (4.2)	34.5 (4.2)	NA
Percentage of patients with Medicaid or uninsured (*p* value‡)		**0.22**	**0.99**	
Non–safety net provider (< 35%)	69.9 (2.7)	80.8 (2.6)	19.2 (2.6)	REF
Safety net provider (≥ 35%)	30.1 (2.7)	74.3 (4.7)	25.7 (4.7)	1.00 (0.51–1.98)
Lack of funds to purchase special equipment (*p* value‡)		**0.21**	**0.95**	
Not a problem	18.7 (2.1)	71.1 (5.5)	28.9 (5.5)	REF
Problem	81.3 (2.1)	78.8 (2.5)	21.2 (2.5)	0.98 (0.44–2.18)
Lack of space in practice to accommodate patients with disability (p-value‡)		**0.11**	**0.31**	
Not a problem	30.5 (2.5)	71.5 (4.4)	28.5 (4.4)	REF
Problem	69.5 (2.5)	79.7 (2.6)	20.3 (2.6)	0.69 (0.34–1.41)
Risk of being sued under ADA because of problems accommodating patients with disability (p-value‡)		**0.09**	**0.29**	
No risk	29.2 (2.5)	70.4 (4.7)	29.6 (4.7)	REF
At risk	70.8 (2.5)	79.6 (2.6)	20.4 (2.6)	0.69 (0.34–1.38)
Participant or staff injured while transferring patient with mobility limitation (p-value‡)		**0.20**		
Yes	10.7 (1.9)	69.2 (8.7)	30.8 (8.7)	NA
No	89.3 (1.9)	81.2 (2.5)	18.8 (2.5)	NA

OR, odds ratio; CI, confidence interval; SE, standard error, NA, not applicable; ADA, Americans with Disabilities Act.

* Some variables have missing values; percentages and standard errors include only completed responses.

† Odds ratios (95% confidence intervals) from multivariable logistic regression model to evaluate using accessible weight scale and gender, race/ethnicity, urban/rural, years since graduating medical school, specialty, practice type, percentage of patients with Medicaid or uninsured, lack of funds to purchase special equipment, lack of space in practice to accommodate patients with disability and risk of being sued under ADA.

‡ Based on Wald chi-square test.

Table 2. Participant Characteristics and Associations with Using Accessible Exam Table/Chair for Patients with Significant Mobility Limitations Who Cannot Transfer Independently

