Psychosocial Stress and Multi-site Musculoskeletal Pain

A Cross-sectional Survey of Patient Care Workers

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RESEARCH ABSTRACT

The aim of this study was to assess the relationship between psychosocial factors at work and multi-site musculoskeletal pain among patient care workers. In a survey of 1,572 workers from two hospitals, occupational psychosocial factors and health outcomes of workers with single and multi-site pain were evaluated using items from the Job Content Questionnaire that was designed to measure psychological demands, decision latitude, and social support. An adapted Nordic Questionnaire provided data on the musculoskeletal pain outcome. Covariates included body mass index, age, gender, and occupation. The analyses revealed statistically significant associations between psychosocial demands and multi-site musculoskeletal pain among patient care associates, nurses, and administrative personnel, both men and women. Supervisor support played a significant role for nurses and women. These results remained statistically significant after adjusting for covariates. These results highlight the associations between workplace psychosocial strain and multi-site musculoskeletal pain, setting the stage for future longitudinal explorations.

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The authors have disclosed no potential conflicts of interest, financial or otherwise.

This work was supported by a grant from the National Institute for Occupational Safety and Health (U19 OH008861) for the Harvard School of Public Health Center for Work, Health and Wellbeing.

The authors thank Partners HealthCare System for participating and Dennis Colling and Kurt Westerman for leading. They thank Partners Occupational Health Services, including Marlene Freeley for her guidance and Terry Orechia for programming support; and individuals at each of the hospitals, including Jeanette Ives Erickson, Mairead Hickey, and Trish Gibbons in Patient Care Services leadership and Jeff Davis and Lisa Pontin in Human Resources.

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Received: April 10, 2012; Accepted: October 15, 2012.
doi:10.3928/21650799-20130226-01

Work factors can affect worker health (Karasek & Theorell, 1990). Occupations with high demand and low control (e.g., excessive work demands, limited job control, and lack of social support from supervisors or coworkers) exhibit the highest levels of psychosocial stress or job strain (International Labour Organization [ILO], International Labour Office SAFEWORK, 1998; Karasek & Theorell, 1990). Musculoskeletal pain is one health outcome that has been associated with psychosocial stress and job strain (Bongers, de Winter, Kompier, & Hildebrandt, 1993; Bongers, Kremer, & ter Laak, 2002; Buckle, 2005; Dennerlein et al., 2012; Feuerstein, 2002; Feuerstein, Shaw, Nicholas, & Huang, 2004; Hoogendoorn et al., 2002; Marras, Davis, Heaney, Maronitis, & Allread, 2000). Musculoskeletal pain is common among health care workers, as health care work is often categorized as high demand and low control (Boden et al., 2012; Ihlebaek & Eriksen, 2003; Waters, 2010).

Several studies have recommended evaluating the effects of pain in several body parts simultaneously because pain is more often reported in multiple sites than in a single site (Hagen, Svensen, Eriksen, Ihlebaek, & Ursin, 2006; Hoe, Kelsall, Urquhart, & Sim, 2012; Kamaleri, Natvig, Ihlebaek, & Bruusgaard, 2008; Markkula

Applying Research to Practice

High job demand was consistently associated with reports of pain in the neck, shoulder, wrist, lower back, knee, or ankle, independently. High job demand was also significantly associated with pain in multiple body sites (concurrently) across all occupations of direct patient care workers. When supervisor support was high, workers were less likely to report neck or knee pain and less likely to report (concurrent) pain in multiple body sites. Components of psychosocial stress, including job demand, control, and coworker or supervisor support, should be assessed along with physical strain when making modifications to workplace designs, policies, and practices to reduce multi-site musculoskeletal pain.

