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The pathway from musculoskeletal pain to mobility difficulty in older disabled women

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Abstract

Little is known about the pathway from musculoskeletal pain to mobility difficulty among older persons. We examined potential physical and psychological mediators of the pain-disability relationship in the Women's Health and Aging Study (WHAS), a cohort of women aged ≥ 65 who had at least mild disability at baseline. Pain was classified according to location and severity (widespread pain; lower extremity pain; other pain; none or mild pain in only one site). Among women without a lot of difficulty in stair climbing ($n = 676$) or walking ($n = 510$) at baseline, those who reported widespread pain were more likely than those with none or mild pain to develop a lot of difficulty with mobility during the 3 year follow-up. The likelihood for mobility difficulty was unchanged after adjusting for physical impairments and symptoms of depression and anxiety (walking aOR = 1.85, 95%CI, 1.08–3.17; stair climbing, aOR = 2.68, 95%CI, 1.56–4.62). Lower extremity pain was associated with increased likelihood for difficulty with climbing stairs but not with walking. However, this association was attenuated after adjusting for physical impairments and psychological symptoms (aOR = 1.66, 95%CI, 0.99–2.77). Pain was not associated with increased risk for becoming unable to walk or climb stairs. The findings suggest that pain is a unique domain as a cause of disablement, independent of the usual pathway to disability via physical impairments. Research is needed to better understand the development of pain-related disability in order to determine optimum approaches to prevent and treat mobility disability in older persons with persistent pain.

Keywords

Pain; Mobility; Disability; Osteoarthritis; Fibromyalgia; Aging; Musculoskeletal; Women

1. Introduction

Musculoskeletal pain exacts a heavy toll on the older population. In recent years, it has become more evident that musculoskeletal pain, often incorrectly attributed to arthritis, is a major cause

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disability in older adults. Even in the absence of radiographic changes due to arthritis, musculoskeletal pain is associated with disability (Hochberg et al., 1989). A better understanding of the pathway from pain to disability is needed in the clinical environment to inform decisions about treatment and rehabilitation. From a public health standpoint, pain is a highly prevalent cause of disability in the older population that seldom has been addressed in epidemiologic studies of older populations. The lack of attention to this problem is apparent in the known undertreatment of pain (Pahor et al., 1999; Landi et al., 2001). Disabling consequences of this neglect among elders are likely to grow dramatically as the baby boom generation approaches old age.

Previously, we found that widespread musculoskeletal pain predicted worsening difficulty in activities of daily living in older women with disabilities, participants in the Women's Health and Aging Study (WHAS) (Leveille et al., 2001). Also, cross-sectional research from the WHAS, examining back pain and disability, showed that the strong relationship between back pain and mobility difficulty was not mediated by physical performance including knee strength and usual paced walk speed (Leveille et al., 1999). We hypothesized from these findings that the pathway from pain to disability was not mediated by physical impairments or functional limitations as posited in the Nagi disablement model (Nagi, 1976; Verbrugge and Jette, 1994). The Nagi model, a well-accepted foundation for many studies of disability in aging, describes the process of disablement as originating in pathology and progressing to physical impairments, functional limitations and finally, disability. In the present study using longitudinal data, we test the hypothesis that the pain-disability relationship is not consistent with the Nagi disablement model, that is, the relationship is independent of physical impairments and functional limitations.

Psychological factors may also explain some disability among persons who have chronic pain conditions. Von Korff and Simon concluded that chronic pain and depression are inter-related problems with pain contributing to depression and vice versa (Von Korff and Simon, 1996). Several reports have shown that depression is a contributor to disability (Bruce et al., 1994; Penninx et al., 1998, 1999; Cronin-Stubbs et al., 2000) and, though less well-studied, anxiety symptoms have been found to modestly predict worsening disability in the WHAS. The role of analgesics, often underused in management of pain in older adults, has rarely been addressed but may contribute to maintenance of function. Thus, we also will evaluate the potentially mediating role of psychological factors and analgesic use in the pain-disability relationship. The Women's Health and Aging Study, which represents the one-third of women who live at home with disabilities, provides an optimal study sample in which to examine the progression of mobility disability due to musculoskeletal pain.