Participant characteristics	Overall* ($n = 584$)	Uses accessible exam table/chair		OR (95% CI)†
		No ($n = 358$)	Yes ($n = 226$)	
	Col % (SE)	Row % (SE)		
All participants		59.7 (2.2)	40.3 (2.2)	
Gender (*p* value‡)		**0.02**	**0.11**	
Male	61.2 (2.2)	63.9 (2.7)	36.1 (2.7)	REF
Female	38.8 (2.2)	53.0 (3.7)	47.0 (3.7)	1.45 (0.92–2.27)
Race/ethnicity (*p* value‡)		**0.66**	**0.84**	
White	66.7 (2.1)	60.1 (2.7)	39.9 (2.7)	REF
Asian	16.7 (1.6)	56.3 (5.2)	43.7 (5.2)	1.10 (0.63–1.90)
Hispanic/African American/Other	16.5 (1.7)	63.2 (5.5)	36.8 (5.5)	0.88 (0.48–1.62)
Urban/rural (*p* value‡)		**0.88**	**0.55**	
Urban	89.4 (1.4)	59.8 (2.3)	40.2 (2.3)	REF
Rural	10.6 (1.4)	58.6 (7.2)	41.4 (7.2)	0.81 (0.40–1.64)
Years since graduating medical school (*p* value‡)		**0.02**	**0.37**	
< 20 years	34.6 (2.2)	52.0 (4.0)	48.0 (4.0)	REF
≥ 20 years	65.4 (2.2)	63.6 (2.7)	36.4 (2.7)	0.81 (0.52–1.28)
Specialty (*p* value‡)		**0.02**	**0.002**	
Primary care	66.8 (0.9)	63.1 (2.8)	36.9 (2.8)	REF
Specialty	33.2 (0.9)	52.7 (3.2)	47.3 (3.2)	1.96 (1.29–2.99)
Practice type (*p* value‡)		**0.0012**	**0.0009**	
Private practice in the community	60.7 (2.2)	65.4 (2.7)	34.6 (2.7)	REF
Academic teaching hospital	17.5 (1.6)	57.5 (5.1)	42.5 (5.1)	0.92 (0.53–1.60)
Other	21.9 (1.9)	43.9 (5.0)	56.1 (5.0)	2.77 (1.58–4.87)
Owner or co-owner of practice (*p* value‡)		**0.007**	NA	
Yes	38.9 (2.2)	66.5 (3.3)	33.5 (3.3)	NA
No	61.1 (2.2)	54.3 (3.0)	45.7 (3.0)	NA
Number of physicians in practice (*p* value‡)		**0.0012**		
Very small (1–3)	31.9 (2.1)	70.9 (3.7)	29.1 (3.7)	NA
Small (4–11)	48.4 (2.3)	55.0 (3.2)	45.0 (3.2)	NA
Large (≥ 12)	19.7 (1.7)	51.9 (4.9)	48.1 (4.9)	NA
Number of nurse practitioners or physician assistants in practice (*p* value‡)		**0.03**		
0	23.7 (2.0)	65.9 (4.5)	34.1 (4.5)	NA
1–2	38.7 (2.4)	62.4 (3.8)	37.6 (3.8)	NA
≥ 3	37.6 (2.4)	50.7 (4.0)	49.3 (4.0)	NA
Percentage of patients with Medicaid or uninsured (*p* value‡)		**0.21**	**0.82**	
Non–safety net provider (< 35%)	68.6 (2.2)	62.1 (2.7)	37.9 (2.7)	REF
Safety net provider (≥ 35%)	31.4 (2.2)	55.5 (4.3)	44.5 (4.3)	1.06 (0.66–1.68)
Lack of funds to purchase special equipment (*p* value‡)		**0.05**	**0.50**	
Not a problem	17.7 (1.7)	50.1 (5.2)	49.9 (5.2)	REF
Problem	82.3 (1.7)	61.6 (2.4)	38.4 (2.4)	0.81 (0.44–1.50)
Lack of space in practice to accommodate patients with disability (*p* value‡)		**0.06**	**0.76**	
Not a problem	26.7 (2.0)	52.3 (4.3)	47.7 (4.3)	REF
Problem	73.3 (2.0)	61.9 (2.5)	38.1 (2.5)	0.92 (0.52–1.61)
Risk of being sued under ADA because of problems accommodating patients with disability (*p* value‡)		**0.04**	**0.17**	
No risk	29.6 (2.1)	51.8 (4.2)	48.2 (4.2)	REF
At risk	70.4 (2.1)	62.4 (2.6)	37.6 (2.6)	0.71 (0.44–1.15)
Participant or staff injured while transferring patient with mobility limitation (*p* value‡)		**0.97**		
Yes	13.5 (1.7)	60.5 (6.8)	39.5 (6.8)	NA
No	86.5 (1.7)	60.8 (2.6)	39.2 (2.6)	NA

OR, odds ratio; CI, confidence interval; SE, standard error, NA, not applicable; ADA, Americans with Disabilities Act.

* Some variables have missing values, and percentages and standard errors include only completed responses.

† Odds ratios (95% confidence intervals) from multivariable logistic regression model to evaluate using accessible exam table/chair and gender, race/ethnicity, urban/rural, years since graduating medical school, specialty, practice type, percentage of patients with Medicaid or uninsured, lack of funds to purchase special equipment, lack of space in practice to accommodate patients with disability and risk of being sued under ADA.

‡ Based on Wald chi-square test.

