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Personal Service Assistance: Musculoskeletal Disorders and Injuries in Consumer-Directed Home Care

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Background *Like other types of care for disabled or elderly adults, consumer-directed personal assistance services may present multi-factorial risks for work-related musculoskeletal disorders (WRMSDs).*
Methods *Using survey data, we compared providers experiencing WRMSDs in the previous year to those who did not, seeking to identify functional, temporal, physical, and relationship risk factors for transient and chronic conditions.*
Results *Longer work experience with the recipient and more frequent bending increased the risk of being in the most chronic group (≥12 painful episodes), whereas predictable work hours with rest breaks and greater social support from the recipient appeared protective. For transient conditions (one to two episodes), longer work experience with the recipient and predictable hours with rest breaks appeared protective.*
Conclusions *We offer recommendations to improve hazard assessment as well as training and information distribution related to home care programs. With the population aging, home care jobs require increasing oversight to prevent WRMSDs.* Am. J. Ind. Med. 56:454–468, 2013. *© 2013 Wiley Periodicals, Inc.*

KEY WORDS: personal assistance services; home care; occupational injury; musculoskeletal; social support

INTRODUCTION

Personal assistance services (PAS) address the personal care and housekeeping needs of elderly and disabled adults to enable them to remain independent in their homes. Homes, however, are typically unregulated work environments. Many home care providers, similar to other paid domestic workers, are often hired directly by the care or service recipient and may not be covered by basic work standards or protections. Furthermore, their risks for occupational injury and illness are obscured because surveillance systems often fail to differentiate home care providers from home health care aides or orderlies and nursing assistants in nursing homes or hospitals [Scherzer and Newcomer, 2007]. A unique working relationship between the long-term care recipient and the person hired to provide service may also develop in the intimacy of the home, in contrast to the institutional environment of the nursing home or hospital [Lindahl et al., 2011]. Our limited knowledge about the home as a workplace, and the risk of occupational injury to home care providers, poses problems for policy related to protecting worker health, and also the quality of care for the recipient. To address this knowledge gap, we investigated the work environment of

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the home for occupational risks associated with musculoskeletal disorders and injuries among PAS providers, and related impairment in work role functioning.

Consumer-Directed PAS Care

Nationally, more than 9.5 million community dwelling adults have limitations in at least one activity of daily living (ADLs, e.g., bathing, dressing, eating). About 13% of these individuals receive personal assistance with all or most of their ADL and instrumental activities of daily living (IADLs, e.g., housecleaning, shopping) from paid helpers [Kaye et al., 2010]. Conservatively, the number of paid personal assistance workers approached one million individuals in 2005 and is projected to grow to 1.2 million by 2018 [BLS, 2009b; Kaye et al., 2010]. Continuing increases in assistive services are expected as a result of the surge in the aging of the population, the growing shift of acute care to home settings, and increased Medicaid spending on home care [Kaye et al., 2006; Howard and Adams, 2010]. In California, the location of our study, family members account for over half of paid providers for PAS recipients over 18; whereas for recipients aged 3–17, about 85% are family members, usually the parent.

Traditionally, Medicaid and home and community-based programs have relied predominantly on agency-employed workers for paid PAS care. This contrasts with the consumer-directed service model, where PAS workers are typically ''independent providers.'' Consumer-direction, which has gained in prominence over the past decade, may give recipients a role in deciding who is hired as their care provider, the option of hiring family members, more control over the services received, and responsibility for supervising and training the worker [Benjamin et al., 2000]. As of 2009, 38 states offered consumer-direction within at least one Medicaid home and community-based service waiver program or through their Medicaid state plan benefits [Ng et al., 2011].

Occupational Risks

Regardless of the service delivery model, work-related musculoskeletal disorders and injuries such as strain and sprain (WRMSDs) are prevalent problems for those who provide ADL/IADL services in the home [BLS, 1997; Galinsky et al., 2001; Kim et al., 2010]. Incidence rates for WRMSDs requiring days away from work put nursing aides, orderlies, and attendants among the highest risk occupations nationally, with overexertion being their leading exposure and the back the most common body part affected [BLS, 2009b]. In home care, the rate of overexertion injuries is 61% higher than in other health care settings [Galinsky et al., 2001]. Furthermore, rates for all types of occupational injuries and illnesses among personal care aides rose by nearly one-third between 2006 and 2010 [Seavey and Marquand, 2011]. With upwards of 44% of low back pain patients in the general working population reporting a recurrence within 1 year [Woolf and Pfleger, 2003], multiple episodes or chronicity among care providers also needs to be considered. Research that elucidates the specific risks of home care providers, however, is markedly lacking, with only a few studies investigating work-related illness and injury among paid PAS workers [Ono et al., 1995; Meyer and Muntaner, 1999; Kim et al., 2010].

Previous research has shown that physical, psychosocial, and organizational factors all play a role in the etiology and course of WRMSDs [Bernard, 1997; National Research Council, 2001]. Hazards in the home that may impact on WRMSDs include poor task ergonomics; lack of space or equipment to get the job done; and barriers to care, such as unruly pets, alcohol or illegal substance use, and physical or verbal abuse by care recipients or their family members [Baron and Habes, 2004; Geiger-Brown et al., 2007; Markkanen et al., 2007; Sherman et al., 2008; Kim et al., 2010]. Furthermore, hazards in the home are often uncontrolled and less predictable than in regulated care environments such as nursing homes. Consumer-directed care, without formal training or professional consultation, may result in poor awareness of hazards in the home for both care recipient and provider. It may also be difficult for the provider whose employment depends directly upon the consumer who is the care recipient (and who may be a family member), to ask for improvements in work conditions. Additionally, advocacy or mediation services to assist providers with the remediation of work conditions are not universal across the agencies and public authorities responsible for consumer-directed PAS programs.

