Results of a Pilot Intervention to Improve Health and Safety for Health Care Workers

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Objective: To test the feasibility of a multicomponent pilot intervention to improve worker safety and wellness in two Boston hospitals. **Methods:** A 3-month intervention was conducted on seven hospital units. Pre- (374 workers) and postsurveys (303 workers) assessed changes in safety/ergonomic behaviors and practices, and social support. Wellness outcomes included self-reported pain/aching in specific body areas (musculoskeletal disorders or MSDs) and physical activity (PA). **Results:** Pain was reported frequently (81%), and PA averaged 4 hours per week. There was a postintervention increase in safe patient handling ($P < 0.0001$), safety practices ($P = 0.0004$), ergonomics ($P = 0.009$), and supervisor support ($P = 0.01$), but no changes in MSDs or PA. **Conclusions:** Safe patient handling, ergonomics, and safety practices are good targets for worker safety and wellness interventions; longer intervention periods may reduce the risk of MSDs.

Musculoskeletal injuries constitute a third of occupational injuries and illnesses in the United States.[1,2] In 2011, more than 380,000 musculoskeletal injuries were reported, 42% of which involved the lower back.[3] Such injuries are among the most expensive of all workers' compensation claims.[4] They can lead to short-term work absences—an average of 11 days for musculoskeletal injuries[3]—and ultimately may result in chronic injury, long-term disability, and reduced earnings for workers.[5–7] Indeed, the Occupational Safety and Health Administration estimates that musculoskeletal injuries cause employers to spend as much as $20 billion per year in direct costs.[2] This does not include the cost of high worker turnover, such as hiring and training and workers to replace those who are injured.[2,8] Total direct and indirect costs of nonfatal occupational injuries have been estimated to exceed $186 billion annually in recent years.[9]

Occupational injuries among health care workers are among the highest in any industry.[10] Among nursing staff, documented injury rates have been reported at rates of 12.89 per 100 full-time employees, and this rate may be nearly double for nursing aides.[11] Be-

yond documented workplace injuries, which may be underreported,[12] self-reported musculoskeletal pain and symptoms (musculoskeletal disorders or MSDs) are widespread among health care workers.[13–15] The 1-year prevalence rate of lower back pain in nursing personnel has been reported at more than 60%.[16] Long work hours (10- and 12-hour shifts), consecutive shifts, and mandatory overtime, or on-call status may contribute to the development or aggravation of such conditions.[13,17–22] Work organization factors, including physical demands, staffing patterns, and psychological pressures, have been associated with MSDs and injuries, especially lower back symptoms.[23–25] Among caregivers, MSDs and work-related injuries have also been associated with job stress, fatigue, and patient-lifting tasks.[26]

Musculoskeletal disorders may be related to other worker wellness indicators such as physical activity. This relationship is likely bidirectional, as musculoskeletal symptoms may restrict physical activity[27] or, alternately, increased physical activity may reduce the risk of pain and injury.[28,29] Beyond MSDs, low levels of physical activity among workers are potentially problematic as they may put workers at a risk for a host of other harmful health outcomes.[30–33] Most US adults get far less physical activity than US Department of Health and Human Service guidelines recommend.[34,35] Even though health care workers may spend the majority of their shifts on their feet, lifting patients, and performing other activities that contribute to fatigue,[36] a recent study of health care workers found that nearly half (45.7%) did not meet recommended levels of physical activity according to a self-reported measure.[37] Indeed, addressing such wellness issues in interventions for MSDs provides an opportunity for holistic messages and comprehensive changes in the work environment that acknowledge the interactive health benefits of improvements in physical activity as well as ergonomics.