2. Methods

The Women's Health and Aging Study is a longitudinal study of the causes and course of disability in older women living in the community. Participants were recruited from an age-stratified random sample of Medicare enrollees living in the city and county of East Baltimore. Of the 5316 women who were living in the catchment area, 4137 participated in the in-home screening. Of these, 1409 met study eligibility criteria and 1002 agreed to participate in the study. Thus, one-third of the random sample was disabled according to the study criteria. To be eligible for the WHAS, women had to have difficulty performing at least one task in at least 2 domains of functioning: lower extremity mobility, upper extremity function, instrumental activities of daily living, and basic activities of daily living. Women were excluded who had moderate to severe cognitive impairment (score <18 on the Mini-Mental State Examination) (Folstein et al., 1975). For these analyses, there were 4 women who were excluded because they were missing baseline pain information. Thus there were 998 women included in the baseline analyses for this report. Details of the study methods were published previously

(Guralnik et al., 1995) and are available on the website of the National Institute on Aging (web address: <http://www.grc.nia.nih.gov/branches/ledb/whasbook/title.htm>).

In-home interviews and physical assessments were conducted at baseline and every 6 months for 3 years. The response rate for the follow-up interviews and examinations was stable at 93% of surviving participants. The rate included proxy interviews which comprised 3% of the 1st follow-up round and increased to 16% of respondents by the 6th follow-up. There were 189 deaths during the 3-year follow-up. The extensive in-home examinations were conducted by trained study staff that followed detailed protocols. The study procedures, including informed consent, were approved by the Institutional Review Board of the Johns Hopkins Medical Institutions.

2.1. Classification of pain

Pain was assessed according to pain location and severity at several musculoskeletal joint sites using methods described previously (Leveille et al., 2002). To summarize, participants were queried about pain in the hands or wrists, back, hips, knees, and feet by asking if they had pain in each site on most days for at least 1 month in the previous year. To measure severity, participants were asked to rate their pain in the past month at each site, referring to an 11-point numeric rating scale (NRS), with 0 indicating no pain and 10 indicating “severe or excruciating pain as bad as you can imagine.” Non-anginal chest pain was based on the presence of chest pain in the past 2 weeks that did not meet algorithm criteria for possible or definite angina. Severity of chest pain was not assessed; therefore chest pain was classified as any pain (mild or worse pain) for the pain groupings.

In earlier studies, we found that widespread pain was associated with greatest risk for falls and disability (Leveille et al., 2001, 2002). Widespread musculoskeletal pain was defined as pain in the upper extremities (hand or wrist), lower extremities (hip, knee, or foot) and axial skeletal pain (back or chest), with at least moderate pain in one or more sites (rated ≥ 4 on the NRS). Less severe categories included moderate or severe lower extremity pain (hip, knee, or foot) that did not otherwise meet criteria for widespread pain and a third category of other pain that did not meet criteria for widespread or lower extremity pain. This other pain category was heterogeneous and included persons with pain in each of the pain sites. The reference category included persons with no pain or only mild pain (< 4 on NRS) in one site. Pain classification was determined at baseline and at each of the 6 follow-up rounds.

2.2. Mobility disability

Walking difficulty was assessed using two questions. Participants were asked if they had any difficulty walking a quarter of a mile, about 2–3 blocks, without help from another person or special equipment. If they said they did have difficulty, they were then asked how much difficulty, with response options of “a little difficulty, some difficulty, a lot of difficulty, or unable to walk without help”. Similarly worded questions asked about difficulty walking up 10 steps without resting. The primary endpoint used in this study was mobility difficulty defined as a lot of difficulty with walking a quarter mile and/or stair climbing. Inability to walk or climb stairs, referred to as mobility dependence, was grouped separately in these analyses.

