The Role of the Work Context in Multiple Wellness Outcomes for Hospital Patient Care Workers

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Objective: To examine the relationships among low back pain (LBP), inadequate physical activity, and sleep deficiency among patient care workers, and of these outcomes to work context. **Methods:** A cross-sectional survey of patient care workers (N = 1572, response rate = 79%). **Results:** A total of 53% reported LBP, 46%, inadequate physical activity, and 59%, sleep deficiency. Inadequate physical activity and sleep deficiency were associated ($P = 0.02$), but LBP was not significantly related to either. Increased risk of LBP was significantly related to job demands, harassment at work, decreased supervisor support, and job title. Inadequate physical activity was significantly associated with low decision latitude. Sleep deficiency was significantly related to low supervisor support, harassment at work, low ergonomic practices, people-oriented culture, and job title. **Conclusions:** These findings point to shared pathways in the work environment that jointly influence multiple health and well-being outcomes.

Health care is the second-fastest-growing sector of the US economy, employing more than 12 million workers[1] and is one of the most dangerous places to be employed.[1] Compared to other sectors, health care workers sustain the second highest number of nonfatal injuries and illnesses.[2,3] These workers face a wide range of hazards on the job, including a high risk for musculoskeletal disorders (MSDs), especially low back pain (LBP). Rates of LBP among nurses and other patient care workers range from 30% to 60%[4–7] and may contribute to the exodus of nurses from this profession.[5,8]

Low back pain has been associated with inadequate physical activity (PA) and sleep deficiencies.[9–16] The potential for synergistic impacts across these outcomes is apparent. Workers who sustain injuries are less able to be physically active during leisure time.[17] Conversely, sedentary behavior increases risk for LBP and injury[9] and, among those already injured, prolongs disability and adds to the risk of further occurrence of LBP.[18,19] There is clear evidence that sedentary behavior is also associated with increased risk of all-cause and cardiovascular disease mortality.[20–25] National guidelines for PA recommend that adults engage in at least 30 minutes of moderate-intensity activity, 5 days per week, or 20 minutes of vigorous-intensity activity, 3 days per week.[26] Nonetheless, in 2007, the percentage of US adults classified as physically active was only 48.8%, including 50.7% of men and 47.0% of women, on the basis of self-reports in telephone interview.[27] When PA is measured using accelerometers, estimates of adherence to these guidelines may be as low as 5%.[28] For workers in physically demanding jobs, being on one's feet all day may contribute to fatigue and the need for recovery at the end of the day.[29] Contrary to workers' perceptions, however, being in a physically demanding job does not necessarily contribute to meeting PA recommendations. For example, the physical demands of lifting patients do not provide a means of building cardiovascular fitness, as through the recommended levels of moderate to vigorous PA. Low levels of PA are also associated with absenteeism, reduced productivity, increased health care costs, and short-term disability.[30–33]

Similarly, research clearly points to the influence of work patterns, such as long work hours, on sleep, and underscores the hazards of work patterns that cause sleep deficiency (insufficient sleep duration and/or inadequate sleep quality).[34] Habitual patterns of insufficient sleep duration independently predict an increased risk of a fall or other injury requiring an emergency department visit.[35] In health care workers, sleep duration and extended shifts are related to health care workplace-associated injuries and patient safety-related errors, including motor vehicle crashes,[36] medical errors,[37] and percutaneous injuries.[38] Working night or rotating shifts (ie, sleeping during the daytime) has deleterious consequences not only for sleep cycles but for health outcomes as well.[39–42] In addition, for patient care workers, working nights, and the associated sleep disruptions may contribute to increased risk of MSDs, reduced PA, and compromised dietary patterns, often contributing to increased weight.[39]

Prior research points to the important roles of job characteristics and the context of the work environment in risk of LBP, inadequate PA, and sleep deficiencies. In addition to the physically demanding nature of the work,[43,44] patient care workers' increased risk for MSDs, including LBP, is associated with high work demands, low social support, and long work hours.[45–48] Similar characteristics of the work environment may contribute to sleep deficiency[42,49] and inadequate PA.[50–52] Despite the shared risks posed by the work environment, however, little research has systematically explored these cross-cutting pathways and their implications for improving the effectiveness of comprehensive worksite interventions to address the broad spectrum of worker health outcomes.[53]

This article examines the relationships among LBP, inadequate PA, and sleep deficiency among hospital patient care workers, which, in combination, may pose an additive threat to worker health and well-being. In addition, we explore the relationships of characteristics of the work environment to these wellness outcomes, as illustrated in Fig. 1 These findings may inform intervention design by helping to prioritize intervention targets; elements of the work environment that impact more than one outcome may be an especially high priority for workplace interventions. Specifically, we hypothesize that (1) the three wellness outcomes—presence of LBP, inadequate PA, and sleep deficiency—are associated with one another and (2) the three wellness outcomes are associated with common characteristics of the work environment, including job characteristics (ie, social relations at work, job strain, use of a lifting device, work hours and schedule, and job title) and organizational context (ie, the safety practices, ergonomic practices, a people-oriented culture, and work unit).