To organize our investigation of potential hazards in the work environment of home care, we utilized a theoretical model that integrates diverse types of risk factors [Faucett, 2005]. The Integrated Model posits that the design of work not only impacts employer productivity goals but also worker outcomes (e.g. occupational illness/injury, disability, psychological strain). Broadly conceived for use across different types of work settings, the model focuses on four domains of the work environment: functional; physical; temporal; and relationships with the employer, supervisor, and coworkers. The impact of these aspects of the work environment on worker health and safety occurs through job-related exposures, and also indirectly through worker perceptions about their work and job strain. In the case of consumer-directed home care, ''productivity goals'' are the maintenance of the care recipient's health and quality of care; and, as paid employees, the four domains of the work environment remain relevant for the PAS provider. For this study of PAS delivery, we theorized

that increased risk for WRMSDs would be associated with increased exposure to task complexity and job strain (functional domain); more years of employment and more weekly work hours in home care (temporal domain); and biomechanical risk factors (physical domain). We also proposed that reduced risk would be associated with social support from the recipient as well as formal training (relationship domain), and predictable work hours with rest breaks (temporal domain). Although social support from work peers, friends, and the spouse of the home care provider has been associated with lower stress, better health, and higher job satisfaction [Denton et al., 2002; Delp et al., 2010], social support from the recipient has not been previously investigated quantitatively. Formal training is a requirement for nursing assistants and home health aides in California, but not for PAS providers. Although others have indicated that training in safe patient handling alone does not influence injury rates [Hignett, 2003; Tullar et al., 2010], we expected formal training in the general organization and performance of home care tasks, above and beyond training by the care recipient, would influence WRMSDs rates. Long or unpredictable work hours and a lack of rest breaks have previously been associated with WRMSDs in other occupations [Grosch et al., 2006; Trinkoff et al., 2006; Faucett et al., 2007; Galinsky et al., 2007]. Within the relationship domain, a further influence on the study design and sample was the policy question: Do paid providers who are relatives of the care recipient differ from those who are not relatives in terms of their risk of WRMSDs? Differences might occur if, for example, the family status of a provider differentially affected the ability to influence PAS work conditions.

MATERIALS AND METHODS

Study data were obtained from a cross-sectional survey conducted in 2009, using a statewide cohort of PAS recipients and providers in California's In Home Supportive Services (IHSS) program. Eligible recipients were aged 65 and over, or aged 18–64 and disabled. All recipients had to be eligible for Supplemental Security Income/State Supplementary Payments or met those eligibility criteria except for income limits [California Department of Social Services [CDSS], 2003]. IHSS includes more than 350,000 PAS recipients per month and employs over 330,000 PAS providers. About 90% of IHSS recipients obtain assistance from independent providers who are hired under the consumer-directed model of care.

The research protocol was approved by the California State Committee for the Protection of Human Subjects; University of California, San Francisco Committee for Human Research; and San Francisco State University's Committee for the Protection of Human Subjects. Because this was a telephone survey, each subject received an information letter and the interviewer documented verbal consent over the phone before scheduling the actual interview.

Sample

The sample was limited to paid care providers for PAS recipients aged 18 or older who had with limitations in two or more ADLs. The sample frame was compiled from the State's Case Management Information and Payrolling System (CMIPS), which includes IHSS recipient and provider contact information, recipient assessments, and demographic information. Assessments were used to screen recipients on their ADL limitations and then stratify those meeting this criterion into two age groups: 18–64 and 65 or more. Within each age group, we matched recipients to their providers and sorted them into those having relatives (other than spouses and parents) as paid PAS providers, and those with non-relatives as paid providers. Recipients having agency-employed providers or spouse or parent providers were excluded.[1] An age and provider relationship stratified probability sample ($n = 5{,}000$) was selected from those meeting the ADL criterion. Equal numbers of recipients aged 18–64 and 65 or more were selected; and within these age groups, equal numbers of recipients having relative and non-relative PAS providers were selected. Stratification by recipient age groups was intended to aid in investigating whether the age of the recipient was associated with provider WRMSD. Race/ethnicity groups were selected proportional to their presence in each subgroup, rather than with overweighting.

The sample of providers, once contacted, was screened to further confirm eligibility based upon the following criteria.

- The provider may be either a relative or non-relative of the service recipient. Recipients having a spouse or parent paid as a primary provider were excluded.[1]
- If there were multiple paid providers working for the same recipient, the provider selected was the one having the most authorized service hours.
- The provider must be able to communicate in English, Spanish, Cantonese, Mandarin, or Tagalog.

[1] The exclusion of spouses and parents from the sample reflects two primary considerations. First, such providers account for a relatively low percentage of paid PAS workers (non-aged: parents = 15.7% of the providers, and spouses = 5.3%. Among recipients aged 65+ spouses = 2.2% of providers), and the expense of oversampling these cases was not considered cost effective. Secondly, we were concerned about possible reporting bias, with parents and spouses possibly being less likely than non-relatives to reliably report injuries or MSD.

Procedures

Provider and recipient addresses, telephone numbers, and preferred language of communication were provided in the state's administrative CMIPS records. All sample subjects were mailed a recruitment letter and information sheet describing the purposes of the survey and offering a participation honorarium of $20, with a postcard to decline. Since the predominant languages spoken by PAS providers are English, Spanish, Cantonese, Mandarin, and Tagalog, mailing materials and survey instruments were developed in these five languages. Providers whose known primary language was not one of these, or who could not complete an interview in English were considered out-of-scope. Each mailing included a version in English and also, as needed, one in the provider's language preference as indicated by the administrative records. About half of the provider records were missing language preference; in those cases, the second language selected for the mailing was that of the care recipient. Trained interviewers, bilingual in English and one of the four other languages, were matched to these language preferences. The interviews were conducted by the Public Research Institute (PRI) at San Francisco State University. Interviews were completed in an average of 22 min. For each active telephone number, an average of 9.5 attempts was made to contact the respondent and complete an interview. Messages were left up to two times on answering machines. Potential respondents who indicated willingness to cooperate in the survey or who had completed some portion of the survey were called up to 40 times.

Because of missing information in the administrative records, the interviewers screened all providers for language preference and eligibility. From the original sample of 5,000, screening revealed that 2,091 were ineligible because relationship or language requirements were not met. Further, we were unable, due to wrong or discontinued phone numbers or mailing addresses, to locate 1,183 providers. The remaining 1,726 cases were presumed to be eligible. Of these, 871 were contacted and declined to participate, leaving a final sample of 855 providers (49.5% of all eligible providers who were contacted) for whom completed interviews were obtained. This completion rate was comparable to those obtained in earlier surveys of IHSS recipients and providers [Benjamin et al., 2000; Howes et al., 2002]. Almost half of the refusals (43.3%) were individuals whose language preference was not English, nor one of the other target languages. Of these, the largest language groups were undetermined (228 cases), Armenian (74 cases), and Russian (27 cases). The non-respondents included both hard refusals (either by phone or post card), and those who did not respond to answering machine messages.

Completion rates were within 1% point for those providing care to recipients aged 65 or over versus those who were younger, and within 2% comparing male versus female providers. Importantly too, the completion rates were within 1% among providers serving those with two ADL limitations up to those serving persons with four limitations. This difference widened to 3% among those with five ADL limitations. Such patterns suggest minimal systematic participation bias associated with care burden or relationship. Language may have contributed to the high rates of not being able to locate or refusals, but there was no consistent evidence for this.[2]

Survey Development

Survey items measuring the domains of the Integrated Model were drawn from the instruments described below. Cognitive interviews in English, Spanish, Cantonese, Mandarin, and Tagalog were conducted before implementing the survey to ascertain the understanding of the survey items among a sample of respondents ($n = 10$) in each of these language groups. The complete survey is available on request.