2.3. Physical performance measures

Physical performance tests were conducted to assess physical impairments and functional limitations. The maximal knee extension strength was the highest strength measured in two trials from each leg using a hand-held dynamometer (Nichols Manual Muscle Tester, Fred Sammons Inc., Burr Ridge, IL). Gait speed was assessed by a timed usual-paced four-meter walk. Chair stand time was measured as the time required to stand five times as quickly as possible from a chair with arms folded across the chest. Balance was tested using three 10-s

stands: standing with feet touching side-by-side, semi-tandem stand with the side of the heel of one foot touching the side of the big toe of the other foot, and full tandem stand with the heel of one foot touching the toes of the other foot. Balance was scored hierarchically from 0 to 7, with 0 indicating inability to stand unassisted and 7, performing the full tandem stand for 10 s. This summary balance scale was described previously and found to be strongly associated with age and disability level in the WHAS participants (Rantanen et al., 2001). There were no significant differences in the proportions that did not perform these tests according to pain groupings. The short physical performance battery (SPPB) score was calculated from the combined results of the balance, walking, and chair stand tests. The SPPB is predictive of disability and hospitalization in older populations (Guralnik et al., 1994, 2000; Penninx et al., 2000).

2.4. Psychological measures

Depressive symptoms were assessed by the 30-item Geriatric Depression Scale, with a cutpoint of 14 or greater indicative of moderate to high levels of depressive symptomatology (Yesavage et al., 1982). Anxiety was measured using 4 items from the Hopkins Symptoms Checklist describing feeling nervous or shaky, avoiding of certain things, tense or keyed up, or fearful (Derogatis et al., 1974). Positive response to at least 2 items was classified as prevalent anxiety. This measure was shown to predict progression of disability among WHAS participants (Brenes et al., 2005).

2.5. Analgesic use

Daily analgesic use was based on the in-home review of all medications taken in the previous 2 weeks. Medications were coded to identify all active ingredients using the Iowa Drug Information Service (IDIS) ingredient codes as described in detail previously (Pahor et al., 1994). Analgesic medications included all oral medications identified as analgesic in the IDIS (salicylates, non-steroidal anti-inflammatory drugs, opioid analgesics, and other analgesics). Frequency of use was recorded and daily use of analgesics was ascertained.

2.6. Demographic and health characteristics

Several major risk factors for disability were assessed at baseline. Demographic characteristics included age, race, and education (did or did not complete high school or equivalent). Prevalent chronic conditions were ascertained using complex study algorithms incorporating information from multiple sources: interviews, nurse examinations, medication reviews, laboratory studies, radiographs, medical record reviews, and physician questionnaires (Fried et al., 1995). The algorithm for symptomatic hip or knee osteoarthritis included presence of hip or knee pain, respectively, thus osteoarthritis was not included in the count of 14 major chronic conditions. Body-mass index was calculated as measured weight in kilograms divided by measured height in meters squared. Activity level was measured and grouped into 3 levels based on a summary score of amount of walking, stair climbing, heavy housework, regular exercise, dancing, bowling, and outdoor chores (Rantanen et al., 1999).

2.7. Statistical analysis

Analyses were restricted to persons who did not have walking or stair climbing disability at baseline and who did not die or drop out of the study before the first 6-month follow-up interview. Trends in proportions with specific characteristics across pain groups were tested using χ^2 statistics (1 df). Cumulative incidence of mobility difficulty ("a lot of difficulty") or inability to perform walking or stair climbing without help (mobility dependence) was measured over the 6 rounds of follow-up interviews.