Occupational interventions using worker education alone have not typically been successful in reducing MSDs,[38,39] but there is some evidence suggesting that exercise training—both physical fitness and strength/endurance activities—may have a positive effect on improving musculoskeletal health in an occupational setting.[15,39] The effects of occupational MSD interventions have been particularly strong when using a multipronged intervention approach, combining physical exercise with another component, such as worksite ergonomic changes.[14,15,39,40] Previous studies among health care workers have also shown that social environment factors such as work demands and social support,[37] as well as existing safety and ergonomic practices,[36,41] are related to reported MSDs. Taken together with the evidence from previous interventions, these findings support intervention strategies that incorporate targeted changes to the social and physical work environment along with worker education.

This study is an assessment of a multicomponent pilot intervention to promote unit-level safety and social environment changes, as well as worker safety and wellness, in two large Boston hospitals. Using a social–contextual framework,[42] the intervention targeted ergonomics and safety, safe patient handling, and worker physical fitness through unit-wide activities, supervisor involvement, and worker education. The aims were (1) to evaluate unit-level changes (safety practices, supervisor and coworker support) and changes in worker behavior (safe patient handling, lifting practice), and (2)

to test the feasibility of the intervention strategies for use in a large-scale intervention and with the longer-term goal of improving MSDs and physical activity outcomes.

METHODS

Study Design

The intervention activities were conducted on seven patient care units in two large teaching hospitals in Boston during the summer of 2011. All participating units received the intervention, and all eligible workers on each unit were asked to participate in a preintervention (baseline) and postintervention (follow-up) Patient Care Worker Survey. The pilot intervention was part of the Be Well Work Well Study, conducted by the Harvard School of Public Health Center for Work, Health, and Wellbeing. The overall goal of Be Well Work Well was to study the relationships among worksite policies, programs and practices, and worker health and economic outcomes at the unit and worker level. The pilot intervention tested a set of strategies to improve worker health in a small number of hospital units, with the aim of informing a large-scale controlled intervention study in the same setting. Formative research for the pilot intervention included a survey conducted among 2000 workers (approximately 20% of the entire cohort) in the same two hospitals in 2009 and a series of six focus groups conducted with workers on participating units in 2010. The study was approved by the institutional review board for the protection of human subjects.

Data Collection and Sample

Baseline surveys were administered to patient care staff on the study units before the start of the intervention (April 2011 to June 2011) and follow-up surveys were administered after the intervention completion (October 2011 to February 2012). All eligible workers ($n = 501$) were selected at baseline and invited via e-mail to participate in an on-line survey. All workers received an e-mail reminder 1 week later; 3 weeks after the initial invitation, workers who had not yet completed the on-line survey were mailed a paper copy. Another e-mail reminder was sent to nonrespondents 5 weeks after the initial invitation. Eligible workers included all nurses (including advanced practice nurses and nurse leaders) and patient care associates getting paid for at least 40 hours from the selected units in the 4 weeks between January 8, 2011, and February 5, 2011. After the completion of the intervention, the follow-up survey was sent to the same cohort who received the baseline survey. The same protocol as at baseline was used for inviting and reminding workers to complete the follow-up survey.

Intervention

The 3-month intervention sought to improve worker health through involvement of unit managers, implementation of unit-wide safety changes, and worker education. Targeting each of these features in the work context recognizes the multiple levels at which the worksite may influence worker health.[43] The intervention activities encompassed three themes: (1) unit ergonomics and safety, (2) safe patient handling, and (3) worker physical fitness. To encourage a participatory approach, each nurse director of the unit appointed a set of unit champions who worked regular and varied (day and night) shifts to assist in the implementation of the activities. During monthly check-ins, intervention staff met separately with unit managers, available floor champions, and a group of workers on each unit to communicate key messages of the intervention, and address barriers to implementation.

To improve unit ergonomics and safety, a unit-level audit was conducted at the start of the intervention to assess safety features on the unit. This audit instrument included a checklist with 53 items related to risks for injury in patient rooms, nurses' workstations, storage areas, staff amenities, and the overall layout of the unit. Unit managers and floor champions met with the intervention team to discuss observations from the audit and possible improvements on the unit.