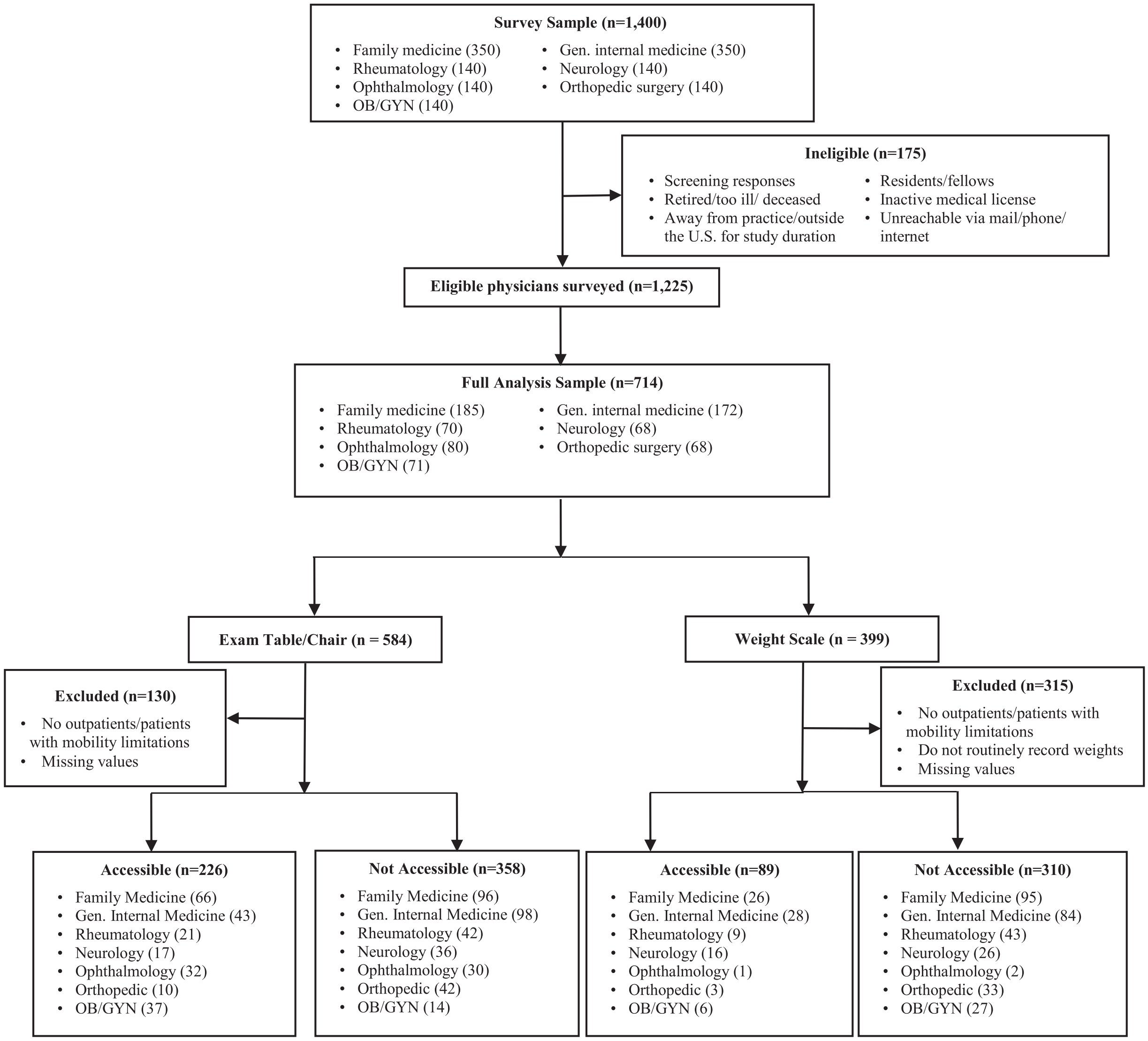

Figure 1: This chart displays the survey sample and analysis groups.

most in community-based private practices they do not own. Among the 399 participants (Table 1), only 22.6% (SE = 2.2) used accessible weight scales, and among the 584 participants (Table 2), 40.3% (SE = 2.2) used accessible exam tables/chairs.

Weight Scale Analyses

Figure 2 shows responses to a battery of five questions about how physicians obtain weights of patients with significant mobility limitations who cannot use a standard scale. (respondent could provide more than one answer to this question). Only 10.0% always use an accessible weight scale, while just 1.4% always use a lift device with a weight scale; 64.4% and 89.3% never use an accessible weight scale or lift device, respectively. To obtain weights, 8.1% reported always asking the patient, while 24.3% and 40.0%, respectively, usually or sometimes ask the patient. In addition, 1.5%, 14.7%, and 44.5%, respectively, reported always, usually, or sometimes using the patient's previous weight from the medical record.