Work environment measures

Items about the work environment asked about work conditions in the home environment of the paired recipient. Items assessing the functional work environment asked workers whether or not they performed 14 types of ADL and IADL tasks for the recipient.[3] Scores for Job Strain as well as Job Demand and Decision Latitude were also obtained using the subscales of the Job Content Questionnaire [JCQ; Karasek et al., 1998]. These items use a four-point Likert response scale. Items assessing the temporal work characteristics asked the provider to estimate how many hours per week they worked with the recipient,

[2] Among providers identifying English as their primary language, 44.4% could not be located and 30% refused an interview. This contrasts with the rates observed (34% and 37.6%, respectively) among those where either the language preference was missing in the CMIPS data or the cases reported a language preference other than those eligible for this survey. The pattern of being unable to be located was relatively consistent across all the target non-English language groups, but refusal rates varied. Among those speaking Spanish, 37.2% could not be located and 27.3% refused. For Mandarin speaking providers, these rates were, respectively, 21.5 and 39.2%. Among the Cantonese, 14.4% were unable to be located and 37% refused interviews.

[3] Activities of daily living included help with eating or drinking, bathing/bed bath, oral hygiene/grooming, dressing, bowel and bladder care or helping with the bathroom/toilet, help with medication. Instrumental activities of daily living included meal preparation, shopping for food or other shopping, cleaning and/or laundry and ironing, lifts/transfers, help with walking, medical appointments, transportation for other errands or appointments, and other errands.

worked at all their current home care jobs, and worked at any type of job; and the date they were employed by the recipient. We also asked about the type of job if they worked outside of home care. We asked about their general ability to take rest breaks (e.g., coffee and lunch breaks) and whether their work hours were always predictable, using a four-point Likert response scale. Workers were asked to report about the physical work environment or biomechanical aspects of their PAS work using items about the space and lift equipment (such as hoists, slides, and belts) available to maneuver and do their work; how many stairs they had to climb; and the number of times per day their work on their last work day required them to lift or transfer the recipient, bend below their hips, reach above their elbows, squat for a prolonged period of time, or push, pull, lift or carry loads greater than 25 pounds. Three items from the JCQ Social Support scale were used to describe the relationship aspect of the work environment. These items referred specifically to support from the work supervisor. We replaced the word ''supervisor'' in these items with the name of the recipient. The items ask whether the recipient is concerned about the provider's welfare, pays attention to what the provider is saying, and helps the provider to do get the job done. Scores could range from 0 to 12. Scores at or above the median were classified as moderate or high social support, respectively.

Outcome measures

The interview documented symptoms of musculoskeletal disorders and injuries experienced by the provider during the previous 12 months, using items drawn from the Nordic Musculoskeletal Questionnaire [Kuorinka et al., 1987]. The survey inquired about injuries (i.e., acute problems occurring on a specific day/at a specific time) and also the musculoskeletal aches and pains that ''build up over time'' and/or ''come and go periodically.'' These musculoskeletal aches and pains take into account cumulative trauma disorders, which can arise gradually over repeated exposure to biomechanical and other risk factors. Providers reported on the location, severity and frequency of their symptoms and attributions of cause. The impact of WRMSDs on the ability to provide home care to the recipient was also assessed using the 15-item Work Role Functioning Questionnaire modified for home care providers [Amick et al., 2004]. The Work Role Functioning Questionnaire reports scores from 0 to 100% functionality, with 100% being fully functional.

Work-Relatedness

For analyses of providers' WRMSDs, we defined as *prominent disorders* those that caused an average pain severity of three or greater on a 0–10 numerical scale (i.e., moderate to severe pain). Subjects who reported more than one prominent disorder were asked to select the one that was ''most prominent or caused the most difficulty.'' We further delimited subjects' prominent disorders by using the criteria below to define *work-relatedness*.

- The provider had been employed by the recipient through IHSS for at least 12 months.
- The prominent disorder was experienced within the previous 12 months.
- The provider attributed the prominent disorder to home care work or a specific home care task (e.g., cleaning floors); physical effort related to home care (e.g., repeated kneeling or lifting); or non-specific complaints, such as ''stress,'' ''strain,'' or ''pressure.''

We excluded from work-related cases any prominent disorder representing injuries or illnesses that the provider acquired outside of work (e.g., from a motor vehicle accident) or due to previous or current work not in the field of home care (e.g., hotel maintenance). We also excluded providers who reported any non-work-related injuries or disorders of any severity in addition to their prominent work-related disorder. Finally, we placed these prominent work-related disorders into three groups. Group 1 included those with transient, that is acute or subacute, disorders who experienced their WRMSD or injury only 1–2 times in the last year. Group 2 included those who had experienced their WRMSD more than 2 but less than 12 times in the last year. In contrast, Group 3 included those with the most persistent or chronic problems, those who experienced 12 or more episodes (e.g., monthly) of their WRMSD during the last year. We selected a cut-off of 12 for Group 3 to reflect the portion of the National Institute for Occupational Safety and Health (NIOSH) definition that states that a WRMSD is one with a moderate level of pain occurring monthly [Bernard et al., 1994].

Data Analyses

Work-related cases in Groups 1–3 were compared to providers who reported no symptoms of MSDs or injuries (the reference group) on demographic and work environment variables using bivariate tests (e.g., Chi-square, Student's *t*-test). To test our hypotheses, we also employed multinomial logistic regression to examine the associations of work environment variables with group membership. The dependent variable in this analysis compared asymptomatic reference group members to providers in each of three groups of cases. Analyses were computed using SPSS, version 18.0.3. Because of the modest response rate and a corresponding concern about unmeasured bias, we did not reweight respondents to adjust for the sample's stratification design or the differential

response rates among sample subgroups. As a consequence, the results are not population estimates. However, the analyses test the strength of relationships between risk factors and WRMSDs.

RESULTS

Sample

Sample demographics for the PAS providers (n = 855) are shown in Table I. Providers were predominately from minority groups (n = 626, 73%). The majority ranged from 41–60 years of age (n = 476, 56%), with an additional 12% (n = 101) over 60. Most (n = 502, 59%) had 12 years or fewer of education. Although most responded in English, 31% (n = 269) responded to the survey in Spanish, Cantonese, Mandarin, or Tagalog.