Safe patient-handling activities included a 1-hour unit manager training, which reinforced principles of worker health protection. One-on-one safe patient-handling training sessions were conducted by a nurse with each worker in the first month of the intervention. These 1.5-hour training sessions were followed by 3 monthly bedside mentoring sessions. One-on-one training/mentoring sessions focused on awareness of strategies to reduce the risk of injury for both the worker and the patient, and the guidelines to strengthen coworker collaboration in moving patients, and compliance with the use of patient-handling equipment.

To encourage physical fitness, posters were placed on the staff break room walls of the unit, and stretching and strength training prompts were placed on the staff break room tables and computer stations. Because unit workers were a notably well-educated group (97% had completed at least 1 year of college or technical school), posters to encourage physical activity were data-centered, emphasizing the association between physical activity and worker health outcomes, as well as the physical activity patterns of health care workers reported in the 2009 workers survey in the same setting. Prompts provided practical suggestions for strength and stretching techniques that could be performed at work and were relevant to patient care workers' activities (eg, bending, stooping, reaching, pushing, and pulling). One-on-one mentoring sessions also discussed fitness resources at the worksite and awareness building for the importance of physical activity in preventing pain and injury.

Unit Safety and Social Support Measures

Safety practices were assessed by five questions on the Patient Care Worker Survey: (1) unsafe working conditions on the unit are identified and improved promptly; (2) the unit maintains excellent housekeeping; (3) action is taken when safety rules are broken; (4) supervisors confront and correct unsafe behaviors and hazards; and (5) supervisors are trained in job hazards and safe work practices. Response categories included a five-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree). Scores for each item ranged from 1 to 5 (higher representing safer working conditions) and scores for all five items were averaged to create an overall safety practices score.

Coworker support was assessed using two items: "If needed, I can get support and help with my work from my coworkers," and "The people I work with are helpful in getting the job done." Responses to each question ranged from "never" (1) to "always" (5), and items were summed for a scale that ranged from 2 to 10.

Supervisor support was assessed by three items: "If needed, I can get support and help with my work from my immediate supervisor," "My supervisor is helpful in getting the job done," and "My work achievements are appreciated by my immediate supervisor." Responses to each question ranged from "never" (1) to "always" (5), and items were summed for a scale that ranged from 3 to 15.

Patient-Handling Measures

Assessments of worker behaviors related to *safe patient handling* were based on the United States Department of Labor Occupational Safety and Health Administration assessment of job task risk factors for nursing home workers, and adapted for use among general patient care workers (http://www.osha.gov/SLTC/healthcarefacilities/training/activity_3.html). A factor analysis indicated that the items were reflective of three subscales: safe handling behaviors, unsafe handling behaviors, and patient repositioning. *Safe patient handling* was composed of four items, including how often workers used a (1) lifting device when a patient needed to be moved, (2) sling or device to boost a patient in bed, (3) sling or device to move a patient from side to side in the bed, and (4) sheet to boost or

move a patient from side to side in the bed. *Unsafe patient handling* included five items and related to how often workers (1) transferred patients who could not bear weight without the use of equipment but with the help of a coworker; (2) transferred patients who could not bear weight without the use of equipment or the help of a coworker; (3) transferred patients who were combative patients; (4) used their hands to tightly grip a belt or article of clothing to pull, lift, or reposition a patient; and (5) lifted or moved a patient using just one side of their body. Patient repositioning questions asked how often workers: (1) made the bed with a patient in it; (2) repositioned a patient in a geriatric chair, wheelchair, or regular chair; (3) transferred a patient from chair to bed or bed to chair; and (4) transferred a patient from chair to toilet or from toilet to chair. For all items, responses ranged from "never" to "always," and a response category of "does not apply" was provided for those whose jobs did not involve these elements of patient handling. The "does not apply" response was set to missing and excluded from the analysis. Responses were coded so that a higher score was consistent with greater frequency of the subscale construct and summed for each subscale.