Table 1 (middle two columns, row percentages [SE]) shows the results of bivariable analyses of associations between participants' characteristics and using an accessible weight scale: overall, 22.6% (SE = 2.2) of the 399 participants reported always or usually using accessible weight scales. Using accessible weight scales was significantly associated with the following participant characteristics: years since graduating medical school, fewer years more likely (32.9% vs. 17.9%, $p = 0.005$); practice type ($p < 0.0001$), academic practices more likely than private practices (43.0% vs. 10.9%); ownership, with non-owners more likely (31.2% vs. 7.2%, $p < 0.0001$); larger practices (12+ physicians) more likely than practices with 4–11 or 1–3 physicians (33.3% vs. 25.6% and 10.9%, $p = 0.0003$); and 3+ vs. 1–2 or no nurse practitioners or physician assistants (34.5% vs. 13.6% and 14.3%, $p < 0.001$). Gen-

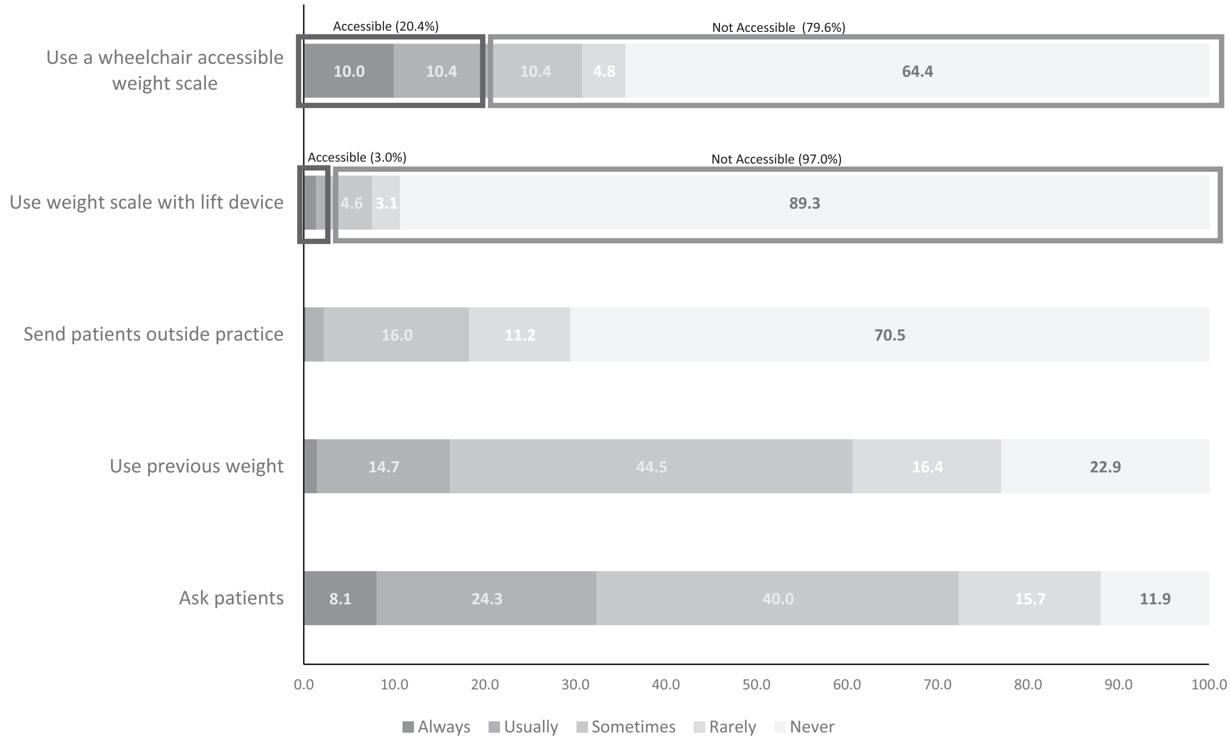

Figure 2: Shown here are the physician responses to the following, as presented in the survey:
B2a. When obtaining the weight of patients with significant mobility limitations who cannot use a standard scale, how often do you or your staff . . .? (Check one for each)
B2a1. Use a wheelchair accessible weight scale (aka "roll-on scale")
B2a2. Use a weight scale within a lift device (e.g., Hoyer lift)
B2a3. Send patients outside your practice to measure their weight
B2a4. Use previous weight in patients' medical record
B2a5. Ask patients how much they weigh
Note: For "Use previous weight," 1.5% of respondents answered "Always;" for "Send patients outside of practice," 0.3% of respondents answered "Always," 2% answered "Usually"; for "Use weight scale with lift device," 1.4% of respondents answered "Always." 1.6% answered "Usually."