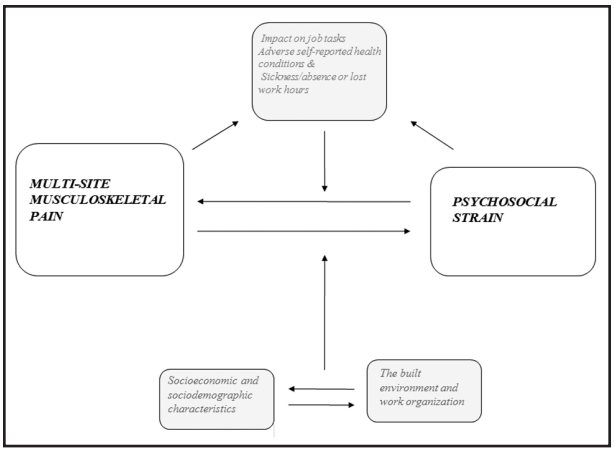

Figure. Conceptual framework highlighting the effects of associations and interactions between workplace psychosocial exposures and multi-site musculoskeletal pain on health, work hours, and job tasks in the Be Well Work Well study. All capital letters, bold, and no shading indicate the hypotheses explored in the current analyses.

et al., 2009; Miranda et al., 2010; Natvig, Rutle, Bruusgaard, & Eriksen, 2000; Schmidt & Baumeister, 2007). Multi-site pain is prevalent in working populations, and increasing evidence has been reported that the effects of this pain can affect work function and overall well-being more than pain at a single site (Croft, 2009; Croft, Dunn, & Von Korff, 2007; Miranda et al., 2010, Natvig et al., 2000; Nordin et al., 2002; Saastamoinen, Leino-Arjas, Laaksonen, Martikainen, & Lahelma, 2006; Schmidt & Baumeister, 2007). Occupational health researchers need to identify links between workplace exposures, including exposures to workplace stressors, and pain in multiple sites (Miranda et al., 2010).

Worker gender and the different roles of males and females may be an added influence on the relationship between worker health and workplace psychosocial stress (Karasek et al., 1998; Niedhammer, 2002). Several studies have reported that gender role differences may be further confounded in a gender-segregated labor market (Karasek & Theorell, 1990; Walsh, Sorensen, & Leonard, 1995). Unfortunately, published investigations of gender and other sociodemographic effects on workplace stressors and resulting health effects are nascent (Fransson et al., 2012; ILO, International Labour Office SAFEWORK, 1998; Kennedy & Koehoorn, 2003; Sembajwe et al., 2011).

This study was designed to investigate the association between workplace psychosocial stressors and workers' reported multi-site pain. The researchers hypothesized that worker-reported pain in multiple areas of the body was associated with the following:

- High job demands.
- Low job control.
- Little supervisor support.

The researchers reviewed reports of multi-site musculoskeletal pain and documented associations reported between pain and worker-reported job strain.

The Figure provides a schematic of the variables and hypothesized relationships. The focus of these analyses is indicated by capital letters and bold. Shaded domains of the Figure indicate areas that are part of the larger longitudinal schema, and are not addressed in these analyses. This initial cross-sectional study was intended to lay a foundation for future analyses of longitudinal data that would further explore the multiplicative effects of the association between psychosocial factors and multi-site musculoskeletal pain on self-reported health, work hours, and job tasks.

METHODS

The Be Well Work Well (BWWW) study was a cross-sectional survey of 2,000 randomly selected direct patient care workers from two large hospitals in the greater Boston area; data were collected between October 2009 and February 2010. Further details of the survey, methodology, and participant eligibility are described elsewhere (Boden et al., 2012; Dennerlein et al., 2012; Sorensen et al., 2011). Eligible participants included those who were employed as direct patient care workers at the institutions in 2008. Travel nurses, workers from environmental services, physical therapy, or occupational therapy, and those on leave for more than 12 weeks were excluded. The study was approved by the relevant university and health care institutional review boards for protection of human subjects.

The Job Content Questionnaire (JCQ) (Karasek, 1985; Karasek et al., 1998) has been used as a measure of psychosocial factors in the workplace when assessing the effects of job stress on overall health (Brisson & Larocque, 2001; Cheng, Luh, & Guo, 2003; De Araújo & Karasek, 2008; Edimansyah, Rusli, Naing, & Mazalisah, 2006; Eum et al., 2007; Hokerberg et al., 2010; Kawakami & Fujigaki, 1996; Landsbergis, Theorell, Schwartz, Greiner, & Krause, 2000; Li, Yang, Liu, Xu, & Cho, 2004; Niedhammer, 2002; Tabanelli et al., 2008).

The complete JCQ consists of 49 items that measure six domains of workplace stress: psychological workload (demand); decision latitude (control); social support; physical demands; macro-level decision authority; and job insecurity (Karasek, 1985; Karasek et al., 1998).