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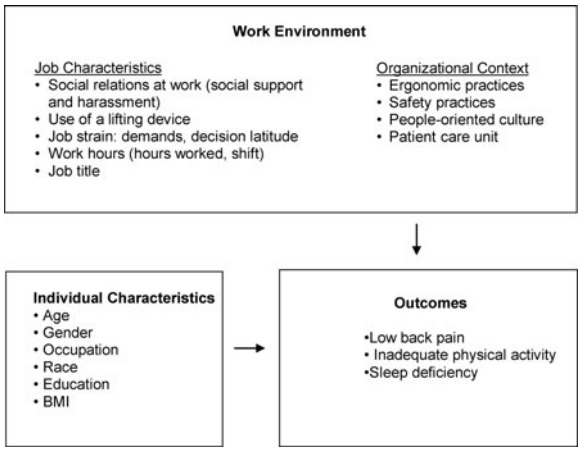

FIGURE 1. Conceptual model.

METHODS

Study Design

The "Be Well Work Well Study" is one of the three studies conducted by the Harvard School of Public Health Center for Work, Health and Well-being. Data presented here were collected through a cross-sectional survey of patient care workers conducted in two large teaching hospitals in the Boston area in late 2009. This survey was conducted as part of research aimed at identifying the relationships among worksite policies, programs and practices, and worker health and economic outcomes, through analysis of employee record data, a review of policies and an examination of their implementation through a survey of nurse managers, and this survey of patient care workers. This survey was designed to evaluate associations of MSDs and worker health behaviors to physical and psychosocial exposures on the job, as well as preventive measures in place. This study was approved by the applicable institutional review board for protection of human subjects.

Sample

The sampling frame for the Patient Care Worker Survey included all workers employed between October 1, 2008, and September 30, 2009, who worked 20 hours per week or more or who were designated as at least half time in patient care services and who had direct patient care responsibilities (including registered nurses, licensed practical nurses, and patient care assistants/nursing assistants). Eligible employees worked in patient care units under the direction of a nurse director. Patient care workers assigned to the "float" unit were eligible to participate in the survey; allied health care professionals (eg, physical therapy, occupational therapy), support staff assigned to environmental services, and any staff on physical medicine units were excluded. Also ineligible were workers on an extended absence greater than 12 weeks, per diem staff, and traveling or contract nurses.

Data Collection

This survey was conducted between October 2009 and February 2010 at two large teaching hospitals in the greater Boston area. We randomly selected 2000 eligible workers and invited them via e-mail to participate in the survey on-line. After two reminders and 4 weeks, we mailed a paper version of the survey to workers who had not yet completed the survey on-line. A second paper survey and a third e-mail reminder were sent to all nonrespondents after another 2 weeks; 1 month later, a final e-mail reminder was sent to all nonrespondents. A total of 1572 workers initiated completion of the survey on-line. Of those, 1399 (89%) completed at least 50% of the survey items and met our definition of survey completion. An additional 173 workers returned a completed mailed version of the survey. The total number of completed surveys is 1572 for a response rate of 79%.

Measures

Outcomes

Low back pain was measured using an adaptation of the Nordic question, "During the *past 3 months*, have you had pain or aching in any of the areas shown on the diagram?"[54] Using a diagram as a reference, respondents were asked to identify areas in which they experienced pain: lower back, shoulder, wrist or forearm, knee, neck, ankle or feet, and none of the above.

The measure of *physical activity* was adapted from the Centers for Disease Control and Prevention Behavioral Risk Factor and Surveillance System Physical Activity measure.[55] We asked respondents about their participation in vigorous and moderate PA of at least 10 minutes' duration outside of work. For each, we asked the number of days per week they participate in the activity and the total time (hours and minutes) per day. Adequate PA was defined as reporting at least 30 minutes of moderate or vigorous activity on at least 5 days a week or at least 20 minutes of vigorous activity on at least 3 days a week.[26]

Sleep deficiency was operationalized as the presence of insufficient sleep duration and/or inadequate sleep quality using responses to a series of questions regarding sleep habits in the preceding 4 weeks, as adapted from the Pittsburgh Sleep Quality Index.[56] Respondents were asked how many hours they slept each night. Insomnia symptoms were assessed by asking how often they had difficulty falling asleep, woke in the middle of the night, or awoke early, with four response categories from *not at all in the last 4 weeks* to *3 or more times a week*. Sleep quality was assessed by asking how often they got enough sleep to feel rested upon waking, with five response categories from *never* to *always*.[57] Sleep deficiency was defined as a report of at least one of the following: insufficient sleep duration (<6 hour/day) or inadequate sleep quality (never feeling rested on waking) or insomnia symptoms 3 or more times a week.

Job Characteristics

Three aspects of social relations on the job were measured. *Coworker support* was assessed using two items: "If needed, I can get support and help with my work from my coworkers." "The people I work with are helpful in getting the job done." The responses, each ranging from 1 to 5, were summed resulting in a scale that ranged from 2 to 10. Similarly, *supervisor support* was measured using 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," "My work achievements are appreciated by my immediate supervisor," with response categories on the same five-point scale. The responses were summed resulting in a scale that ranged from 3 to 15. These social support scales were adapted from the Job Content Questionnaire.[58,59] *Harassment* was measured by asking five questions, assessing frequency in the last 12 months of someone at work yelling or screaming at the respondent, making hostile or offensive gestures, swearing at, talking down to, or treating the respondent poorly.[60] A participant was coded as experiencing harassment if she or he reported "more than once" to any of the five questions.