For the longitudinal analysis, the likelihood of developing a lot of difficulty or inability with walking or stair climbing during the 3 year follow-up was estimated using discrete time survival analyses (Lawless, 1982), a method that uses generalized estimating equations (GEE) to determine the factor by which the odds of developing mobility disability in a given round are increased (or decreased) in each category of pain compared to the none or mild pain category, among women who were not lost-to-follow-up or had not previously developed mobility disability during the study. Of the 940 women who were in the study until at least the first 6 month follow-up, there were 510 women who did not have walking disability at baseline and 676 women without stair climbing disability who were included in the respective models examining the 2 outcomes. Each woman potentially contributed an observation for each follow-up round, for a maximum of 6 follow-up observations. In fact, each woman contributed data up to the round at which she first reported a lot of difficulty or inability in walking or stair climbing and not thereafter (censored).

The primary risk factor was baseline pain category. We performed a series of models with additional sets of adjustment variables with each of the 2 outcomes, incident disability in walking 2–3 blocks and climbing up 10 steps. All models were adjusted for several known risk factors for disability. Additional adjustment for cognitive status using MMSE score did not alter the pain-disability relationship and it was not included in the models presented. To assess potential mediators of the pain-mobility relationship, we observed changes in the disability odds ratios for the main effects pain categories with the addition of the mediators to the base models (model 1). In addition, we observed the c-statistic in the series of models to determine whether the potential mediators had any additional impact on the base pain–disability models. Analyses using updated pain status during follow-up as a predictor of disability yielded similar results, and therefore are not presented.

3. Results

At baseline, the proportion of women who reported a lot of difficulty with walking and/or stair climbing was substantially greater across pain groups, ranging from 12% of women with none or mild pain to 34% of women with widespread pain (Fig. 1). We did not find differences between pain categories in the proportions who reported they were unable to walk 2 to 3 blocks or climb stairs.

Of the 460 women who did not have either walking or stair climbing disability at baseline, 19% had widespread pain, 30% had lower extremity pain, 22% had other pain, and 30% had no pain or only mild pain in 1 joint area. Women who had widespread musculoskeletal pain at baseline were more likely than their peers with none or less pain to be younger, more obese, have fair or poor self-rated health, and were more likely to have symptoms of depression and anxiety (Table 1). Women with widespread pain or lower extremity pain who were not mobility disabled at baseline generally did not perform worse than other women in tests of gait speed, chair stands, balance and knee extension strength (Table 2).

The cumulative percentage of women who developed new mobility difficulty over 3 years rose steadily across baseline pain categories (Fig. 2A). However, the increase was initially steeper and, substantially greater overall among women who reported widespread pain at baseline compared to other women. Approximately one-quarter of women (26%) with widespread pain reported a lot of difficulty with mobility by the 6 month follow-up and this percent rose to 43% over 3 years. Among those without pain at baseline, 10% reported new mobility difficulty at the 6 month follow-up, rising to 24% over the 3 year follow-up. The cumulative percentages of women who developed inability with walking or stair climbing (mobility dependence) during the follow-up also rose steadily from about 20% at 6 months to 40–50% at 36 months, though there was not a consistent pattern according to baseline pain status (Fig. 2B).

Interestingly, during the latter half of the study follow-up, those who did not have pain at baseline had the highest cumulative incidence of mobility dependence, perhaps reflecting baseline differences in disability hazards.

Substantial differences were observed in the likelihood for onset of mobility difficulty versus inability according to pain category during the follow-up. Women with widespread pain had increased odds of developing stair climbing (adjusted OR 2.86, 95% CI, 1.74–4.68) or walking difficulty (adjusted OR 1.85, 95% CI, 1.08–3.17) compared to women with none or mild pain at baseline, adjusted for demographic characteristics, health behaviors, chronic conditions, body-mass index, baseline walking difficulty. Using a series of models, we found that further adjusting for physical impairments or psychological factors and daily analgesic use did not materially alter the likelihood for developing mobility difficulty related to widespread pain over time (Table 3). When analgesic use was added separately to model #1, there was very little change in the odds ratios (data not shown). The c-statistic was essentially unchanged with the addition of the potential mediators to the initial multivariate model, indicating that these factors had little impact on the likelihood for disability related to widespread pain.