The JCQ distinguishes occupations with high levels of job stress using occupational codes from the U.S. Census (Karasek, 1985; Karasek et al., 1998). The JCQ, also called the Demand/Control model, posits a link between jobs with high demand, low control, and low social support and poor health outcomes (ILO, International Labour Office SAFEWORK, 1998; Karasek et al., 1998).

The BWWW study used two of the JCQ domains (demand and control), along with coworker and supervisor support, to assess job stressors among a sample of health care workers (i.e., nurses, nurse managers, and patient care associates). The survey also included a series of questions to assess pain and severity in specific areas of the body (Dennerlein et al., 2012; Sorensen et al., 2011).

Sociodemographic and Work Characteristics

From the questionnaire, the researchers gathered information on gender, occupation, education, and body mass index (BMI) calculated from reported height, weight, and age.

Occupation was determined from job title and categorized as staff nurse, patient care associate, or other (e.g., administrative job titles, operations coordinator, assistant nurse manager, or clinical nurse specialist).

Education, highest grade or level of school completed, was categorized as grade 12/general equivalency diploma (GED) or less; 1 to 3 years of college or technical school; 4-year college degree (graduate); or any graduate school.

Exposure Measures

Exposure measures for psychosocial strain included items taken from an abbreviated JCQ scale and validated elsewhere (Karasek et al., 1998; Karasek & Theorell, 1990; Landsbergis, Schnall, Pickering, & Schwartz, 2002). These questions focused on coworker support, supervisor support, psychological workload (demand), and decision latitude (control), including decision authority and skill discretion.

Psychological demands were measured by five items on the questionnaire: 1. "My job requires working very fast."; 2. "My job requires working very hard."; 3. "I am not asked to do an excessive amount of work."; 4. "I have enough time to get the job done."; and 5. "I am free from conflicting demands that others make."

Decision latitude was created as a weighted sum of decision authority (three items) and skill discretion (six items). The decision authority items were: 1. "My job allows me to make a lot of decisions on my own."; 2. "On my job, I have very little freedom to decide how to do my work."; and 3. "I have a lot of say about what happens on my job." The skill discretion items were: 1. "My job requires that I learn new things."; 2. "My job requires a lot of repetitive work."; 3. "My job requires me to be creative."; 4. "My job requires a high level of skill."; 5. "I get to do a variety of different things on my job"; and 6. "I have an opportunity to develop my own special abilities."

Coworker support was assessed using two items: 1. "If needed, I can get support and help with my work from my coworkers."; and 2. "The people I work with are helpful in getting the job done."

Supervisor support was measured using three items: 1. "If needed, I can get support and help with my work from my immediate supervisor."; 2. "My supervisor is helpful in getting the job done."; and 3. "My work achievements are appreciated by my immediate supervisor."

Response categories for all of the JCQ items were on a 5-point Likert scale of "strongly agree," "agree," "neither agree nor disagree," "disagree," and "strongly disagree."

Demand, control, and social support were dichotomized at the 75th percentile to delineate high and low exposures; all values at the 75th percentile and above were deemed high. This was an arbitrary cutpoint based on the upper quartile of the demand, control, and support scales. It was based on the upper quartile or upper tertile used to define high-strain jobs from the JCQ (Karasek, 1985; Karasek et al., 1998; Sembajwe et al., 2011; Wahrendorf et al., 2012). After examining the differences between groups using the upper tertile and upper quartile as cutpoints, the authors chose the upper quartile cutpoint of the psychosocial factors because a clear difference existed between this group and those below this quartile, in relation to the exposure distribution. The upper quartile cutpoint was shown to be the stable value.

As recommended in the JCQ instructions, factor analyses were conducted to confirm the internal validity of these questions for this particular study population. The confirmatory factor analyses showed that the component questions for each JCQ item loaded as expected.

Outcome Measures

Pain from the neck, shoulder, lower back, knee, ankle, and wrist was documented using the standard Nordic Questionnaire for musculoskeletal symptoms (Kuorinka et al., 1987). This instrument consisted of a diagram of the body segmented into various areas (e.g., neck area, shoulder area) for which pain may be indicated.

Specifically, the researchers asked, "During the past 3 months, have you had pain or aching in any of the areas shown on the diagram?" (i.e., "low back," "shoulder," "neck," "wrist or forearm," "knee," "ankle or feet," or "none of the above").