Job strain was assessed using the abbreviated version of the Job Content Questionnaire,[58] focusing on the three subscales: psychological job demand (five items); decision authority (three items); and skill discretion (five items). Decision latitude was created as a weighted sum of decision authority and skill discretion. A worker was defined as having job strain if his or her psychological demand was greater than the national median while decision latitude was below the national median. National medians[59,61] were rescaled to adjust for the different number of items used in our study.

TABLE 1. Selected Characteristics of Hospital Patient Care Workers ($n = 1572$)

Individual Characteristics	*N*	%
Gender		
Male	143	9.5
Female	1369	90.5
Race/ethnicity		
Hispanic	65	4.3
White, non-Hispanic	1185	79.1
Black, non-Hispanic	159	10.6
Other	89	5.9
Education		
Grade 12/GED or less	78	5.2
1–3 years of college	360	23.9
Baccalaureate degree	803	53.4
Graduate degree	264	17.5
	Mean (SD)	**Min–Max**
Age, yr	41.4 (11.7)	21–73
Body mass index, kg/m^2	26.3 (5.3)	18–44
Work context/job characteristics	*N*	%
Job title		
Staff nurse	1103	70.5
Patient care associate	127	8.1
Other	335	21.4
Hours worked per week		
<29	347	22.2
30–34	188	12.0
35–39	453	28.9
40–44	508	32.4
45 or more	70	4.5
Shift		
Regular day	469	30.0
All others	1097	70.0
Job strain		
Yes	266	17.4
No	1259	82.6
Harassment at work		
Yes	913	59.7
No	617	40.3
	Mean (SD)	**Min–Max**
Decision latitude	71.7 (9.7)	28.5–96
Demands	35.9 (5.2)	13.5–48
Supervisor support	10.6 (2.9)	3–15
Coworker support	8.0 (1.5)	2–10
Safety Practices Scale	3.83 (0.60)	1.25–5
Ergonomic Practices Scale	3.13 (0.83)	1–5
People-oriented Culture Scale	3.59 (0.75	1–5

Use of a lifting device was measured by a single item, "In general, when a patient needs to be moved, how often do you use a lifting device?" with five response categories from "never" to "always " as well as an option to indicate that the respondent does not lift patients.

We measured *work hours* by self-report of the number of hours worked in a typical week at this job. *Work shift* was also measured by self-report. *Job title* was categorized as assistant nurse manager, clinical nurse specialist, staff nurse, patient care associate, operations coordinator, and other.

Organizational Context

We measured four indicators of the organizational context: people-oriented culture, ergonomic practices, safety practices, and work unit. For three of these measures, we used the Organizational Policies and Practices (OPPs) questionnaire, developed by Amick et al,[62] which was designed to address organizational context in relation to injury claims and disability management. We adapted some of the item wording to better match the health care setting and to indicate that the item was referring to the work unit, not the entire workplace. We also designed several related items to capture similar constructs in ways appropriate for this work setting. We used factor analysis to evaluate the new items in conjunction with the standard and reworded items and based our study scales on those results. The *people-oriented culture scale* included four items to assess to what extent employees are engaged in meaningful decision making in their work unit. Our *ergonomic practices scale* included six items concerning the design of work to reduce lifting; pushing and pulling; bending reaching and stooping; the use of other ergonomic factors in work design and the purchase of equipment. Our *safety practices* scale combined items from the OPPs measures of safety diligence and safety training; it was composed of eight items, including the identification and improvement of unsafe work conditions, housekeeping, equipment maintenance, action when safety rules are broken, and whether supervisors confront and correct unsafe behaviors or hazards as well as items assessing safety leadership (eg, the training of supervisors and employees in job hazards and safe work hazards) and two questions designed for this setting: "I feel free to report any unsafe working conditions where I work"; and "On this unit, employee suggestions about worker safety are supported by management." The response scale for all items was a five-point scale ranging from *strongly disagree* to *strongly agree*. The responses were coded so that a high score indicated positive people-oriented culture, ergonomic practice, or safety as appropriate and the items in each scale were summed. For comparability with the original OPPs scores, each score was divided by the number of items in the scale to create a scale ranging from 1 to 5.

Participants worked in 128 patient care units. The patient care *work units* were grouped into 12 categories reflecting similar workloads: emergency department, operating room, adult medical/surgical, adult intensive care unit, step-down, pediatric medical/surgical, pediatric/neonatal intensive care, psychiatry, obstetrics/postpartum, float pool, ambulatory units, and orthopedics.