To assess ergonomic lifting behavior, participants were asked whether work ever involved lifting or moving loads greater than 100 lb (45 kg); response options were yes/no.

Worker Wellness Measures

Pain was assessed through an adapted Nordic questionnaire.[44] Participants were asked whether they had any pain or aching during the past 3 months in body areas specified on a diagram, including lower back, shoulder, neck, wrist or forearm, knee, ankle, or feet. We grouped the neck and shoulder together into a single category (neck/shoulder); wrists and forearm in to a single category (arm); and knees, ankle, and feet into a single category (lower extremities).

Work interference from pain was reported by participants as the degree to which pain interfered with normal work (not at all, a little bit, moderately, quite a bit, and extremely). Responses of moderately, quite a bit, and extremely were categorized as interfering with work.[36]

The *physical activity* measure was adapted from the CDC BRFSS measure.[45] Participants were asked how much time they spent doing moderate (one item) and vigorous (one item) activities for at least 10 minutes at a time while at work in the past 7 days, and then while not at work in the past 7 days. Responses for moderate and vigorous activity were summed to reflect total (moderate and vigorous) physical activity while at work and total (moderate and vigorous) physical activity while not at work over the preceding week.

Other Measures

Individual demographic information, including age, sex, race, and education, was collected in the baseline and follow-up surveys. In addition, job characteristics such as job title, hours per week, and shift were collected.

Statistical Analysis

To assess the change in the primary outcomes, we compared the preintervention and postintervention means or frequencies using repeated measures linear modeling methods that controlled for the fact that most participants answered both the pre- and postintervention surveys. For continuous measures, we used general linear models with residual maximum likelihood estimation, assuming a Gaussian distribution. For dichotomous outcomes, we used generalized linear modeling methods for a binary distribution with a logit link function. Analyses were carried out using SAS version 9.3 (SAS Institute, Inc, Cary, NC).

RESULTS

Sample Characteristics

Overall, 374 workers completed the baseline survey (75% response rate) and 303 completed the follow-up (60% response rate). Two hundred sixty-nine workers completed both surveys. At the baseline (Table 1), most (90%) were women, with a mean age of 40.8 years. The majority (80%) was white, and 97% had completed at least some college. Most participants were staff nurses (84%), whereas 13% were patient care associates and the remainder held other positions.

At the baseline (Table 2), 82% of workers reported experiencing pain in the past 3 months. The most common kind of pain reported was lower back pain (62%), followed by neck/shoulder pain (50%) and lower extremity pain (36%). Arm pain was experienced 10% of the time. This pain led to moderate to extreme work interference in 35% of workers. The average amount of physical activity reported was 4.0 hours per week at work, and 4.6 hours per week total.

The average reported safety practice score was 3.5 out of 5. Support from coworkers averaged 8.3 out of 10, and support from supervisors averaged 10.6 out of 15. Safe patient-handling scores were 10.5 out of 20, and unsafe patient-handling scores averaged 13.3 out of 25. At the baseline, average patient repositioning scores were 15, and 75% reported ever having to lift or move more than 100 lb (45 kg).

Intervention Feasibility

The intervention was implemented on seven units in two hospitals with more than 500 workers. Despite some unit-specific challenges, the intervention was successful in engaging nursing leadership, all of whom were present at intervention planning and debriefing sessions, as well as for periodic one-on-one meetings with the intervention staff throughout its implementation. Each unit elected two to three floor champions. Overall, the one-on-one training and mentoring sessions had an 84% participation rate from unit workers. Unit ergonomic and safety audits were undertaken, and minor improvements on the unit were implemented as a result of these audits, including, for example, rearranging a storage closet so that heavier items needed to be moved less, placing heavier items between knee and shoulder height, and relocating sharps containers. Although a unit-wide physical activity challenge was planned, it was not implemented because of difficulties in coordinating staff members on different shifts. Nevertheless, physical activity prompts and posters were placed in each of the units for the duration of the intervention. Overall, workers indicated a desire for more wellness activities in future interventions.