der, race/ethnicity, urban/rural location, primary care vs. specialty, safety net practices, and having experienced injury while transferring patients were not statistically significantly associated with reporting using accessible weight scales, although some differences were substantial. Factors raised by physicians during the qualitative interviews that informed survey development as affecting acquisition of accessible equipment[28]— lacking funds, lacking space, and concerns about ADA compliance—had no significant associations with reports of using accessible weight scales (Table 1).

The multivariable model predicting using accessible weight scales found few significant associations (Table 1, right column). In this full model, physicians who graduated medical school ≥ 20 years previously had much lower odds of using accessible weight scales: OR = 0.51 (95% CI = 0.26–0.99, $p = 0.05$). Physicians in private practice had much lower odds of reported use than physicians practicing in academic (OR = 6.25, 95% CI = 2.83–13.83) or other settings (OR = 4.40, 95% CI = 2.06–9.37) ($p <$ 0.0001).

Exam Table/Chair Analyses

Figure 3 shows responses to a battery of three questions about what physicians do when patients cannot independently transfer onto an exam table/chair. Only 19.0% always use an accessible exam table/chair, and just 0.6% always use a lift device; 40.8% and 85.5% never use an accessible exam table/chair or lift device, respectively; and 11.5% always, 28.3% usually, and 45.1% sometimes get help from the person accompanying the patient.

Overall, 40.3% (SE = 2.2) always or usually use an accessible exam table/chair or lift device to transfer patients who cannot transfer independently (Table 2). Significant bivariable associations with using accessible exam tables/chairs included the following (Table 2, middle columns): gender, women more likely than men (47.0% vs. 36.1%, $p = 0.02$); years since graduating medical school, fewer years more likely (48.0% vs. 36.4%, $p = 0.02$); specialists more likely than primary care (47.3% vs. 36.9%, $p = 0.0012$); practice type, academic practices more likely than private practices (42.5% vs. 34.6%, $p = 0.001$); own-