Women with moderate to severe lower extremity pain also had an increased risk of a lot of difficulty with stair climbing which was attenuated slightly when adjusted for all covariates (adjusted OR = 1.66, 95% CI, 0.99–2.77). Lower extremity pain alone was not a risk factor for developing a lot of difficulty with walking (adjusted OR = 1.13, 95% CI, 0.63–2.03). Musculoskeletal pain was not associated with increased risk for developing inability with stair climbing or walking regardless of multivariate adjustment. Other than pain, independent risk factors for new onset of difficulty with stair climbing ($p < 0.05$) in the study population included the following: body-mass index, depressive symptoms, slower gait speed, and baseline report of mild difficulty with stair climbing. The only independent predictors of walking difficulty other than pain were the number of chronic conditions and baseline report of mild difficulty with walking.

4. Discussion

This study presents new information that improves our understanding of the pathway from musculoskeletal pain to severe mobility disability in older women. The progression of mobility disability was not mediated by either psychological symptoms or measures of physical impairments and functional limitations. Widespread pain, reported by 1 in 5 women without mobility difficulty at baseline, was the only category of musculoskeletal pain that consistently and independently predicted onset or worsening of severe difficulty with walking or stair climbing. Moderate lower extremity pain was a weak predictor of worsening difficulty with stair climbing but not with walking. Widespread pain, a common problem among older women, leads to disability in a process that does not follow the well-tested Nagi model of disablement.

In this study of disabled older women, we showed that the pathway from widespread pain to mobility difficulty is likely a direct relationship. This is consistent with our earlier cross-sectional research on the relationship between back pain and disability (Leveille et al., 1999). There is a traditional belief that pain leads to reduced physical activity and subsequent muscle weakness leading, ultimately, to disablement. Although eligibility for the WHAS required that participants had at least some disability at baseline, we did not find evidence that women in the WHAS who had musculoskeletal pain were less physically active or weaker than other women, nor did they have more gait or balance problems than other women in the WHAS. Our findings address the *progression of disability* rather than incident disability in women with no other impairments and disability. Thus, we do not know whether the pathway from pain to disablement among women without disability is mediated by physical activity and muscle weakness.

In reference to the Nagi disablement pathway, pain is a symptom of pathology and may be considered an impairment on the pathway from pathology to physical impairment to functional limitation and finally to disability (Nagi, 1976). Our research suggests that widespread musculoskeletal pain, regardless of impairments such as muscle strength or gait speed, may be sufficient to cause disability. In fact, our baseline cross-sectional analysis showed the high prevalence of difficulty among women with widespread pain compared to those with none or less pain, suggesting that the pain-difficulty relationship often may be concurrent rather than sequential in many persons. In other words, having musculoskeletal pain creates immediate difficulty with mobility. For this study, we were interested in determining potential mediators of the longitudinal pain-disability relationship and the findings showed that 2 key sets of factors, physical performance and psychological factors, that often explain progression of disability had little to do with the pain-disability relationship in this population. We know from other WHAS analyses that pain status persists over time and it is likely that our findings reflect the long term effects of living with chronic pain, or also, the progression of underlying chronic diseases that may contribute to chronic pain. It is also possible that other age-related declines may limit compensatory ability to continue to function in the face of chronic pain. Further studies are needed to evaluate other possible mechanisms by which chronic pain leads to progression of disability.

Why is this discussion of the pathway from pain to disability of interest? The answer will inform both clinical and public health efforts to prevent pain-related disability. If adequate pain relief, including better management of underlying musculoskeletal pathology, is sufficient to prevent or treat pain-related disability, then it is possible that a substantial portion of disability in the older population could be resolved through more aggressive pain management approaches. Alleviation of pain may be sufficient to restore functioning in a major segment of the population that experiences chronic undertreated musculoskeletal pain. More frail persons or those who have had chronic activity restrictions related to pain may require additional physical rehabilitation.