Intervention Effects

Safe patient-handling behaviors improved over the course of the intervention (Table 2). There was a statistically significant increase in mean safe patient-handling scores from the baseline to the follow-up (10.5 to 12.0; $P < 0.0001$) and a corresponding decrease in mean unsafe patient-handing scores (13.3 to 12.9; $P = 0.04$). Mean patient repositioning scores also decreased, indicating safer repositioning behaviors (15.0 to 14.7; $P = 0.01$), and the proportion of patients who reported lifting more than 100 lb (45 kg) on their shift decreased from 74.5% to 64.5% ($P = 0.009$).

Mean reported safety practices also improved over the course of the intervention (3.5 to 3.7; $P = 0.0004$), as did mean support from supervisors (10.6 to 10.9; $P = 0.01$). There was no change in coworker support (8.3 vs 8.2; $P = 0.62$).

There was no change in percentage of respondents who reported overall pain between the baseline and the follow-up nor in reported lower back pain, neck/shoulder pain, arm pain, or lower extremity pain (Table 2). The proportion of workers who reported

TABLE 1. Selected Participant Characteristics at Baseline and Follow-Up

Characteristic	Baseline ($N = 374$) % (Frequency/Total Respondents)	Follow-Up ($N = 303$) % (Frequency/Total Respondents)
Occupation		
Staff nurse	83.6 (312/373)	84.5 (256/303)
Patient care associate	12.6 (47/373)	11.2 (34/303)
Other	3.8 (14/373)	4.3 (13/303)
Hours worked per week		
<30	20.1 (75/374)	20.8 (63/303)
30–34	10.7 (40/374)	10.9 (33/303)
35–39	45.2 (169/374)	43.6 (132/303)
40–44	20.6 (77/374)	20.1 (61/303)
>44	3.5 (13/374)	4.6 (14/303)
Shift		
Day shift	26.5 (99/374)	28.1 (85/302)
All others	73.5 (275/374)	71.9 (217/302)
Race		
Hispanic	3.1 (11/357)	3.5 (10/282)
White	79.8 (285/357)	81.9 (231/282)
Black	11.5 (41/357)	9.6 (27/282)
Mixed race/other	5.6 (20/357)	5.0 (14/282)
Sex		
Male	9.8 (35/358)	7.4 (21/285)
Female	90.2 (323/358)	92.6 (264/285)
Education		
Grade 12/General Education Development or less	3.1 (11/358)	2.4 (7/286)
1–3 yrs of college or technical school	20.7 (74/358)	19.6 (56/286)
4-yr college degree (graduate)	60.1 (215/358)	60.5 (173/286)
Any graduate school	16.2 (58/358)	17.5 (50/286)
Age, yr		
Mean ± standard deviation (n)	40.8 ± 11.8 (355)	41.6 ± 11.8 (279)
Minimum, median, maximum	21, 41, 70	21, 43, 68

work interference from pain decreased from 35% to 30%, but this change was not statistically significant ($P = 0.21$). Mean reported physical activity declined slightly from the baseline to the follow-up for total physical activity at work (4.0 to 3.5; $P = 0.08$) and not at work (4.6 to 4.1, $P = 0.12$).

DISCUSSION

In this pilot intervention among hospital workers, pain was reported by most workers, most commonly in the form of lower back pain. Workers also reported very high levels of physical activity on the job. Implementing strategies to improve the social and physical work environment proved feasible, and multiple safe patient-handling and lifting behaviors among workers improved from preintervention to postintervention. There were, however, no changes in worker wellness outcomes (MSDs and physical activity) during the short duration of the intervention.