Thirty-one percent (n = 262) reported symptoms of injury or MSDs from any cause that had occurred in the last 12 months and that reached a level of 3 or greater on a 0–10 scale for average pain (i.e., prominent disorders). Of these, 233 (27%) reported work-related prominent disorders, with 220 (26%) of those reporting only work-related prominent disorders and no non-work-related ones. We further analyzed this subsample of 220 to consider the number of painful episodes reported for the previous 12 months. The majority (n = 180) was able to estimate the number of episodes. At the more acute or transient

TABLE I. Personal Assistance Services Provider Demographics, Including Three Groups of Providers with Work-Related Injuries/Musculoskeletal Disorders and a Reference Group

	All providers (n = 855)	Reference Group[a] (n = 580)	Group 1[b] (n = 66)	Group 2[b] (n = 49)	Group 3[b] (n = 65)
Demographic variables	**Number (%)**	**Number (%)**	**Number (%)**	**Number (%)**	**Number (%)**
Sex: Female	686 (80)	446 (77)	53 (80)	46 (94)	59 (91)
Age (years)					
18–30	126 (15)	97 (17)	13 (20)	4 (8)	4 (6)
31–40	148 (17)	102 (18)	12 (18)	6 (12)	14 (22)
41–50	235 (28)	155 (27)	13 (20)	19 (40)	20 (31)
51–60	241 (28)	151 (26)	21 (32)	14 (29)	22 (34)
61–65	65 (8)	45 (8)	4 (6)	3 (6)	4 (6)
>65	36 (4)	28 (5)	3 (4)	2 (4)	1 (2)
Education (years)					
≤8	101 (12)	67 (12)	7 (11)	10 (21)	12 (20)
9–11	98 (12)	75 (13)	3 (5)	4 (8)	8 (14)
12	303 (35)	219 (38)	22 (34)	19 (40)	19 (32)
13–15	221 (26)	137 (24)	26 (40)	11 (23)	9 (15)
≥16	116 (14)	76 (13)	7 (11)	4 (8)	11 (19)
Formal training: None	656 (77)	452 (78)	50 (76)	33 (67)	49 (75)
Family status: Relative	474 (55)	316 (54)	33 (50)	27 (55)	40 (62)
Race/ethnicity					
White (Non-Hisp.)	229 (27)	144 (25)	18 (27)	12 (25)	14 (22)
African-American	170 (20)	125 (22)	15 (23)	8 (16)	11 (17)
Asian	127 (15)	76 (13)	13 (20)	8 (16)	9 (14)
Pacific Islander	26 (3)	19 (3)	0 (0)	3 (6)	1 (2)
Hispanic (any race)	295 (34)	211 (37)	20 (30)	17 (35)	29 (45)
Native American	4 (<1)	1 (<1)	0 (0)	1 (2)	1 (2)
General health					
Excellent	203 (24)	162 (28)	4 (6)	17 (35)	9 (14)
Very Good	183 (21)	130 (22)	16 (25)	5 (10)	10 (15)
Good	341 (40)	225 (39)	32 (49)	21 (43)	26 (40)
Fair	113 (13)	58 (10)	13 (20)	5 (10)	16 (25)
Poor	12 (<2)	3 (<1)	0 (0)	1 (2)	4 (6)

[a]Reference group members reported no symptoms of injury or musculoskeletal disorders.

[b]Group 1 = 1–2 episodes of the WRMSD in the last year. Group 2 = 3–11 episodes of the WRMSD in the last year. Group 3 = 12 or more episodes of the WRMSD in the last year. Totals may not add to 100% because of rounding or missing responses.

end of the spectrum, 66 reported no more than two episodes of their WRMSD within the last 12 months (Group 1). Forty-nine reported 3–11 episodes (Group 2). At the more chronic end of the spectrum, 65 reported 12 or more episodes of their WRMSD (Group 3). A remaining 40 did not report on the number of episodes they experienced in the last 12 months. In Group 1, there were 13 acute injuries, including 10 reported as sprain/strain or ligament/tendon problems. The remainder of reports from Groups 1–3 was for MSD symptoms that emerged gradually with no acute event. For each group, including those who did not report on episodes, pain in the neck/shoulder/upper back or lower back regions predominated, followed by lower and then upper extremity pain.

Demographics for the total sample, Groups 1–3, and the reference group (n = 580) who reported no symptoms are shown in Table I. Chi-square tests showed significant differences for the reference group: they were less likely to be women as compared to Groups 2 ($\chi^2 = 7.65$, $P \leq 0.01$) and 3 ($\chi^2 = 6.62$, $P \leq 0.01$), described themselves as healthier than Groups 1 ($\chi^2 = 18.09$, $P \leq 0.01$) and 2 ($\chi^2 = 33.62$, $P \leq 0.01$), and reported less education than Group 1 ($\chi^2 = 9.98$, $P \leq 0.05$). Bivariate and analysis of variance comparisons of those who reported WRMSDs but who did not report the number of episodes (n = 40) showed that they did not differ substantially from Groups 1–3, nor from the reference group, on their demographics. This group is further discussed in the section on post hoc analyses, below.

Most of the 180 cases in Groups 1–3 had reported their WRMSD to the recipient (n = 121) but fewer sought out a professional health care provider (n = 70). Those in Group 3 were somewhat more likely to seek the help of a health professional, but did not differ significantly from those in the Groups 1 or 2. Family members were no more likely to report their WRMSD to the recipient or a health care provider than providers who were not related to the recipient.

Work Environment Characteristics

Functional work environment characteristics

PAS providers in the total sample assisted recipients with home care for a mean of 10.08 tasks per day (SD = 2.49, n = 855). The most commonly reported tasks were cleaning/laundry (98%), shopping (96%), and meal preparation (95%). IADLs were more common than ADLs such as dressing (71%) or bathing (67%).

The Job Demand subscale failed to meet acceptable standards of reliability (alpha coefficient = 0.42, n = 732), even in separate analyses for racial/ethnic group, sex or family membership. The Decision Latitude subscale demonstrated modest reliability, but poorer participation (alpha coefficient = 0.73, n = 709). Thus, our hypothesis about Job Strain was not considered for further testing.

Significant differences on functional work environment characteristics, using Student's *t*-test, are shown in Table II.