In clinical practice and research, pain and pain-related disability are sometimes attributed to psychological factors in the absence of other explanations for the physical symptoms. In this study, we did not find that depression or anxiety accounted for the disabling consequences of widespread musculoskeletal pain. Although we know that pain and depression are related in the general adult population (Magni et al., 1990, 1993) and among elders in the WHAS and in other cohorts (Landi et al., 2005), research has not demonstrated that depression explains pain-related disability in older adults. Hughes and colleagues studied subgroups of older adults in Chicago and found that both arthritic pain and psychological status (depression and anxiety) were independent predictors of general functional decline after 2 years but that pain had a somewhat stronger impact on function (Hughes et al., 1994). Ours may be the first population-based study examining the pathway from musculoskeletal pain to mobility disability in older adults. Studies in non-disabled elder cohorts using comprehensive pain assessments are needed to determine whether the pain-disability relationship is as direct as our findings indicate.

A serious limitation in studies of pain and disability in the elderly is the lack of a consistent approach to assessing and classifying pain. We have found that the ACR classification of widespread pain provides a sound method for classifying the most disabling pain that causes quantitatively different risks for older persons compared to lower extremity pain or mild musculoskeletal pain in 1 joint area. Prior studies have shown that location and severity of pain are key pain characteristics that are associated with disability (Lichtenstein et al., 1998; Scudds and Robertson, 2000). In addition, more severe joint pain is associated with multisite pain (Leveille et al., 1998; Vogt et al., 2003; Croft et al., 2005) and multisite pain is more disabling than other pain (Hopman-Rock et al., 1997; Leveille et al., 2001). In fact, multisite pain is so common among older adults that studies of the disabling impact of single sites of

musculoskeletal pain in the elderly may lead to inconclusive or questionable findings if multisite pain, particularly widespread pain, is not addressed in the analyses.

We also examined the potential impact of daily analgesic use on the risk for disability due to pain. As with the other potential mediators, we did not find that analgesic use altered the likelihood for disability related to pain. Again, this is a potential mediator that has rarely been studied. Further observational studies are needed. However, the optimal examination of the role of analgesics is through use of randomized trials to determine which approaches to pain relief will lead to the greatest functional improvements.

The limitations of the present analysis have to do with the composition of the study cohort, women who already had some disabilities at baseline. This group was more at risk for new or worsening disability and their experience may not reflect the risks of a more general older population. The study population was representative of the many disabled women who live in the community, one-third of all older women, and these findings can only be generalized to similar populations. Studies in the general population of older adults are needed to better understand the development of pain-related disability. It is unknown whether the pathway from pain to mobility difficulty would be the same in older men. Older women report more pain and have more disability than older men (Leveille et al., 2005).

The causes of musculoskeletal pain are numerous in older adults, even though unexplained pain is frequently attributed to arthritis. Previous analyses of the WHAS suggest that polyarticular osteoarthritis may explain fewer than half the cases of widespread pain in this cohort (Leveille et al., 2002). Clinical information to determine non-articular explanations for widespread musculoskeletal pain, such as fibromyalgia and myofascial pain, was unavailable in this study. Though widespread pain, leg pain and other pain are classified as separate entities for this research, clinical experience suggests that persistent widespread pain may represent the progression and accumulation of segmental pain problems. Though pain may fluctuate in location and severity, widespread pain may be an endpoint through which single site chronic pain problems may progress. By clarifying the disabling impact of widespread pain, our research provides an important foundation for further efforts to examine chronic widespread pain in the elderly.