A score consisting of the sum of pain sites was created by accumulating the number of pain sites from those reported for each respondent; the multi-site pain categories were mutually exclusive. For example, if a respondent reported neck and shoulder pain, a score of 2 would be recorded; similarly, if a respondent reported neck pain, shoulder pain, and knee pain, a score of 3 would result.

Statistical Analysis

Logistic regression analysis was used to explore patterns of association, rather than to infer predictive

Table 1

Distribution of Sociodemographic Characteristics, Psychosocial Exposures, and Pain Outcomes in the Be Well Work Well Study, Overall and by Occupation and Gender

	Overall		*Staff Nurse*		*Patient Care Associate*		*Other*		*Men*		*Women*	
Variable/Category	***%***	***(n)***	***%***	***(n)***	***%***	***(n)***	***%***	***(n)***	***%***	***(n)***	***%***	***(n)***
Education												
Grade 12/general equivalency diploma or less	5.2	(78)	0.1	(1)	36.2	(42)	10.9	(35)	7.0	(10)	4.9	(66)
1 to 3 years of college or technical school	23.9	(360)	18.9	(201)	40.5	(47)	34.4	(110)	25.9	(37)	23.8	(323)
4-year college degree (graduate)	53.4	(803)	64.9	(690)	15.5	(18)	28.8	(92)	51.7	(74)	53.6	(727)
Any graduate school	17.5	(264)	16.1	(171)	7.8	(9)	25.9	(83)	15.4	(22)	17.7	(241)
Occupation												
Staff nurse	70.5	(1,103)							52.4	(75)	72.6	(990)
Patient care associate	8.1	(127)							11.9	(17)	7.6	(103)
Other	21.4	(335)							35.7	(51)	19.8	(270)
Gender												
Male	9.5	(143)	7.0	(75)	14.2	(17)	15.9	(51)				
Female	90.5	(1,369)	93.0	(990)	85.8	(103)	84.1	(270)				
Variable (Range)	**n**	**M (SD)**	**n**	**M (SD)**	**n**	**M (SD)**	**n**	**M (SD)**	**n**	**M (SD)**	**n**	**M (SD)**
Age (21–73 years)	1,478	41.4 (11.7)	1,049	41.0 (11.4)	112	39.8 (12.2)	311	43.3 (12.4)	139	40.6 (11.7)	1,337	41.5 (11.7)
Body mass index (18.0–44.3)	1,420	26.3 (5.3)	1,017	26.0 (5.3)	96	28.0 (5.1)	303	27.0 (5.2)	138	27.2 (4.6)	1,280	26.2 (5.3)
Job Content Questionnaire												
Psychological workload (13.5–48.0)	1,521	35.9 (5.2)	1,073	36.5 (5.1)	119	33.6 (5.2)	322	34.9 (5.2)	140	34.5 (5.6)	1,324	36.0 (5.1)
Decision latitude (28.5–96.0)	1,520	71.7 (9.7)	1,075	73.1 (8.7)	116	64.4 (8.9)	322	69.5 (11.3)	139	71.2 (10.7)	1,324	71.8 (9.5)
Skill discretion (13.5–48.0)	1,541	37.2 (4.7)	1,085	38.0 (3.9)	121	34.3 (5.7)	328	35.8 (5.7)	141	36.9 (5.4)	1,340	37.3 (4.5)
Decision authority (12–48)	1,546	34.4 (6.4)	1,092	35.1 (6.0)	120	30.3 (5.6)	327	33.7 (7.1)	141	34.3 (6.8)	1,348	34.5 (6.3)
Social support at work (6–25)	1,525	18.7 (4.0)	1,083	18.7 (3.7)	114	18.5 (4.7)	321	18.5 (4.3)	142	18.7 (4.1)	1,325	18.7 (3.9)
Supervisor support (3–15)	1,529	10.6 (3.0)	1,084	10.6 (2.9)	115	11.0 (3.2)	323	10.9 (3.0)	142	10.8 (3.0)	1,329	10.7 (3.0)
Coworker support (2–10)	1,563	8.0 (1.5)	1,101	8.6 (1.3)	125	7.5 (1.9)	330	7.6 (1.7)	143	8.0 (1.5)	1,360	8.0 (1.5)