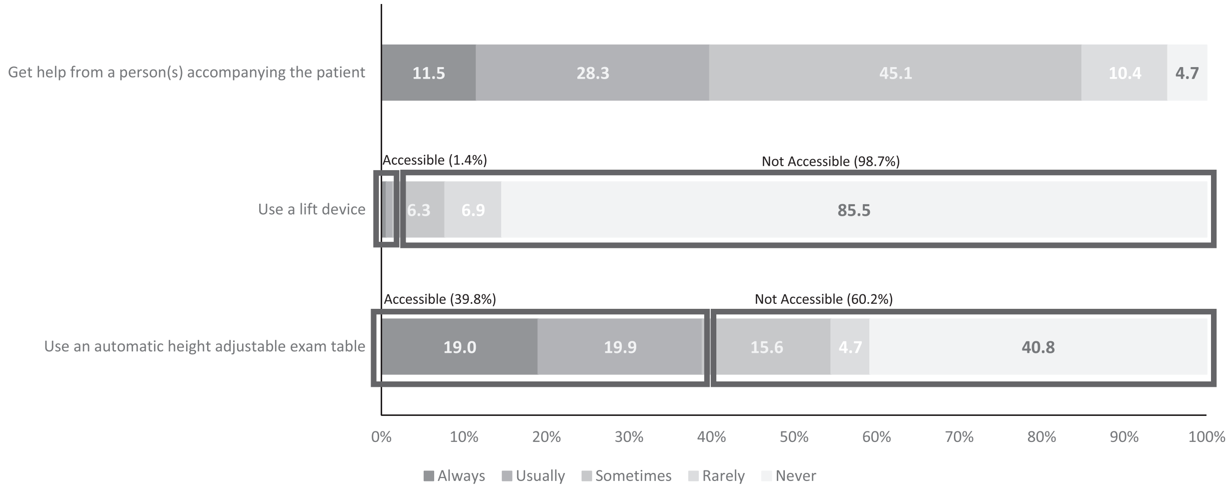

Figure 3: Shown here are the physician responses to the following, as presented in the survey:
B3. When patients with significant chronic mobility limitations cannot transfer independently onto an exam table or exam chair, do you or your staff . . .?
B3a. Get help from a person(s) accompanying the patient
B3b. Use a lift device
B3c. Use an automatic height adjustable exam table
Note: For "Use lift device," 0.6% of respondents answered "Always," 0.8% answered "Usually."

ership, with non-owners more likely (45.7% vs. 33.5%, $p < 0.007$); practice size ($p = 0.001$), with larger practices (12+ physicians) more likely than practices with 4–11 or 1–3 physicians (48.1% vs. 45.0% and 29.1%, $p = 0.0012$); 3+ vs. 1–2 or no nurse practitioners or physician assistants (49.3% vs. 37.6% and 34.1%, $p = 0.03$); lack of funds posing a problem to acquiring equipment (38.4% vs. 49.9%, $p = 0.05$); and reporting being at risk of lawsuit under the ADA (37.6% vs. 48.2%, $p = 0.04$). Race/ethnicity, urban/rural location, safety net provider, lacking space, and staff injuries were not significantly associated with using accessible exam tables/chairs.

Despite the many significant bivariable associations, multivariable models predicting using accessible exam tables/chairs found few significant associations (Table 2, right column). In our full model, specialists had much higher odds than primary care physicians of reporting using accessible exam tables: OR = 1.96 (95% CI = 1.29–2.99, $p < 0.002$). Practice type was also statistically significant ($p = 0.0009$), with physicians in other practice types—as noted above, a mix of community health centers and other practice settings—having a much higher odds of reporting use of accessible exam tables/chairs than physicians in community-based private practices: OR = 2.77 (95% CI = 1.58–4.87).

The survey asked participants a battery of eight questions about what caused their inability to transfer patients with significant mobility difficulties onto exam tables/chairs; respondents could provide more than one answer. As shown in Figure 4, major reasons for being unable to transfer patients included lack of lift devices (44.9%) and lack of accessible tables (25.4%). Major reasons also included non-equipment concerns, notably fears about injuring the patient (25.1%), patient refusals (13.3%), and fears about staff injuries (10.2%).

DISCUSSION

This national survey found that, when seeing patients with significant mobility limitations, only about one fifth of physicians reported measuring patients' weights using accessible weight scales and only two fifths of physicians reported using accessible exam tables/chairs or lifts for transferring these patients. It is illegal under the ADA to ask patients to provide their own assistance with transfers, and we cannot tell from our survey questions whether participants explicitly requested that patients bring their own personal assistants. However, many survey participants reported seeking help from persons accompanying the patient to transfer them onto exam tables or chairs. Our results represent physicians' self-reports, rather than objective, outside assessments. Nevertheless, our findings validate concerns expressed by people with mobility limitations that inaccessible equipment poses barriers to their obtaining basic medical services.[13,17,19]

As have other studies,[17,36] we found that many physicians simply ask patients with significant mobility limitations their weights. However, research examining the accuracy of self-reported anthropometric measures among people who use wheelchairs found they significantly underestimate their weights, leading to body mass index (BMI) misclassification.[37] Relying on self-reported weights