Individual Characteristics

We asked participants about their individual characteristics including occupation, race/ethnicity, education, gender, age, height,

TABLE 2. Number of Respondents Who Report Low Back Pain, Inadequate Physical Activity, and Sleep Deficiency

Low Back Pain	Physical Activity	Sleep Deficiency		% Sleep Deficient
		Yes	No	
Yes	Inadequate	234	133	63.8
	Adequate	247	174	58.7
	% Inadequate	48.6	43.3	
No	Inadequate	189	121	61.0
	Adequate	214	184	54.0
	% Inadequate	46.9	39.7	

TABLE 3. Bivariate Associations of Low Back Pain, Work Context, and Worker Characteristics ($N = 1568$)

	Low Back Pain		
Variables	**Yes ($n = 828$; 52.8%)**	**No ($n = 740$; 47.2%)**	***P***
Job characteristics			
Mean support from coworkers (SD)	7.9 (1.5)	8.1 (1.5)	0.05
Mean support from supervisor (SD)	10.3 (3.0)	11.0 (2.9)	<0.0001
Harassment at work			<0.0001
No	263 (32.3%)	352 (49.5%)	
Yes	552 (67.7%)	359 (50.5%)	
Use of a lifting device, *n* (%)			0.007
Low	310 (42.1%)	234 (39.5%)	
Medium	231 (31.3%)	156 (26.2%)	
High	196 (26.6%)	203 (34.3%)	
Hours worked per week, *n* (%)			0.02
<30 hours	184 (22.3%)	164 (22.2%)	
30–34	100 (12.1%)	87 (11.8%)	
35–39	258 (31.2%)	193 (26.2%)	
40–44	258 (31.2%)	250 (33.9%)	
>44 hours	26 (3.1%)	44 (6.0%)	
Shift, *n* (%)			0.03
Regular day	229 (27.7%)	240 (32.9%)	
All others	598 (72.3%)	496 (67.4%)	
Job title, *n* (%)			
Staff nurse	634 (76.8%)	465 (63.3%)	<0.0001
Patient care associate	65 (7.9%)	62 (8.4%)	
Other	127 (15.4%)	208 (28.3%)	
Job strain			<0.0001
0. No	632 (78.4%)	623(87.1%)	
1. Yes	174 (21.6%)	92 (12.9%)	
Mean demands (SD)	36.8 (4.9)	35.0 (5.3)	<0.0001
Mean decision latitude (SD)	71.4 (9.5)	71.9 (9.8)	0.32
Organizational context			
Mean People-oriented Culture (SD)	3.53 (0.76)	3.65 (0.74)	0.002
Mean Ergonomic Practices Scale (SD)	3.02 (0.80)	3.25 (0.80)	<0.0001
Mean Safety Practices Scale (SD)	3.76 (0.60)	3.91 (0.58)	<0.0001
Work unit			0.26
Emergency department	48 (5.8%)	38 (5.1%)	
Operating room	76 (9.2%)	81 (11.0%)	
Variables	Low back pain		
	Yes ($n = 828$; 52.6%)	No ($n = 747$; 47.4%)	
Adult medical/surgical	329 (39.7%)	252 (34.0%)	
Adult ICU	102 (12.3%)	94 (12.7%)	
Step-down	45 (5.4%)	37 (5.0%)	
Pediatric medical/surgical	9 (1.1%)	11 (1.5%)	
Pediatric ICU/NICU	33 (4.0%)	33 (4.5%)	
Psychiatry	6 (0.7%)	14 (1.9%)	
Obstetrics/postpartum	60 (7.2%)	70 (9.5%)	
Float pool	35 (4.2%)	30 (4.0%)	
Ambulatory/consult/Education	85 (10.3%)	80 (10.8%)	
Orthopedics	20 (2.4%)	21 (2.8%)	
Individual characteristics			
Gender, *n* (%)			0.21
Male	68 (8.6)	75 (10.4)	
Female	726 (91.4)	643 (89.6)	

(*Continued*)

TABLE 3. Bivariate Associations of Low Back Pain, Work Context, and Worker Characteristics ($N = 1568$) *(Continued)*

	Low Back Pain		
Variables	**Yes ($n = 828$; 52.8%)**	**No ($n = 740$; 47.2%)**	***P***
Race/ethnicity, *n* (%)			0.01
Hispanic	32 (4.0)	33 (4.7)	
White	649 (82.2)	536 (75.7)	
Black	67 (8.5)	92 (13.0)	
Mixed/other	42 (5.3)	47 (6.6)	
Education, *n* (%)			0.15
Grade 12/GED or less	29 (3.7)	49 (6.9)	
1–3 years of college	178 (22.5)	182 (25.4)	
4-year college degree	439 (55.6)	364 (50.9)	
Any graduate school	144 (18.2)	120 (16.8)	
Mean age (SD)	40.5 (11.9)	42.4 (11.4)	0.001
Mean body mass index (SD)	26.2 (5.3)	26.4 (5.3)	0.42

GED, general education diploma; ICU, intensive care unit; NICU, neonatal intensive care unit.

and weight. Body mass index (BMI) was computed as weight (kg) per cm^2 of height.

Statistical Analyses

To evaluate the association among the three outcomes—LBP, inadequate PA, and sleep deficiency—we used log-linear modeling methods. To explore the bivariate associations of job characteristics and organizational context with each of the outcomes, we used cross-classification and the chi-square test of homogeneity. For each outcome, we then computed a multiple logistic regression analysis including all the measures that were bivariately associated with the outcome at $P < 0.2$. We then removed all variables with $P > 0.05$ in the multivariable model, resulting in a final model for each outcome that included only significant independent variables. We computed a common model for all the outcomes including all variables that were in the final model for any outcome so that the associations could be compared across outcomes. All analyses were carried out using SAS statistical software, version 9.2.[63]

RESULTS

Characteristics of the Sample

The sample of 1572 patient care workers was 91% women and they were 41 years old, on average. Most were of non-Hispanic white ethnicity (79%) (Table 1). Only 30% worked a regular day shift and nearly two thirds (63%) worked fewer than 40 hours in a typical week.