The intervention was most effective at altering safe patient-handling behaviors, and future larger-scale interventions would do well to incorporate strategies to improve safe patient-handling as a potential prevention strategy for worker pain. Because patient-handling behaviors are a leading risk factor for MSDs,[41] activities that reduce this risk are well aligned with hospital priorities for worker wellness. In general, hospitals encouraged the use of assistive lifting devices where possible, and one-on-one trainings promoting safe practices received strong support from nursing leadership. Nevertheless, a longer evaluation period assessing the retention of be-

havioral improvements over time may be essential to determine the potential of safe patient-handling improvements to result in fewer MSDs. In addition, a longer intervention in safe patient-handling will allow for the evaluation of potential recidivism rates to manual patient-handling and subsequent reinforcement strategies.

In addition to worker behaviors, there appeared to be positive improvements in overall safety practices and supervisor support on the unit after the intervention. Such changes indicate an overall improvement in some work environment factors that may ultimately affect the manifestation of MSDs.[36,37] For instance, supervisor support could be associated with reduced worker stress and more consistent break-taking which, in turn, might lead to more protective behaviors by workers. No change in coworker support was observed during the intervention. This could be due to a "ceiling" effect, as coworker support was already quite high at the baseline. Also, although we made a substantial effort to involve managers in the planning of the intervention, the two to three floor champions on each unit may have had different levels of involvement and interest in promoting intervention activities and messages, and it was unclear how workers perceived the involvement of their peers in this intervention. Moreover, floor champions may be responsible for multiple unit initiatives, and intervention initiatives may be competing with other patient-centered care directives.

In such an abbreviated intervention, we did not observe changes in more distal worker outcomes such as MSDs. Reviews of previous occupational interventions do not reveal a consistent

TABLE 2. Comparison of Outcomes and Mediating Mechanisms at Baseline and Follow-Up: Adjusted[a] Percentage or Mean (Standard Error) and *P* Value for Test of No Change

	Baseline (*N* = 374)	Follow-Up (*N* = 303)	*P**
Patient handling	**Mean Score (Standard Error)**	**Mean Score (Standard Error)**	
Safe patient handling	10.45 (0.16)	12.04 (0.17)	<0.0001
Unsafe patient handling	13.33 (0.20)	12.86 (0.22)	0.04
Patient positioning	15.00 (0.12)	14.65 (0.13)	0.01
Ergonomics	**%**	**%**	
Lift >100 lb (45 kg)	74.50	64.44	0.009
Psychosocial	**Mean Score (Standard Error)**	**Mean Score (Standard Error)**	
Safety practices	3.53 (0.04)	3.66 (0.04)	0.0004
Support from supervisors	10.58 (0.14)	10.94 (0.15)	0.01
Support from coworkers	8.27 (0.07)	8.23 (0.08)	0.63
Pain	**%**	**%**	
Any pain	81.85	81.37	0.87
Lower back pain	61.53	59.02	0.53
Neck/shoulder pain	50.25	46.90	0.41
Arm pain	10.79	8.01	0.22
Lower extremity pain	36.44	36.80	0.93
Work interference	35.05	30.30	0.22
Physical activity	**Mean Hours (Standard Error)**	**Mean Hours (Standard Error)**	
Total physical activity at work	3.98 (0.22)	3.54 (0.24)	0.08
Total physical activity not at work	4.55 (0.20)	4.13 (0.22)	0.12

[a]Adjusted for individuals who responded to both the baseline and the follow-up.
*P value from the repeated measures linear model comparing the baseline and the follow-up.

formula for improving musculoskeletal symptoms that so commonly affect workers, but most do advocate for a multicomponent approach.[15,38,39] Previous studies indicate that improved physical fitness may help in preventing MSDs, but the relationship between physical activity and MSDs is complex and may be difficult to capture among health care workers. Although exercise interventions have had moderate success in reducing *new* episodes of MSDs, it has not always shown an effect on existing pain levels.[39] Although physical fitness may reduce the risk of pain, physical activity may also exacerbate existing pain among those who experience it.[46,47] Given the high prevalence of pain among workers at the baseline, an alternative model for a larger intervention might be to focus on rehabilitation from existing pain in a subset of workers with the greatest severity at the start of the intervention, and then expand to the gradual improvement of physical fitness to prevent future MSDs, rather than seeking simultaneous improvements in both physical activity and pain in all workers.