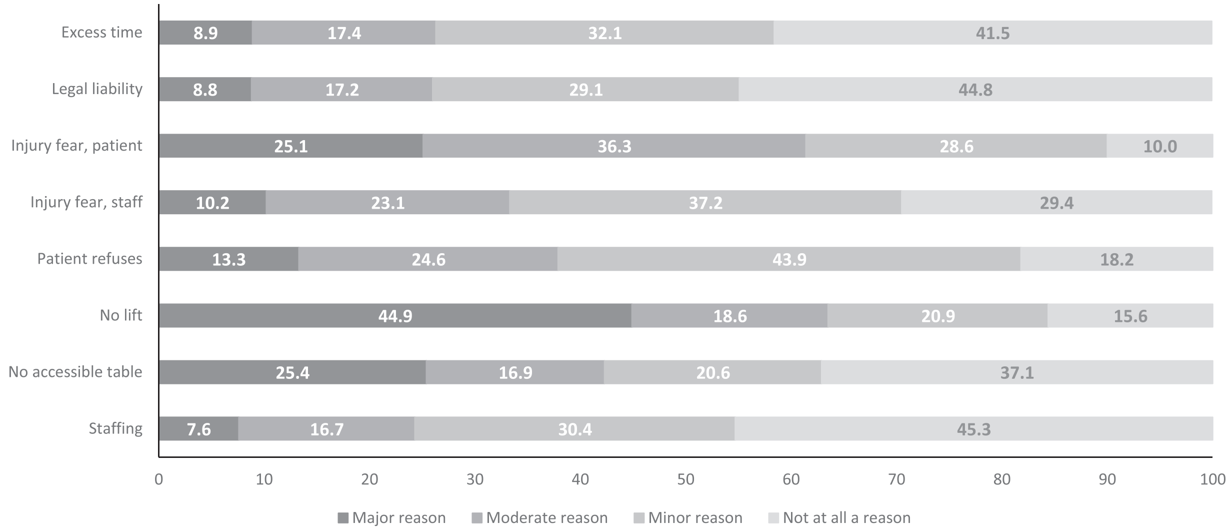

Figure 4: Shown here are the physician responses to the following, as presented in the survey:
B4. When it is not possible to transfer a patient with significant chronic mobility limitations onto an exam table or exam chair, is that due to. . .?
B4a. Inadequate staffing
B4b. No height adjustable exam table/chair
B4c. No lift device (e.g., Hoyer lift)
B4d. Patient refuses to be transferred
B4e. Fear of injury to yourself or staff
B4f. Fear of injury to patient
B4g. Fear of legal liability or exposure
B4h. The amount of additional time it takes

may compromise weight management interventions[38] and prenatal care[10] and may result in medication errors (for example, with medications for which dosages are determined by weight).[39] Reproductive-age women with disability have significantly higher BMIs than do nondisabled women, heightening the importance of accurate weight measurement throughout pregnancy (for example, particularly for assessing risks of preeclampsia).[38,40] In general, adults with mobility disability have significantly higher obesity rates than their nondisabled peers,[41] underscoring the need to accurately measure weight in this population.

Depending on their presenting complaints, patients may not require full physical examinations on exam tables or chairs. However, to fully evaluate patients, complete physical assessments typically require positioning on exam tables/chairs. One study performed in an active practice setting found that height-adjustable exam tables reduced patients' physical exertions and increased their sense of safety while transferring onto the table.[42] Another study found that height-adjustable exam tables can reduce risks of musculoskeletal injury for practice staff transferring patients.[43] In our survey, one third of physicians reported that fear of patient injury was a major or moderate reason for not transferring patients onto exam tables/chairs. The survey question did not ascertain whether patients themselves expressed these fears, or the reluctance came from staff.

Our findings suggest that various other factors may affect whether physicians transfer patients onto exam tables/chairs, including patients' refusals, legal liability concerns, worries about staff injuries, and the extra time required. These findings are consistent with a study of 399 primary care patients at two clinics in Rochester, Minnesota—one with and one without accessible exam tables—that found that both clinics had comparable rates of transferring patients, although patients reporting disability were 27% less likely than other patients to be examined on an exam table.[44] Patients who did transfer for examinations provided significantly better ratings of their physicians' bedside manner and job performance than other patients. Noting that availability of accessible tables did not guarantee their use, the researchers concluded that additional provider education might be required.