Table 2

Distribution of Musculoskeletal Pain Outcomes in the Be Well Work Well Study, Overall and by Occupation and Gender

	Overall		Staff Nurse		Patient Care Associate		Other		Men		Women	
Variable	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Musculoskeletal pain												
Upper body												
Neck	27.7	(435)	30.2	(332)	15.8	(20)	24.5	(82)	24.5	(35)	27.6	(378)
Shoulder	32.0	(502)	33.9	(372)	27.6	(35)	27.5	(92)	25.2	(36)	32.2	(441)
Wrist	10.7	(167)	9.8	(108)	7.9	(10)	14.3	(48)	11.2	(16)	10.8	(148)
Lower body												
Lower back	52.8	(838)	57.7	(634)	51.2	(65)	37.9	(127)	47.6	(68)	53.0	(726)
Knee	19.8	(311)	19.9	(219)	15.8	(20)	21.2	(71)	21.0	(30)	19.7	(270)
Ankle	26.3	(412)	28.1	(309)	28.4	(36)	19.7	(66)	24.5	(35)	26.5	(363)
Multi-site pain												
No pain site (0)	26.4	(414)	21.8	(239)	33.9	(43)	38.5	(129)	33.6	(48)	25.6	(351)
One pain site (1)	23.4	(367)	24.9	(274)	21.3	(27)	19.4	(65)	19.6	(28)	24.4	(334)
Two pain sites (2)	23.1	(362)	24.5	(269)	24.4	(31)	17.9	(60)	21.7	(31)	22.9	(314)
Three pain sites (3)	14.9	(233)	15.8	(174)	10.2	(13)	13.7	(46)	17.5	(25)	14.6	(200)
Four pain sites (4)	7.7	(120)	8.2	(90)	7.1	(9)	6.0	(20)	2.8	(4)	7.7	(106)
Five pain sites (5)	3.0	(47)	3.5	(38)	1.6	(2)	2.1	(7)	2.1	(3)	3.2	(44)
Six pain sites (6)	1.6	(25)	1.4	(15)	1.6	(2)	2.4	(8)	2.8	(4)	1.5	(20)

relationships, between psychosocial exposures and multi-site pain outcomes. All models included the psychosocial factors of age, BMI, gender, occupation, and education because these variables were shown to be significant in several of the bivariate analyses. Initially, each pain outcome was analyzed independently; then, the researchers examined the associations between the components of psychosocial job stress and multi-site pain using the sum of pain sites. Binomial, multinomial, and cumulative logistic regression methods were used to explore associations between single and multiple musculoskeletal pain outcomes, respectively, and workplace psychosocial exposures. SAS statistical software, version 9.2 (SAS Institute, Inc., Cary, NC), was used for all analyses.

RESULTS

A total of 1,572 direct patient care workers completed at least half of the survey, for a response rate of 79%, and were included in these analyses. The majority were women (n = 1,369) and staff nurses (n = 1,103). The average age of the sample was 41 years (Table 1). Respondents indicated more low back pain overall (52.8%) (Table 2). Overall, approximately 27% of the respondents experienced pain in three or more body sites (three, four, five, or six body sites); more than one fourth of the respondents (26.4%) experienced no pain at all.

Staff nurses (78.2%) reported more pain than patient care associates (66.1%) and workers in other occupations (61.5%). Women (74.4%) reported more pain than men (66.4%).

Individual Pain Sites

Table 3 shows logistic regression results for the associations between psychosocial job stress factors and pain at individual sites for all of the respondents. High psychological demand was significantly associated with pain at each individual musculoskeletal site (Table 3). Low supervisor support was significantly associated with high reports of neck and knee pain.

Covariates in the Models

Among the covariates in the logistic regression models, BMI and age were associated with pain at some sites; education was not associated with pain at any site. Higher BMI was associated with reports of pain in the knee and ankle, with odds ratios ranging from 1.02 to 1.07. Older age was also linked with reports of wrist, knee, and lower back pain, with odds ratios ranging from 1.01 to 1.7.