Among the 1496 respondents for whom we had complete data for all three outcomes, 788 (53%) reported experiencing LBP in the last 3 months, 677 (45%) reported not meeting the recommended guidelines for PA, and 884 (59%) reported sleep deficiency. A total of 234 (16%) reported all three outcomes and 569 (38%) reported two of the three outcomes (Table 2). Sleep deficiency was higher among those with inadequate PA, and similarly the prevalence of inadequate PA was higher in those with sleep deficiency. These relationships were the same whether a person reported LBP or not. Thus we saw a two-way association of sleep deficiency and inadequate PA that was independent of the presence of LBP. Log-linear modeling of the co-occurrence of the three risks confirmed that the three-way effect was not statistically significant ($P = 0.71$) and that the two-way effects of LBP and inadequate PA, and LBP and sleep deficiency were not statistically significant ($P = 0.33$ and $P = 0.12$, respectively). The association of inadequate PA and sleep deficiency, however, was statistically significant ($P = 0.02$).

Factors Associated With the Three Outcomes

Bivariate Associations of LBP with Worker and Work Characteristics

Workers who reported LBP also reported significantly lower levels of supervisor and coworker support, were more likely to report harassment at work, and were less likely to use a lifting device, than those not reporting LBP (Table 3). Those who worked regular day shifts were less likely than other workers to report LBP, and a greater proportion of staff nurses than other workers reported LBP. In addition, workers with LBP reported significantly greater job demands, and correspondingly, higher levels of job strain, than workers without LBP. Workers with LBP also were significantly more likely to report lower people-oriented culture, lower safety practices, and lower ergonomic practices than those without LBP.

Bivariate Associations of PA with Worker and Work Characteristics

Respondents with inadequate PA reported significantly lower coworker support (Table 4). A greater proportion of staff nurses reported adequate PA than other workers. Respondents with inadequate PA also reported lower decision latitude on the job as well as lower people-oriented culture and, compared with those with adequate PA. Physical activity was strongly associated with worker characteristics including race/ethnicity, education, BMI, and age. Workers with inadequate PA had significantly higher BMI and were significantly older than those with adequate PA.

Bivariate Associations of Sleep Deficiency with Worker and Work Characteristics

Compared with workers reporting sufficient sleep, workers who reported sleep deficiency were significantly more likely to report low supervisor support and low coworker support, harassment at work, lower decision latitude, lower people-oriented culture, poorer

TABLE 4. Bivariate Associations of Physical Activity, Work Context, and Worker Characteristics ($N = 1518$)

Variables	Physical Activity		
	Adequate ($n = 825$; 54.3%)	**Inadequate (n = 693; 45.7%)**	***P***
Job characteristics			
Mean support from coworkers (SD)	8.2 (1.4)	7.8 (1.5)	<0.0001
Mean support from supervisor (SD)	10.8 (3.0)	10.5 (2.9)	0.06
Harassment at work, *n* (%)			0.23
No	337 (41.7)	261 (38.6)	
Yes	471 (58.3)	415 (61.4)	
Use of a lifting device, *n* (%)			0.75
Low	300 (41.5)	226 (39.8)	
Medium	206 (28.5)	172 (30.3)	
High	218 (30.0)	170 (29.9)	
Hours worked per week, *n* (%)			0.15
Less than 30 hours	205 (24.9)	135 (19.6)	
30–34	98 (11.9)	84 (12.2)	
35–39	227 (27.6)	205 (29.7)	
40–44	260 (31.6)	231 (33.4)	
Over 44 hours	33 (4.0)	35 (5.1)	
Shift, *n* (%)			0.73
Regular day	243 (29.5)	209 (30.3)	
All others	580 (70.5)	480 (69.7)	
Job title, *n* (%)			0.0001
Staff nurse	611 (74.2)	455 (66.0)	
Patient care associate	46 (5.6)	74(10.7)	
Other, please specify	166 (20.2)	160 (23.2)	
Job strain, *n* (%)			0.57
No	655 (81.8)	558 (82.9)	
Yes	146 (18.2)	115 (17.1)	
Mean demands (SD)	36.1 (5.2)	35.8 (5.2)	0.27
Mean decision latitude (SD)	72.7 (9.1)	70.5 (10.0)	<.0001
Organizational context			
Mean People-oriented Culture Scale (SD)	3.65 (0.72)	3.54 (0.78)	0.004
Mean Ergonomic Practices Scale (SD)	3.11 (0.84)	3.17 (0.82)	0.13
Mean Safety Practices Scale (SD)	3.85 (0.59)	3.81 (0.61)	0.25
Work unit			0.90
Operating room	53 (6.4%)	32 (4.6%)	
Emergency department	83 (10.1%)	71 (10.2%)	
Adult medical/surgical	309 (37.5%)	256 (36.9%)	
Adult ICU	106 (12.9%)	80 (11.5%)	
Step-down	42 (5.1%)	39 (5.6%)	
Pediatric medical/surgical	9 (1.1%)	10 (1.4%)	
Variables	Physical Activity		
	Adequate ($n = 825$; 54.3%)	Inadequate ($n = 694$; 45.7%)	*P*
Pediatric ICU/NICU	32 (3.9%)	30 (4.3%)	
Psychiatry	11 (1.3%)	9 (1.3%)	
Obstetrics/postpartum	60 (7.3%)	65 (9.4%)	
Float pool	34 (4.1%)	28 (4.0%)	
Ambulatory/consult/education	86 (10.4%)	73 (10.5%)	
Orthopedics	21 (2.6%)	19 (2.7%)	
Individual characteristics			
Gender, *n* (%)			0.36
Male	83 (10.2)	59 (8.8)	
Female	734 (89.8)	614 (91.2)	