TABLE II. Means and Standard Deviations for Functional And Physical Work Environment Variables for Three Groups of Providers With Work-Related Injuries or Musculoskeletal Disorders and a Reference Group

	Reference Group[a] (n = 580)	Group 1[b] (n = 66)	Group 2[b] (n = 49)	Group 3[b] (n = 65)
Work environment variables	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Functional work environment				
No. of home care tasks daily	10.00 (2.57)	9.97 (2.28)	10.51 (2.11)	10.25 (2.57)
No. of ADLs performed daily[c]	3.64 (1.80)	3.55 (1.70)	3.92 (1.66)	4.05 (1.93)
No. of IADLs performed daily[c]	6.36 (1.24)	6.42 (1.11)	6.59 (1.15)	6.20 (0.92)
Physical work environment				
No. of transfer/lift events daily	6.85 (9.04)	8.11 (10.07)	8.78 (11.83)	10.97 (14.04)*
No. of reaching events daily	2.21 (3.46)	2.76 (4.82)	2.51 (2.85)	4.42 (8.69)*
No. of bending events daily	3.14 (3.84)	3.09 (3.39)	3.29 (2.57)	5.97 (8.81)*
No. of squatting events daily	1.36 (2.01)	1.89 (2.97)	1.63 (2.15)	1.88 (3.77)
No. of events pushing, pulling or carrying at least 25 lbs. daily	1.97 (3.55)	2.09 (3.08)	1.86 (4.09)	2.85 (4.89)

[a]Reference group members reported no symptoms of injury or musculoskeletal disorders.

[b]Group 1 = 1–2 episodes of the WRMSD in the last year. Group 2 = 3–11 episodes of the WRMSD in the last year. Group 3 = 12 or more episodes of the WRMSD in the last year.

[c]ADL = Activities of daily living. IADL = Instrumental activities of daily living. Complete lists are provided in note iii in the text.

*Student's *t*-test comparisons for the reference group against each subgroup. *P*-value < 0.05.

Physical work environment characteristics

Just over half (58%) of the total sample reported assisting with transfers or lifting the recipient, for example, from bed to chair. Nearly 42% reported between 1 and 10 transfers per day, with another 15% reporting up to 20 transfers per day. However, 85% of those who performed transfers daily reported that no lift equipment or aids were available. Most of those who performed transfers without equipment described managing the transfers by fully or partially moving the recipient alone (e.g. ''with my arms'' or ''I just lift him''). In occasional cases, the recipient managed the transfer alone or with only light physical guidance from the provider. The number of transfers/lifts was significantly correlated with the number of ADLs ($r = 0.58$, $P < 0.01$) and IADLs ($r = 0.30$, $P < 0.01$) performed, as were the other four types of physical exertion (bending, reaching, etc.). Men and women did not differ significantly on the physical exertion measures of their work, nor did relatives as compared to non-relatives.

Table II shows that the most chronic group (Group 3), but not Groups 1 or 2, differed significantly from the reference group on a number of the types of physical exertion. The four groups did not differ significantly on whether or not they performed transfers or whether needed lift equipment was available in the home.

Temporal work environment characteristics

PAS providers in the total sample provided a mean of 23.67 hr (SD = 12.5 hr, n = 855) of care per week to the PAS recipient. Most reported that they were able to take rest breaks on a typical day (74%), with 64% agreeing that they had enough time to do their work. Fifty-nine percent stated their work hours were predictable. There were 258 providers who reported working for other home care recipients in addition to the recipient in our study and 232 providers who reported having jobs other than home care. The jobs outside of home care were diverse, ranging from occupations such as pharmacist, barber, administrative assistant and accountant to work in childcare, construction, food service, or retail sales.

Table III shows the frequencies for temporal work environment characteristics for Groups 1–3 and the reference group. In Chi-square comparisons, the four groups did not differ significantly on their hours of work for the recipient, the total number of hours spent in home care, or for all types of jobs. Chi-square tests showed significant differences for the reference group: they were more likely to have predictable work hours as compared to Groups 1 ($\chi^2 = 8.77$, $P \leq 0.01$) and 3 ($\chi^2 = 8.74$, $P \leq 0.01$), more likely to take rest breaks than Groups 2 ($\chi^2 = 5.69$, $P \leq 0.05$) and 3 ($\chi^2 = 5.30$, $P \leq 0{,}05$), more likely to have worked more than 2 years for the recipient than Group 1 ($\chi^2 = 6.19$, $P \leq 0.01$), and less likely to have worked more than 2 years for the recipient than Groups 2 ($\chi^2 = 9.98$, $P \leq 0.01$) and 3 ($\chi^2 = 10.61$, $P \leq 0.01$).

Relationship characteristics

The JCQ Social Support scale was retained for analyses (alpha coefficient = 0.81, n = 795). The mean score for the JCQ Social Support scale was 8.57 (SD = 1.84), with a median of 9.0. Scores of 9.0 were considered moderate social support (n = 333 of 855, 39%), and scores above the median were considered high social support. Providers who were related to the recipient did not differ significantly from those who were not related in terms of the social support they received from the recipient. The reference group had significantly more social support than Group 3 ($\chi^2 = 14.51$, $P \leq 0.01$).

Work role functioning

Cases in Groups 1–3 were asked about work role functioning to examine the degree to which their WRMSD might impact their ability to care for the PAS recipient. The great majority reported no lost workdays, and many reported little loss of function in terms of providing home care assistance, despite repeated episodes of pain, but the range was broad (mean = 85.47% of full function, SD = 17.68). Groups 1–3 did not differ significantly from each other in their work role functioning.

Multinomial logistic regression analysis

The multivariate test investigated the association of group membership with a number of predictor variables (Table IV). The analysis compared providers reporting no symptoms of injury or MSD in the last year (Reference Group) to each of the three groups of providers who reported WRMSDs (Groups 1–3).

The number of hours worked each week in home care, the number of daily transfers/lifts and squatting events performed during care for the recipient, and formal training in home care were included for hypothesis testing, even though they had not shown significant results in the bivariate tests. The number of reaching events was excluded, as was the number of events pushing/pulling/carrying loads over 25 pounds, because of correlations with the other physical measures of transfers, bending and/or squatting. We examined the personal characteristics of sex and education, which showed significant differences in the bivariate tests, and also age and family membership because of sample stratification.

TABLE III. Frequencies for Temporal Work Environment and Relationship Characteristics for Three Groups of Providers With Work-Related Injuries or Musculoskeletal Disorders and a Reference Group