In conclusion, our findings suggest that musculoskeletal pain, particularly widespread pain, is a unique domain as a cause of disablement, independent of the usual pathway to disability via physical impairments and functional limitations. Contrary to usual assumptions about pain and depression, psychological factors did not explain the strong relationship between pain and disability in older women. Research is needed to better understand the development of pain-related disability in order to determine optimum approaches to prevent and treat mobility disability in older persons with persistent pain.

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Fig. 1. Baseline prevalence of severe mobility disability according to pain category, 998 disabled women aged >65y, Women's Health and Aging Study, 1992–1995.

Fig. 2.

(A) Cumulative percentage of women who developed mobility difficulty during 3-year follow-up according to baseline pain, among 460 women without mobility disability at baseline. (B) Cumulative percentage of women who developed mobility dependence during 3-year follow-up according to baseline pain, among 460 women without mobility disability at baseline.

Table 1

Baseline risk factors for mobility disability according to pain categories, 460 women without mobility disability at baseline, Women's Health and Aging Study, 1992–1995

	None/mild pain 1 site (n = 136) (%)	Other pain(n = 100) (%)	Lower ext. pain(n = 136) (%)	Widespread pain(3 sites) (n = 88) (%)	Trend ^a (p-value)
<i>Age</i>					
65–74y	30.9	45.0	49.3	52.3	<0.001
75–84y	35.3	33.0	30.2	29.6	
≥85y	33.8	22.0	20.6	18.2	
<i>African American</i>					
High school education	19.1	24.0	40.4	27.3	0.004
Fair/poor self-rated health	43.4	37.0	34.6	36.4	0.19
<i>Body-mass index</i>					
<25	28.7	43.0	43.0	51.1	<0.001
25–29	44.1	45.0	29.4	26.1	<0.001
≥30	33.8	35.0	36.0	35.2	
	22.1	20.0	34.6	38.6	
<i>Physical activity level</i>					
Inactive	20.0	10.3	12.2	17.4	0.103
Low activity	57.7	62.9	54.2	52.3	
Moderate activity	22.3	26.8	33.6	30.2	
Daily analgesic medication	44.1	49.0	62.5	70.5	<0.001
<i>Chronic conditions</i>					
0–1	68.4	74.0	58.1	75.0	
≥2	31.6	26.0	41.9	25.0	0.90
Diabetes mellitus	11.0	8.0	21.3	12.5	0.143
Depressive symptoms	5.2	12.0	9.6	18.2	0.007
Anxiety symptoms	12.5	19.0	19.1	28.4	0.005

^aTrend determined from χ^2 test (1 d.f.).

Table 2

Baseline physical performance according to pain categories, 460 women without mobility disability at baseline, Women's Health and Aging Study, 1992–1995

Performance tests ^a	None/mild pain 1 site mean $\pm$ SE	Other pain mean $\pm$ SE	Lower ext. pain mean $\pm$ SE	Widespread pain mean $\pm$ SE	Trend ^e (p-value)
Usual pace gait speed (m/s)	0.76 $\pm$ 0.02	0.79 $\pm$ 0.03	0.72 $\pm$ 0.02	0.75 $\pm$ 0.03	0.337
Balance test score ^b	5.4 $\pm$ 0.13	5.5 $\pm$ 0.15	5.3 $\pm$ 0.13	5.7 $\pm$ 0.17	0.432
Chair stand time (s)	14.6 $\pm$ 0.37	13.7 $\pm$ 0.42	14.5 $\pm$ 0.37	15.0 $\pm$ 0.43	0.312
Short Physical Performance Battery ^c	7.4 $\pm$ 0.21	8.0 $\pm$ 0.25	7.3 $\pm$ 0.21	7.7 $\pm$ 0.26	0.914
Knee extension strength ^d (kg)	14.3 $\pm$ 0.42	14.4 $\pm$ 0.48	13.5 $\pm$ 0.41	13.4 $\pm$ 0.51	0.086

^aLeast squares means adjusted for age, weight, and height.