(*Continued*)

TABLE 4. Bivariate Associations of Physical Activity, Work Context, and Worker Characteristics ($N = 1518$) (*Continued*)

	Physical Activity		
Variables	**Adequate ($n = 825$; 54.3%)**	**Inadequate (n = 693; 45.7%)**	***P***
Race/ethnicity, *n* (%)			<.0001
Hispanic	25 (3.1)	40 (6.0)	
White	697 (85.8)	477 (71.5)	
Black	56 (6.9)	98 (14.7)	
Mixed/ Other	34 (4.2)	52 (4.2)	
Education, *n* (%)			0.0007
Grade 12/GED or less	27 (3.3)	49 (7.34)	
1–3 years of college	181 (22.2)	168 (25.1)	
4-year college degree	466 (57.2)	331 (49.4)	
Any graduate school	140 (17.2)	122 (18.2)	
Mean age (SD)	40.6 (11.6)	42.0 (11.7)	0.02
Mean body mass index (SD)	25.5 (4.8)	27.4 (5.6)	<.0001

GED, general education diploma; ICU, intensive care unit; NICU, neonatal intensive care unit.

safety practices, and poorer ergonomic practices (Table 5). In addition, those reporting sleep deficiency were more likely to be staff nurses and to work 40 hours per week or more than those reporting no deficiency. They were also significantly older and had greater BMI.

Multivariable Associations with the Outcomes

The results of the final logistic regression models for the three outcomes are presented in Table 6. In multivariable analysis, variables associated with increased risk of LBP included decreased supervisor support, increased harassment at work, being a staff nurse or patient care associate, increased job demands, and younger age. The safety and ergonomic practices scales were no longer significantly associated with LBP when the other characteristics were controlled, nor were the use of lifts, hours worked, shift, or race/ethnicity. Variables that remained significantly associated with inadequate PA included low decision latitude, increased age, increased BMI, and "other" race/ethnicity compared with whites. People-oriented culture, coworker support, occupation, and education were no longer associated with PA when the other factors were controlled. Low supervisor support, harassment at work, and low ergonomic practices were significantly associated with sleep deficiency in multivariable analysis, as was not working as a staff nurse. The relationship between sleep deficiency and people-oriented culture remained statistically significant but the direction was reversed compared with that shown in bivariate analyses. The safety practices scale and coworker support were not significantly associated with sleep deficiency when other variables in the model were controlled.

DISCUSSION

Increasing attention has been given to the multiple risks workers face related to hazards on the job as well as individual health behaviors. A growing literature points to the need for integrated interventions that can effectively coordinate efforts to address multiple outcomes influencing worker health and wellness.[53,64,65] In the analyses presented here, we examined the relationships among three important wellness outcomes among hospital patient care workers: LBP, inadequate PA, and sleep deficiency. We hypothesized that these outcomes would be associated with one another, posing increased risk to health and well-being for these workers. We found that sleep deficiency, common among these workers, was significantly associated with inadequate PA. Unexpectedly, however, LBP was not associated with either PA or sleep deficiency in these cross-sectional data. We also hypothesized that the three outcomes would be associated with common characteristics of the work environment, as illustrated in Fig. 1 In multivariable analyses, we found several important themes in the nature of the relationships of these outcomes to job characteristics (ie, social relations at work, job strain, use of a lifting device, work hours and schedule, and job title) and organizational context (ie, safety practices, ergonomic practices, a people-oriented culture, and patient care work unit).

Our finding of the relationship between inadequate PA and sleep deficiency is consistent with prior reports in the literature.[66] Indeed, research has indicated that improved fitness can improve sleep.[67] The lack of association of either sleep or PA to LBP is contrary to our hypothesis and is in contrast to prior research, which has shown a relationship between sedentary behavior and increased risk for MSDs of both the low back and neck.[68] In addition, others have reported that among those already injured, physical inactivity prolongs disability and adds to the risk of further occurrence of musculoskeletal pain.[69,70] Prior research has also found that workers who sustain injuries are less able to be physically active during leisure time.[9,29,71–73] These results are also inconsistent with prior studies that have shown that adequate restorative sleep improves long-term pain.[74] For patient care workers, working nights and the associated sleep disruptions contribute to increased risk of MSDs and predict a decreased probability of returning to work.[75] The discrepancies between prior research and the findings presented here may reflect the cross-sectional nature of our data, the focus on LBP rather than other MSDs, or the specific work experiences of these patient care workers employed in acute care settings. Further research exploring the nature of these relationships, particularly for patient care workers, is warranted.