Table 3

Logistic Regression Results for Associations Between High Workplace Stress Components and Specific Musculoskeletal Pain

Psychosocial Factor (Upper Quartile)[a]	OR (95% CI)[b]					
	Neck	***Shoulder***	***Wrist***	***Lower Back***	***Knee***	***Ankle***
Overall						
Psychological demands	1.56 (1.21–2.02)**	1.80 (1.40–2.31)**	1.71 (1.18–2.48)**	1.66 (1.30–2.12)**	1.60 (1.19–2.14)**	1.53 (1.17–1.98)**
Decision latitude	1.27 (0.97–1.66)	0.94 (0.72–1.22)	0.70 (0.46–1.06)	0.85 (0.66–1.09)	0.91 (0.67–1.25)	0.86 (0.65–1.14)
Supervisor support	0.67 (0.48–0.93)*	0.84 (0.62–1.15)	1.11 (0.69–1.78)	0.80 (0.60–1.07)	0.52 (0.35–0.77)**	0.84 (0.61–1.16)
Coworker support	1.09 (0.81–1.48)	1.07 (0.80–1.43)	0.71 (0.44–1.13)	0.89 (0.68–1.16)	1.10 (0.78–1.56)	1.31 (0.97–1.76)

Note. OR = odds ratio; 95% CI = 95% confidence interval. No pain was the reference. [a]*Psychosocial factors were dichotomized at the 75th percentile.* [b]*Models included all of the psychosocial measures, adjusted for gender, age, occupation, education, and body mass index.*

*$p < .05$. **$p < .01$.

Multi-site Pain

In cumulative logistic regression analyses using the proportional odds model and controlling for psychosocial factors and other covariates in the assessment of pain at multiple sites (Table 4), low decision latitude (job control) was associated with increased odds of pain but was statistically significant only among patient care associates. High psychological (job) demand was associated with increases in multi-site pain across categories of occupation and gender.

Low supervisor support was associated with pain at multiple sites. It reached statistical significance overall and among staff nurses and women.

In general, women were less likely to experience multi-site pain if they reported high supervisor support. This association was less evident among men.

DISCUSSION

This study demonstrated that high job demand is one of the workplace psychosocial factors associated with musculoskeletal pain in direct patient care workers and ancillary staff. Low supervisor support was also associated with increases in pain, especially among women and staff nurses. These results relating to job demand coincide with findings from other similar studies of psychosocial factors and pain (Alexopoulos et al., 2011; De Souza Magnago, Lisboa, Griep, Kirchhof, & De Azevedo Guido, 2010; Edme, Facq, Frimat, & Vezina, 2011; Miranda et al., 2010; Theorell, Harms-Ringdahl, Ahlberg-Hulten, & Westin, 1991).

In the analyses, the associations between psychosocial job stress factors and multi-site musculoskeletal pain did not differ between men and women. However, the positive effect of supervisor support on musculoskeletal pain was statistically significant only for women.

BMI and age showed varying associations with musculoskeletal pain, indicating that these factors may play a role in pain reporting among this sample. Indeed, several studies have shown BMI and age to be positively associated with musculoskeletal strain and pain (Arvidsson, Bergman, Arvidsson, Fridlund, & Tingstrom, 2012; Heuch, Hagen, Heuch, Nygaard, & Zwart, 2010; Nilsen, Holtermann, & Mork, 2011).

Occupation has also been linked with musculoskeletal pain. As measured here, occupation may be a proxy for physical job-related tasks that cause musculoskeletal strain (Dennerlein et al., 2012). Patient care tasks such as lifting and repositioning are major contributors to occupationally related musculoskeletal injury and pain among health care staff. In surveys of health care workers, many direct care providers report their work is strenuous and point to heavy lifting, bending, stooping, and awkward postures related to patient handling as contributing to occupational pain and musculoskeletal injury (Engels, van der Gulden, Senden, & van't Hof, 1996; Engkvist, Hagberg, Hjelm, Menckel, & Ekenvall, 1998; Engkvist, Hjelm, Hagberg, Menckel, & Ekenvall, 2000; Karahan, Kav, Abbasoglu, & Dogan, 2009; Shannon et al., 2001; Trinkoff, Lipscomb, Geiger-Brown, & Brady, 2002; Venning, Walter, & Stitt, 1987).