	Reference Group[a] (n = 580)	Group 1[b] (n = 66)	Group 2[b] (n = 49)	Group 3[b] (n = 65)
Work environment variables	**Number (%)**	**Number (%)**	**Number (%)**	**Number (%)**
Temporal work environment				
Hours of recipient care per week[c]				
≤20	296 (51)	26 (39)	24 (49)	27 (42)
≤35	205 (35)	33 (50)	17 (35)	23 (35)
≤48	47 (8)	4 (6)	4 (8)	8 (12)
>48	32 (6)	3 (4)	4 (8)	7 (11)
Hours of home care per week[d]				
≤20	222 (38)	14 (21)	16 (32)	16 (25)
≤35	205 (35)	34 (52)	18 (37)	25 (38)
≤48	85 (15)	12 (18)	8 (16)	11 (17)
>48	68 (12)	6 (9)	7 (14)	13 (20)
Total work hours per week[e]				
≤20	162 (28)	11 (17)	11 (22)	10 (15)
≤35	187 (32)	29 (44)	15 (31)	25 (38)
≤48	95 (16)	12 (18)	6 (12)	12 (18)
>48	136 (23)	14 (21)	17 (35)	18 (28)
Lack rest breaks	146 (25)	19 (29)	20 (41)	25 (38)
Unpredictable work hours	222 (39)	38 (58)	21 (43)	37 (58)
Worked for recipient >2 years	278 (48)	21 (32)	35 (71)	45 (69)
Work relationships				
Social support from recipient				
Low support (<9)	194 (34)	32 (48)	24 (49)	37 (58)
Moderate support (9)	244 (42)	22 (33)	15 (31)	18 (28)
High support (>9)	137 (24)	12 (18)	10 (20)	9 (14)

[a]Reference group members reported no symptoms of injury or musculoskeletal disorders.
[b]Group 1 = 1–2 episodes of the WRMSD in the last year. Group 2 = 3–11 episodes of the WRMSD in the last year. Group 3 = 12 or more episodes of the WRMSD in the last year.
[c]Total number of hours worked per week for the recipient.
[d]Total number of hours worked per week for all current home care jobs.
[e]Total number of hours worked per week for all types of current jobs.

The overall model likelihood ratio test was significant ($\chi^2 = 98.449$, $P < 0.000$). Five variables demonstrated significant associations with the dependent variable in likelihood ratio tests. These included more than 2 years of employment with the recipient, the number of bending events below the hips daily, better work hours (dichotomized as predictable work hours with rest breaks vs. all other combinations), better social support from the recipient, and being female. We explored those variables further by examining the parameter estimates (Table IV).

Table IV shows that having more than 2 years of experience working for the recipient lowered the risk of membership in the group with the most acute problems (Group 1) by almost 50%. In contrast, having more than 2 years of experience working for the recipient approximately doubled the risk of greater chronicity (Groups 2 and 3). Predictable work hours with rest breaks appeared to be protective, dropping the likelihood of being in Group 1 by roughly half, and also decreasing the likelihood of being in Group 3. The likelihood of being in Group 3 increased by 7% with each additional bending event, above and beyond the number of transfers/lifts per day. Higher levels of social support from the recipient, on the other hand, reduced the risk for membership in Group 3 by 38%. Being female increased by over 4 times the likelihood of being in Group 2, but did not reach significance for Group 3.

In post hoc analyses, we examined the group who reported WRMSDs but who did not report a specific number of episodes in the last year (n = 40, 18% of the 220

TABLE IV. Likelihood Ratio Tests and Parameter Estimates Among Three Groups of Providers With Work-Related Injuries or Musculoskeletal Disorders, as Compared to a Reference Group[a] (n = 568), on Demographic and Work Environment Variables Using Multinomial Logistic Regression

			Parameter estimates					
	Likelihood ratio tests		Group 1[b] (n = 65)		Group 2[b] (n = 48)		Group 3[b] (n = 59)	
Independent variables	**Chi-square**	***P*-value**	**OR (CI)**	***P*-value**	**OR (CI)**	***P*-value**	**OR (CI)**	***P*-value**
Personal demographics								
Age (<50 years)	0.57	0.90	0.85 (0.49–1.47)	0.56	1.14 (0.61–2.15)	0.68	1.00 (0.56–1.80)	0.99
Graduated high school	6.46	0.09	0.42 (0.20–0.88)	0.02	1.04 (0.51–2.11)	0.92	1.13 (0.59–2.16)	0.72
Female	**10.75**	**0.01**	1.18 (0.60–2.28)	0.63	**4.10 (1.23–13.66)**	**0.02**	2.45 (0.93–6.45)	0.07
Relative of recipient	1.67	0.64	0.83 (0.48–1.46)	0.52	1.04 (0.54–1.98)	0.92	1.39 (0.75–2.57)	0.30
Formal training	2.86	0.41	1.04 (0.56–1.95)	0.90	1.78 (0.92–3.47)	0.09	1.17 (0.60–2.30)	0.64
Temporal work environment								
Better work hours[c]	**10.00**	**0.02**	**0.55 (0.31–0.98)**	**0.04**	0.85 (0.44–1.65)	0.64	**0.42 (0.22–0.84)**	**0.01**
Home care hrs./wk.	3.01	0.39	0.88 (0.67–1.15)	0.34	0.94 (0.68–1.28)	0.68	0.80 (0.60–1.06)	0.12
Worked ›2 years with recipient	**22.28**	**0.00**	**0.45 (0.25–0.80)**	**0.01**	**2.44 (1.26–4.76)**	**0.01**	**2.00 (1.09–3.66)**	**0.03**
Physical work environment								
Transfer events	2.47	0.48	1.02 (0.99–1.05)	0.20	1.02 (0.99–1.05)	0.29	1.01 (0.98–1.04)	0.64
Bending below waist	**8.77**	**0.03**	0.96 (0.87–1.05)	0.34	0.98 (0.89–1.09)	0.76	**1.07 (1.02–1.13)**	**0.01**
Squatting events	2.83	0.42	1.10 (0.98–1.23)	0.10	1.04 (0.90–1.20)	0.63	1.03 (0.92–1.16)	0.57
Work relationships								
Social support from recipient	**8.30**	**0.04**	0.71 (0.48–1.03)	0.07	0.78 (0.51–1.21)	0.27	**0.62 (0.41–0.95)**	**0.03**

Bold indicates $P < 0.05$.

[a]Reference group members reported no symptoms of injury or musculoskeletal disorders.

[b]Group 1 = 1–2 episodes of the WRMSD in the last year. Group 2 = 3–11 episodes of the WRMSD in the last year. Group 3 = 12 or more episodes of the WRMSD in the last year.

[c]Better work hours are predictable work hours that include rest breaks.

who reported only work-related WRMSDs). Notably, the significant likelihood ratio test findings reported for the multinomial logistic regression analysis for Groups 1–3, discussed above, remained significant after including this cohort of 40 as a separate, additional group. However, although the cohort met the criteria for case membership, none of the variables in our study offered potential unique explanations for their WRMSDs.

DISCUSSION

We theorized that temporal, physical, and social aspects of the work environment of the home would all play a part in distinguishing PAS providers who reported WRMSDs from those who did not. We found that a cluster of four of these work environment characteristics differentiated PAS providers who reported painful symptoms related to their work: the duration of employment with the recipient, whether work hours were predictable and included rest breaks, the number of times bending was required—whether for ADL or IADL tasks, and social support from the recipient. Notably, several these factors operated differently, either in the direction or the strength of the association, for providers reporting transient or acute disorders in contrast to those reporting the most chronic of disorders.