We found several cross-cutting associations with the work environment among the three outcomes in our multivariable analyses. Harassment on the job and low supervisor support were significantly associated with both LBP and sleep deficiency. The importance of these central indicators of social relationships on the job is of clear relevance to efforts to improve the work environment. Being a staff nurse or patient care associate as compared to other occupations also increased risk of LBP and sleep deficiency. In addition, core

TABLE 5. Bivariate Associations of Sleep Deficiency, Work Context, and Worker Characteristics ($N = 1516$)

	Sleep Deficiency		
Variables	**Yes ($n = 896$; 59.1%)**	**No ($n = 620$; 40.9%)**	***P***
Job characteristics			
Mean support from coworkers (SD)	7.9 (1.5)	8.1 (1.5)	0.003
Mean support from supervisor (SD)	10.4 (3.0)	11.0 (2.9)	0.0002
Harassment at work, *n* (%)			0.0008
No	319 (36.5)	274 (45.1)	
Yes	555 (63.5)	333 (54.9)	
Use of a lifting device, *n* (%)			0.92
Low	306 (40.2)	217 (41.3)	
Medium	226 (29.7)	152 (28.9)	
High	229 (30.1)	157 (29.9)	
Hours worked per week, *n* (%)			0.047
<30	183 (20.5)	156 (25.3)	
30–34	116 (13.0)	66 (10.7)	
35–39	252 (28.2)	183 (29.7)	
40–44	296 (33.2)	193 (31.3)	
>44	46 (5.2)	19 (3.1)	
Shift, *n* (%)			0.65
Regular day	271 (30.4)	181 (29.3)	
All others	621 (69.7)	437 (70.7)	
Job title, *n* (%)			0.02
Staff nurse	610 (68.3)	457 (74.1)	
Patient care associate	67 (7.5)	49 (7.9)	
Other	216 (24.2)	111 (18.0)	
Job strain, *n* (%)			0.01
0. No	695 (80.3)	516 (85.4)	
1. Yes	171 (19.8)	88 (14.6)	
Mean demands (SD)	36.2 (5.2)	35.5 (5.2)	0.008
Mean decision latitude (SD)	71.1 (10.0)	72.6 (9.1)	0.005
Organizational context			
Mean People-oriented Culture Scale (SD)	3.56 (0.75)	3.65 (0.74)	0.02
Mean Ergonomic Practices Scale (SD)	3.06 (0.83)	3.23 (0.82)	<0.0001
Mean Safety Practices Scale (SD)	3.79 (0.62)	3.90 (0.56)	0.0004
Work unit, *n* (%)			0.24
Emergency department	54 (6.0)	30 (4.8)	
Operating room	94(10.5)	58 (9.4)	
Adult medical/surgical	300 (33.5)	219 (35.3)	
Adult ICU	120 (13.4)	71 (11.5)	
Step-down	46 (5.1)	35 (5.7)	
Pediatric medical/surgical	12 (1.3)	8 (1.2)	
Pediatric ICU/NICU	37 (4.1)	26 (4.2)	
Psychiatry	9 (1.0)	11 (1.8)	
Obstetrics/postpartum	77 (8.6)	50 (8.1)	
Float pool	35 (3.9)	29 (4.7)	
Ambulatory/consult/education	98 (10.9)	59 (9.5)	
Orthopedics	14 (1.6)	24 (3.9)	
Individual characteristics			
Gender, *n* (%)			0.60
Male	81 (9.1)	61 (9.9)	
Female	806 (90.9)	553 (90.1)	

(*Continued*)

TABLE 5. Bivariate Associations of Sleep Deficiency, Work Context, and Worker Characteristics ($N = 1516$) (*Continued*)

	Sleep Deficiency		
Variables	**Yes ($n = 896$; 59.1%)**	**No ($n = 620$; 40.9%)**	***P***
Race/ethnicity, *n* (%)			0.52
Hispanic (n%)	39 (3.7)	23 (5.2)	
White (n%)	832 (79.7)	349 (78.8)	
Black (n%)	108 (10.3)	48 (10.8)	
Mixed/other (n%)	65 (6.2)	23 (5.2)	
Education, *n* (%)			0.24
Grade 12/GED or less	44 (5.0)	33 (5.4)	
1–3 years of college	225 (25.5)	131 (21.4)	
4-year college degree	456 (51.7)	344 (56.3)	
Any graduate school	157 (17.8)	103 (16.9)	
Mean age (SD)	42.0 (12.0)	40.5 (12.0)	0.02
Mean body mass index (SD)	26.6 (5.5)	25.9 (4.9)	0.01

GED, general education diploma; ICU, intensive care unit; NICU, neonatal intensive care unit.