Nonetheless, to improve care for patients with mobility limitations, it is essential to maximize the availability of accessible medical diagnostic equipment (MDE), including weight scales and exam tables/chairs. To specify accessibility standards for MDE, Section 4203 of the 2010 Patient Protection and Affordable Care Act (ACA) required the Architectural and Transportation Barriers Compliance Board (that is, US Access Board) to collaborate with the Food and Drug Administration (FDA). Over several years, the US Access Board and FDA sought advice from diverse stakeholders and, following public comments, issued final MDE accessibility standards, effective February 8, 2017.[45] The US Department of Justice (DOJ) next needed to specify rules for adopting these standards, but in December 2017 the DOJ withdrew rulemaking plans.[46]

In addition, ACA section 4302 requires the government to "survey health care providers and establish other procedures to assess access to care and treatment for individuals with disabilities . . ." and to assess "the number of providers with accessible facilities and equipment to meet the needs of the individuals with disabilities . . ."[47(p. 579)] Such a survey would provide national information about the extent to which basic medical diagnostic equipment, such as weight scales and exam tables/chairs, is accessible throughout the health care delivery system. However, these surveys have never happened. Therefore, the extent to which accessible equipment is currently available remains unknown. Furthermore, no regulations currently govern the installation and thus availability of accessible MDE in US health care settings.

Our survey has important limitations. Although the weight scale and exam table/chair analysis samples overlapped (380 participants were in both samples), the numbers were too small (49 [12.9%[of the 380 participants) to conduct extensive analyses of physicians who report using both accessible weight scales and exam tables/chairs. Because of budgetary constraints, we could not survey sufficient numbers of physicians within specialties to compare outcomes by specialty. Finally, our findings represent physicians' self-reports, which could be affected by various factors, including positive response bias, which would overestimate their use of accessible equipment. Despite these limitations, this study provides the first national information about physicians' using accessible weight scales and exam tables/chairs when caring for patients with significant mobility limitations.

More than 30 years following the ADA, most physicians still do not use accessible equipment for routine medical care for patients with mobility disability. Our findings suggest that physicians who do not use accessible exam tables/chairs for patients who cannot transfer independently might recognize their risks of being sued under the ADA, but some also raise concerns about lack of funds to purchase this equipment. New technologies for measuring weights of patients with mobility disability may decrease concerns about costs and space demands, and may improve patients' experiences—at least for obtaining weights.[48,49] Other work suggests that physicians may simply be unaware of equipment options. One study surveyed 63 primary care practice administrators between 2011 and 2012 and found that less than half knew that accessible medical equipment existed.[50]

Although height-adjustable tables can cost more than twice as much as fixed-height tables,[51] private practices may be eligible for tax credits to offset acquisition costs for accessible equipment.[52] Furthermore, although our study failed to find high rates of injuries from transferring patients, other work has documented significant benefits from installing assistive lift devices, including reductions in back injuries among nursing staff and their associated costs.[53] One reason that physicians who graduated from medical school more than two decades previously are less likely to report using accessible equipment than more recent graduates might be the older age of their office equipment. Unless they have recently updated or renovated their facilities, these physicians may not proactively seek accessible equipment or recognize the benefits this equipment offers, not only to patients but also to practitioners. It is possible that these physicians may not have been exposed to accessible equipment during their training or to the concepts of universal design—the aspirational notion of designing all equipment to be accessible to all who use it, in whatever capacity. For example, patients of short stature who have no mobility limitations could benefit from height-adjustable exam tables or chairs, as could physicians, who can position adjustable tables at the height that most comfortably allows them to examine patients.

CONCLUSION

Mobility limitations are the most common disability type among adult Americans, and all physicians providing direct patient care can expect to see growing numbers of these patients in their practices in coming decades. Using accessible equipment—weight scales and exam tables/chairs—improves the comfort and safety of patients with mobility disability and benefits practice staff. Our findings suggest much remains to be done to ensure that most patients with significant mobility limitations receive routine outpatient care using accessible equipment, and these results are consistent with other survey findings that many physicians do not feel strongly confident in their ability to provide equal quality care to patients with disability, in general.[54] Research from the perspective of people with disability suggests that inaccessible equipment is an important reason for their well-documented health care disparities. Under the ADA and the tenets of professionalism, ensuring equitable care for patients with disability is not only legally required but also an ethical imperative. Increasing the availability of accessible basic medical diagnostic equipment, such as weight scales and exam tables/chairs, should improve the ability of physicians to provide safe, equitable care to the large and growing population of people with mobility disability.

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SUPPLEMENTARY MATERIALS

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