Our findings support accumulating evidence that PAS providers, like home health care providers, are at high risk for occupational musculoskeletal problems. Twenty-seven percent of the provider sample reported at least one episode of a moderately to severely painful WRMSD within the prior year; including the subset of 65 (7.6%) who experienced at least 12 episodes in the last year. Women, who dominate the PAS role, were especially at risk for repeat episodes, even though the physical characteristics of their work did not differ from men. By comparison, using the slightly different NIOSH case definition for WRMSDs (moderate to severe pain lasting a week or more or at least monthly), Kim and colleagues [2010 identified rates of 16.6% (Wave 1) and 12.6% (Wave 2) in a longitudinal study of Los Angeles County PAS providers. Unlike studies using claims data [Meyer and Muntaner, 1999; Howard and Adams, 2010], many cases in our sample remained remarkably capable in performing their job duties, with the majority reporting only modest decrements in function and few work loss days. It should be

noted, however, that additional factors are likely to limit work disability: in many counties, IHSS does not provide sick leave nor are respite or replacement providers available for PAS recipients; and further, many home care providers are low wage minority workers with little education and few additional job opportunities. Furthermore, like many studies about workers, our study is subject to a ''healthy worker effect,'' with a potential for underestimation: providers with more serious WRMSDs may stop providing home care, leaving a sample of workers who are healthier.

Temporal Work Environment Factors

Temporal factors previously associated with WRMSDs include rest breaks and long or unpredictable work hours [Grosch et al., 2006; Trinkoff et al., 2006; Faucett et al., 2007; Galinsky et al., 2007]. Our hypotheses about temporal work factors were supported in part: Having predictable work hours with rest breaks appeared protective against both transient and the most chronic of disorders, dropping the risk by 42–55%. Our proposition that risk was associated with longer job duration was also partially supported—although transient and chronic disorders varied, such that longer job duration posed a greater risk of having a chronic disorder, but was apparently protective against more acute disorders. More on-the-job experience is likely to reduce the likelihood of acute injury, while the potential for a chronic problem may increase the longer one works in home care. The number of home care hours of work per week was not significantly associated with WRMSDs, but it is important to note that the majority of PAS providers in our study worked 35 hr or less in home care, by self report, with just under half providing 20 hr or less of care to the specific recipient in the study. Limiting exposure to biomechanical risk factors through shorter or more predictable work hours or rest breaks may alleviate strains associated with poor work conditions; however, these temporal factors require further research attention.

Physical Work Environment Factors

Exposure to biomechanical risk factors such as awkward or static postures, force, and repetitive motion are frequently associated with WRMSDs. The combination of IADL and ADL tasks in home care is likely to increase exposure to such risk factors through repeated lifting, reaching, bending, and squatting. For example, tasks like cleaning the floor (an IADL) and putting shoes on the recipient of care (an ADL) both contribute to the number of times a provider bends below the hips during each shift. We were unable to demonstrate that a greater number of different ADL or IADL tasks increased risk, or that the number of transfers or lifts performed daily differentiated cases from those reporting no symptoms. However, above and beyond the number of transfers and lifts for the recipient, bending below the hips increased the risk of chronicity by 7% for each additional bend. This suggests that a combination of tasks that require bending may increase the risk of musculoskeletal problems for PAS providers. Similarly, Kim and colleagues [2010 found only a modest increase in risk (OR = 1.14; CI = 1.08–1.19) for the physical demands of the ADL and IADL tasks performed by PAS providers. Other studies of care providers have also found challenges in identifying the role of physical risk factors in WRMSDs or related disability [Ando et al., 2000; Simon et al., 2008], or determining the most problematic physical risk factor in home care [Ono et al., 1995; Cheung et al., 2006]. Most of these studies, like ours, were self report surveys, and lacked validation from medical or disability records, which may lead to misclassification of cases or imprecision of the models. Given the seriousness of reported injury rates, future research, perhaps using observational measures, must continue to examine the physical aspects of home care.

Social Support

Our hypothesis about social support as a characteristic of work relationships was supported for providers in the group with the most WRMSD recurrences. Moderate to high social support from the recipient dropped the risk of being in the most chronic group by approximately one-third, regardless of family membership. Positive emotional ties connecting providers with recipients may mitigate job strain and impart dignity to an otherwise difficult, demanding, and often demeaning, service job [Chichin, 1992; Denton et al., 2002; Stacey, 2005]. Furthermore, Lindahl and colleagues [2011 have described the relationship between the home care professional and care recipient as one of ''being there for each other.'' Such support may extend to protecting the vulnerable provider from risky tasks or further injury, and may be especially important under the consumer-directed model where there is frequently less access to professional supervision and guidance. The alternative, that the provider's WRMSD may reduce the recipient's support is possible, but logically less likely. Social support from work peers, friends, and the spouse of the home care provider has been associated with lower work stress, better health, and higher job satisfaction [Denton et al., 2002; Delp et al., 2010]. To our knowledge, however, social support uniquely from the care recipient has not been quantitatively investigated previously for its impact on PAS provider reports of occupational injury or illness.

We found no differences between providers who were related to the recipient and those who were not in terms of

their group membership or social support from the recipient. This suggests that family members hired as providers through the consumer-directed model do not experience differential risks for WRMSDs, or any advantage or disadvantage in terms of the social support they may receive from the recipient. Building a positive relationship with the care recipient may reduce the risk of WRMSDs for the provider, whether a relative or not.

Training and Supervision

Although formal training in home care did not differentiate cases in our study, the lack of job training raises concerns about both provider and recipient safety. Over three-fourths of providers had never received formal training to prepare them to give home care or perform safely in the home. PAS providers are not required to have formal training in California, nor are they regulated by the State. In fact, fully 60% of states do not require training for PAS providers, with consumer-directed programs being less likely than agency programs to have formal requirements [Seavey and Marquand, 2011]. Instead, under consumer-directed programs, many PAS providers receive their orientation and training from the recipient of care, who is similarly likely to never have had any training in how to supervise or work with a PAS provider [Newcomer et al., 2011]. This contrasts with home health aides in California who are state-regulated and must complete a 75-hr training course and certification examination; certified nursing assistants require even more training. A further contrast is that both of these groups of aides work under the supervision of a registered or licensed practical nurse; whereas PAS providers usually have no supervision other than from the recipient. Many individual home care providers have no one to turn to for assistance or advocacy should the work situation become problematic, although in some California counties the structure of IHSS services offers providers assistance through a union or public authority.