Overall, the intervention activities demonstrated adequate feasibility. This was particularly the case in encouraging safe patient-handling, which was linked with the priorities of the hospital, and had notable support from nursing leadership. Implementing activities to improve physical activity was, however, more challenging. In a setting where fatigue from job tasks is common, physical activity promotion was limited to informational materials and one-on-one worker education, rather than group activities or unit-wide events. Although group activities have been successful in other occupational settings,[48] implementing these approaches proved quite difficult in health care sites, not only because of the perceived high physical demands of the job, but also because of difficulties congregating a team of workers with staggered breaks and asynchronous work hours. The promotion of supervisor and coworker support for physical activity was also difficult to implement effectively in a distributed work force. Although one-on-one training and mentoring sessions

were a successful means of communicating key messages to workers, such strategies are resource intense and do not capitalize on the potential of unit-wide work environment improvements to affect worker behavior.

This population of workers may have a high level of fatigue because of job tasks. Physical activity patterns may vary widely from day to day and across shifts, with day workers on their feet much more than night workers[49]; occupational duties may also be different for nurses and patient care associates, with different patterns of risk on the basis of job title.[37] This study was, however, not powered to detect differences in the intervention between subgroups. Such diverse work patterns, coupled with inaccurate perceptions of on-the-job physical activity levels, can complicate the framing of messages surrounding physical fitness among health care workers.

Without a control group, this study was not able to compare changes in worker behaviors and outcomes with units who did not receive the intervention. Because this study was a pilot study meant to test intervention strategies for use in a future large-scale intervention, all units received the intervention package. This design was the most appropriate design and use of resources for a pilot study that aimed to test the feasibility of the intervention.

The assessment of pain using self-reported measure has some limitations in that it may be susceptible to recall or social desirability bias. Furthermore, the measurement of physical activity also was limited as a self-reported measure. In a subsample of workers within this study, self-reported measures of physical activity substantially overestimated moderate and vigorous activity levels as compared with accelerometers (forthcoming manuscript: Umukoro P, Arias A, Stoffel SD, Hopcia K, Sorensen G, Dennerlein JT. Physical activity at work contributes little to acute care hospital patient care workers' weekly minutes of moderate and vigorous activity. In revision. *J Occup Environ Med*), a finding that has been demonstrated elsewhere.[35] There is some evidence that the self-report of

physical activity is particularly inaccurate among chronic back pain sufferers compared with healthy controls.[50] Workers in this population report spending more than half their time at work standing, walking, lifting/carrying, or pushing/pulling.[36] Such activities, although potentially fatiguing, may not correspond with even moderate levels of physical activity.

Nevertheless, this study had a number of strengths, including the use of a pre–post design to assess changes in physical activity and MDSs among patient care workers. The intervention was grounded in theory,[43] and incorporated best practices and recommendations from previous reviews of occupational interventions to improve musculoskeletal pain and injury, including a multilevel approach using a combination of health promotion and health protection tactics; the involvement of management and administrative controls in the intervention; and the incorporation of components of a participatory approach.[15,39,51,52]

In conclusion, these findings suggest opportunities for future multicomponent interventions to improve wellness outcomes and MSDs among patient care workers. Efforts that target the work environment along with safety practices and ergonomics may influence worker behaviors that contribute to the burden of workplace injury. Furthermore, managerial involvement for the planning and implementation of unit-wide changes may contribute to successful improvements in work environments and more positive worker behaviors. Over time, the cumulative effect of these wellness promotion and injury prevention strategies has the potential to improve multiple dimensions of worker health.

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