Moreover, patient care can lead to a variety of work-related musculoskeletal disorders (Ando et al., 2000; Edlich, Woodard, & Haines, 2001; Nelson & Baptiste, 2004). An annual incidence of between 17% and 75% and a lifetime prevalence between 35% and 80% have been reported for back injuries (Harber et al., 1985; Hignett, 1996; Retsas & Pinikahana, 2000; Smedley, Egger, Cooper, & Coggon, 1995, 1997; Smedley, Trevelyan, et al., 2003; Yip, 2004). Staff have also reported that patient handling is a significant contributor to injuries to the back, neck, and shoulders (Shannon et al., 2001; Smedley, Inskip, et al., 2003; Trinkoff et al., 2002; Trinkoff, Lipscomb, Geiger-Brown, Storr, & Brady, 2003). Thus, it is conceivable that multi-site injury is a persistent problem among health care workers.

Physical demands were not measured directly in this study and thus not included in these analyses. This is a limitation of the study, and omits any exploration of psychosocial and physical exposures independently and interactively. Future data collection should include measures of physical demand in this population. Nevertheless, occupation may capture some work-related physical demands.

Additionally, BMI was calculated using self-reported height and weight. Evidence exists that survey participants, especially women, overestimate height and underestimate weight in surveys (Wen & Kowaleski-Jones, 2012). It is possible that bias in the BMI variable could have resulted in a weaker association between psychological stress and BMI than would have been seen with objective measurement of this variable.

Another limitation of this study is that it was cross-sectional; thus, any associations cannot be interpreted as predictive. Reverse causality cannot be ruled out, nor can associations due to other factors. Additional surveys and interventions may further develop and confirm associative patterns that may result in pathways to causation. These study analyses offer a foundation for subsequent longitudinal investigations into associations and causations of multi-site musculoskeletal pain.

Multi-site musculoskeletal pain may be a mediating factor in the pathway to lost workdays and increased absenteeism. Future studies should explore the relationships among worker pain, return on investment, and economic indicators such as workers' compensation longitudinally, thus expanding on the cross-sectional associations found in this baseline study.

IMPLICATIONS FOR OCCUPATIONAL HEALTH NURSES

When making recommendations for pain management and work task accommodations, occupational health nurses should be mindful of psychosocial stressors contributing to workers' reports of musculoskeletal pain at multiple body sites. The components of psychosocial stress, including job demand, control, and coworker or supervisor support, must be considered along with physical strain when conducting comprehensive ergonomic assessments and implementing modifications to workplace designs, management, and policies.

Table 4

Cumulative Logistic Regression Results for Associations Between High Workplace Stress Components and Multi-site Musculoskeletal Pain, Overall and by Occupation and Gender

	OR (95% CI)					
Psychosocial Factor (Upper Quartile)[a]	***Overall[b]***	***Staff Nurse[c]***	***Patient Care Associate[c]***	***Other[c]***	***Men[c]***	***Women[c]***
Psychological demands	2.03 (1.64–2.50)**	1.98 (1.55–2.53)**	5.61 (1.91–16.50)**	2.03 (1.24–3.35)**	2.41 (1.15–5.07)*	1.99 (1.60–2.49)**
Decision latitude	0.91 (0.73–1.13)	0.98 (0.76–1.25)	0.16 (0.03–0.71)*	0.86 (0.51–1.46)	0.50 (0.24–1.04)	0.97 (0.77–1.22)
Supervisor support	0.67 (0.52–0.86)**	0.58 (0.43–0.78)**	0.93 (0.32–2.68)	1.17 (0.63–2.16)	0.57 (0.23–1.41)	0.68 (0.52–0.89)**
Coworker support	1.14 (0.90–1.44)	1.27 (0.97–1.66)	0.87 (0.29–2.64)	0.72 (0.39–1.33)	0.82 (0.36–1.86)	1.18 (0.92–1.52)

Note. OR = odds ratio; 95% CI = 95% confidence interval. No pain was the reference. [a]Psychosocial factors were dichotomized at the 75th percentile. [b]Models included all the psychosocial measures, adjusted for gender, age, occupation, education, and body mass index (BMI). [c]Models included all the psychosocial measures, adjusted for gender, age, education, and BMI.
*$p < .05$. **$p < .01$.

These analyses showed associations between components of psychosocial stress and multi-site musculoskeletal pain among patient care workers and underlined the need for more study of health care workers' psychosocial stress and physical burden. Due to the gender distribution in these occupations, future studies may also consider separate analyses for men and women.

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