Our findings reinforce reports by others that formal training that fosters the working relationship between the provider and recipient may be beneficial [Baron and Habes, 2004; Menne et al., 2007; Delp et al., 2010]. Examples of such training might include sections on communication, role negotiation, conflict resolution, and assertiveness [Baron and Habes, 2004; Menne et al., 2007]. Furthermore, training programs that include both the provider and the recipient could enhance communication and teamwork for physical activities such as lifts and transfers or bathing.

Job Strain

Although potentially important for PAS providers, the inclusion of job strain in our final multivariate model was precluded by low reliability scores for the Job Demand scale. Previously, JCQ scales have been used successfully in numerous studies of low wage jobs and among workers across many languages and cultures. A unique subset of participants in our study, but not one we could identify by race or ethnicity, sex or family relationship, may have been uncomfortable reporting on their job demands or participation in decision-making; thus, decreasing the reliability of our Job Demand and Decision Latitude subscales. The Job Demand-Control Model was successfully used with a large sample of IHSS providers in Los Angeles County [Delp et al., 2010]. They reported adequate reliability for the Decision Latitude subscale (alpha coefficient = 0.80), but employed new measures for job demand as well as social support. The study of job strain and its impact on WRMSDs among home care workers will require further attention from researchers, and perhaps a new measure of job demands [Kim et al., 2010]. The Copenhagen Psychosocial Questionnaire also provides a wide variety of subscales about the psychosocial nature of work that might be explored further for applications to work in the home [Kristensen et al., 2005].

Limitations

In addition to the limitations noted above, as a cross-sectional survey, the study cannot make strong causal inferences. Furthermore, despite considerable recruitment efforts, the response rate of about 50% leaves open the possibility of self-selection bias in the survey respondents. This bias was previously investigated in a separate analysis of PAS recipient outcomes and respondents were found to be predominantly satisfied with their providers [Newcomer et al., 2011]. While this may reflect homeostasis in the fit between recipient needs and provider abilities in consumer directed care, it raises the possibility that those with less satisfactory relationships may have been less likely to participate in the survey. Such bias would likely under-report both the true incidence of WRMSDs in the IHSS population as a whole, and under-value the true association of social support on WRMSD outcomes. Recall bias may have affected the accuracy of the dates of injury occurrence, the duration of the musculoskeletal symptoms or related details such as work impairment. To limit recall bias, most items about work activities referred to work for the specific recipient, over the last day of work or in general (with no specified time period). We used hours working in home care rather than hours of care for the recipient alone to acknowledge risks common to this type of work (nonetheless, hours working in home care did not make an additional significant contribution to the risk for WRMSDs in the context of the multivariate analysis). For the wide diversity of additional jobs held outside of home care, risk factors are likely to be more broadly distributed.

Lastly, the similarity between doing domestic tasks in one's own home and PAS work tasks may confound attributions of work-relatedness in this occupation.

Implications

PAS makes it possible for the elderly and disabled to live independently in their own homes; such independence offers a measure of dignity and control over one's life, on the one hand, and costs the public far less than institutionalization on the other hand. Nonetheless, work in the home is largely unregulated, and PAS providers, as well as other types of domestic workers, may not enjoy basic work standards and protections, including those for occupational safety and health. Yet, few would argue that PAS workers are less deserving of a safe work environment than other types of employees. In fact, simple tools (such as long-handled mops, grab bars, and transfer aids) and task alterations may help to alleviate physical strain [Baron and Habes, 2004; Parsons et al., 2006a, 2006b; Waters et al., 2006]. With attention to common hazards, respect for work hours and rest breaks, and supportive interaction between the care recipient and provider, the home as a work environment need not pose serious threats to worker health and safety.

Our study has shown significant associations between chronic and transient WRMSDS and work conditions related to unpredictable work hours, inability to take rest breaks, bending activities, and lack of support from the recipient of care. Further, the findings suggest that few workers access health care professionals to assess or treat their work-related disorders. Given our findings, and the limitations noted above, we offer recommendations to improve PAS provider health and safety. Agencies and public authorities responsible for PAS programs under the consumer-direction model should provide:

- Examples of PAS contracts or care plans for providers and recipients of care that specify rest and meal break requirements and work shift times, in addition to specifying the tasks and time allotments covered by the agency or authority for each task.
- An initial occupational health and safety assessment of the recipient's home and home care equipment to complement the usual assessments of the care recipient to determine care needs. At a minimum, these additional assessment measures might include the provision of fact sheets, checklists, or other information resources for providers and recipients to perform simple assessments on their own.
- Information about the importance of a mutually supportive recipient–provider relationship, and resources to assist with the development of communication skills.
- An advocacy or mediation system for PAS workers who need assistance to address inappropriate work hours, demands or conditions with the hiring care recipient. Some union contracts provide for mediation, this might be expanded.

While recognizing that individual family providers and care recipients may vary in their needs for specialized training, we note that the Institute of Medicine has recommended minimum training requirements and several states are working towards certified training for all types of providers [Institute for Medicine, 2008; Seavey and Marquand, 2011]. Although some family providers and recipients may consider this unnecessary, we suggest that providers, whether relatives or not, should have access to quality training on social support, work tasks, and their risks for WRMSDs. Finally, to improve our knowledge of the risks involved in PAS work, government authorities and agencies should ensure that providers understand their rights under worker compensation laws and how to obtain appropriate health care in the event of a work-related injury or illness; and further, that surveillance data on work-related injuries and illnesses should clearly separate PAS providers from other home care and home health care providers. Consumer and worker advocacy groups also play important roles in moving such recommendations forward [Delp and Quan, 2002; Delp and Muntaner, 2010]. Grouping PAS providers together with home health aides, nursing home and hospital nursing assistants, orderlies, and other such job titles masks their unique work exposures and outcomes and contributes to obscuring the risks of these occupations.

CONCLUSIONS

This study reaffirms the findings of others that PAS providers face a considerable risk for WRMSDs. Furthermore, the use of our occupational health model demonstrated significant associations for WRMSDs across several domains of personal assistance work in the home, including psychosocial (i.e. social support), organizational (i.e. unpredictable work hours and rest breaks), and physical risk factors (i.e. bending activities). These findings corroborate the multidimensional nature of WRMSDs, emphasize the importance of collaboration between PAS provider and recipient, and suggest that some of the risks posed by home care work may be alleviated by workplace health and safety assessments with simple modifications of tools and tasks. The recommendations offered above suggest several ways for government agencies, consumer groups, unions and others to approach improvements for worker health and safety in consumer-directed programs. PAS work, like other domestic services, has largely been a hidden occupation because of the lack of specific

occupational injury and illness surveillance data and attention to the home as a workplace. As the population ages, and the need for supportive care in the home increases, greater attention should be given to the risks faced by paid workers in the home.

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