^bBalance test was a composite rating based on 3 timed balance tests: feet side-by-side, semi-tandem, and full tandem stands, scored from 0 to 7.

^cShort Physical Performance Battery (Guralnik et al., 1994) is a composite score based on 3 tests, the usual-paced walk, balance test, and the 5 repeated chair stands test.

^dKnee strength calculated as the highest strength measured in either leg using a handheld dynamometer.

^eTrend determined from chi-square test (1 d.f.)

Table 3

Likelihood for progression of mobility disability adjusting for multiple risk factors^a according to baseline pain category, during 3-year follow-up, Women's Health and Aging Study, 1992–1998

Pain categories	Model 1 ^b OR (95% CI)	Model 2 ^c (+performance measures) OR (95% CI)	Model 3 ^d (+psych. measures and analgesic) OR (95% CI)	Model 4 ^e (full model) OR (95% CI)
<i>A lot of difficulty stair climbing</i>				
None or mild pain	1.00	1.00	1.00	1.00
Other pain	1.45 (0.85–2.47)	1.63 (0.93–2.85)	1.39 (0.82–2.37)	1.58 (0.90–2.79)
Lower ext. pain	1.85 (1.14–2.99)	1.74 (1.05–2.90)	1.69 (1.04–2.76)	1.66 (0.99–2.77)
Widespread pain	2.86 (1.74–4.68)	2.96 (1.76–4.99)	2.46 (1.47–4.13)	2.68 (1.56–4.62)
<i>Unable to climb stairs</i>				
None or mild pain	1.00	1.00	1.00	1.00
Other pain	0.96 (0.65–1.40)	1.12 (0.74–1.69)	0.93 (0.64–1.37)	1.10 (0.73–1.66)
Lower ext. pain	1.00 (0.71–1.42)	0.88 (0.61–1.28)	0.93 (0.66–1.33)	0.83 (0.57–1.21)
Widespread pain	1.17 (0.80–1.69)	1.25 (0.84–1.86)	1.08 (0.73–1.59)	1.17 (0.78–1.77)
<i>A lot of difficulty walking</i>				
None or mild pain	1.00	1.00	1.00	1.00
Other pain	0.98 (0.55–1.74)	1.12 (0.61–2.06)	1.01 (0.57–1.80)	1.16 (0.62–2.14)
Lower ext. pain	1.01 (0.59–1.73)	1.08 (0.61–1.92)	1.05 (0.61–1.81)	1.13 (0.63–2.03)
Widespread pain	1.85 (1.08–3.17)	2.01 (1.14–3.54)	2.03 (1.15–3.58)	2.19 (1.20–3.99)
<i>Unable to walk 1/4 mile</i>				
None or mild pain	1.00	1.00	1.00	1.00
Other pain	1.02 (0.69–1.51)	1.28 (0.84–1.94)	0.99 (0.67–1.46)	1.22 (0.80–1.86)
Lower ext. pain	1.03 (0.72–1.48)	1.06 (0.72–1.56)	0.97 (0.67–1.40)	0.97 (0.65–1.44)
Widespread pain	0.98 (0.65–1.49)	1.05 (0.67–1.64)	0.88 (0.57–1.36)	0.92 (0.57–1.47)

^a Adjusted odds ratios and 95% confidence intervals (C.I.) from discrete time survival analysis (using Generalized Estimating Equations) predicting new onset of a lot of difficulty or inability in walking or stair climbing.

^b Model 1 covariates included age, race, education, body-mass index, self-rated health, number of confirmed diseases, baseline walking difficulty, and use of proxy respondent.

^c Model 2 included all variables from model 1 and usual-pace gait speed, balance test score, repeated chair stand time, and maximum knee extension strength.

^d Model 3 included all variables from model 1 and presence of depressive and anxiety symptoms; additional covariate was daily use of any analgesic medications.

^e Model 4 included all variables from models 1, 2, and 3.