TABLE 6. Multiple Logistic Regression Analysis of Each Outcome on Work Context and Worker Characteristics

Measure	**Low Back Pain ($N = 1228$)**			**Inadequate Physical Activity ($N = 1219$)**			**Sleep Deficiency ($N = 1225$)**		
	OR	**95% CI**	***P***	**OR**	**95% CI**	***P***	**OR**	**95% CI**	***P***
Job characteristics									
Supervisor support	0.95	0.91, 0.997	0.04	0.99	0.95, 1.04	0.78	0.94	0.89, 0.98	0.008
Harassment at work	1.72	1.34, 2.24	<0.0001	1.21	0.93, 1.57	0.16	1.38	1.07, 1.79	0.01
Job title			0.0008			0.56			0.04
Nurse vs other	1.67	1.23, 2.26		1.18	0.87, 1.60		0.69	0.50, 0.93	
Patient care association. vs other	2.20	1.25, 3.88		1.15	0.66, 2.03		0.64	0.36, 1.12	
Job demands	1.04	1.01, 1.06	0.004	1.00	0.98, 1.03	0.98	1.01	0.99, 1.00	0.36
Decision latitude	1.00	0.98, 1.01	0.43	0.98	0.97, 1.00	0.01	0.99	0.97, 1.00	0.15
Organizational context									
Ergonomic practices	0.92	0.78, 1.08	0.30	1.13	0.96, 1.33	0.15	0.83	0.71, 0.97	0.02
People-oriented culture	1.12	0.90, 1.39	0.31	0.96	0.77, 1.19	0.72	1.26	1.01, 1.56	0.04
Individual characteristics									
Race ethnicity			0.46			0.0005			0.68
Hispanic vs other	1.13	0.51, 2.51		0.90	0.40, 1.99		0.66	0.30, 1.48	
White vs other	1.19	0.70, 2.03		0.43	0.25, 0.73		0.73	0.42, 1.26	
Black vs other	0.83	0.43, 1.62		0.78	0.40, 1.51		0.70	0.36, 1.37	
Age (10 yr)	0.89	0.80, 0.99	0.03	1.15	1.03, 1.27	0.01	1.08	0.98, 1.21	0.13
Body mass index	1.00	0.98, 1.03	0.92	1.07	1.04, 1.09	<0.0001	1.02	0.998, 1.05	0.07

CI, confidence interval; OR, odds ratio.

indicators of job strain played an important role: Low decision latitude was significantly associated with inadequate PA, and high job demands increased the risk of LBP. In addition, poor ergonomic practices were associated with sleep deficiency.

Other studies have underscored importance of experiences at work as important determinants of worker health and well-being.[76–80] For example, consistent with our findings, in a study of nurses aids, Eriksen[81] found that LBP was associated not only with ergonomic exposures, but also with working night shift, lack of support from one's superior, and work culture. Others have also shown the importance of workplace abuse or harassment in workplace injuries and other worker health outcomes.[82,83] Prior studies have also reported that risk of injury on the job is associated with the pace of work and a sense of time urgency, staffing patterns and resulting workload that may be associated with them, the degree of perceived control over work, and the nature of job tasks, such as the extent to which high physical exertion is a requirement of the job.[43–48,78,80,84–88]

Similarly, prior research has found that insomnia and poor sleep quality are associated with high job demands, low influence over decisions on the job, and other work-related factors.[16,89,90] The role of supervisor support has also been demonstrated. For example, supervising managers of health care workers who are inflexible

about their employees' work–family conflicts have employees with measured sleep duration about one-half hour shorter per night, on average, than employees with more flexible managers.[41]

We also found that job decision latitude was associated with PA. This finding is consistent with prior literature demonstrating that PA is positively associated with job control and inversely related with both job demands and generalized occupational stress.[14–16,50–52,79,89–94] Nonetheless, others have reported stronger associations between the work organization and PA levels, compared to the findings we reported here. Although we found that in bivariate analyses, inadequate PA was additionally associated with lower people-oriented culture and lower coworker support, only the association with decision latitude remained significant in multivariate analyses. The nature of patient care work may indeed involve a different dynamic in these pathways, and further research may help to elucidate these pathways.

Knowledge about the co-occurrence of risks associated with exposures on the job and health behaviors is clearly relevant to understanding the patterns of risks. For example, consistent evidence underscores the pattern of increased risk of both MSDs and risk-related behaviors by socioeconomic position, with higher risk among workers in lower-status service positions and with lower levels of education.[95,96] In our findings, staff nurses and patient care assistants were at elevated risk for LBP relative to other workers, although these occupational differences did not hold in multivariate analyses for the other two outcomes.

We recognize that in general the magnitudes of the odds ratios we found to be statistically significant may not be seen as "clinically relevant." Others have observed, however, that small changes in risk at a population level have meaningful public health implications.[97,98] Indeed, while the associations observed here may have limited implications for the treatment of individual workers, they represent an opportunity for health care professionals and others to work with hospital leadership on organizational changes to optimize wellness and well-being in the workforce. The combined impact of these work factors suggests in addition that worksite interventions target multiple factors in the work environment for optimal impact.

These findings rely on a cross-sectional survey; as with any cross-sectional assessment, it is not possible to determine the temporal sequence in these relationships, and we therefore do not infer causality. Data were collected from two academic teaching hospitals in the greater Boston area; we acknowledge that findings from this setting may not be generalizable to other patient care settings. Findings reported here are based on self-reports from the survey and accordingly are subject to recall and social-desirability bias. In addition, while we controlled for workload by grouping similar units, we recognize that work on patient care units is highly variable and unknown confounders or work characteristics may impact the outcomes. Despite these limitations, it is important to note the high response rate to this survey (79%) and the use of multiple indicators of work experiences.

In conclusion, these findings point to important shared pathways in the work environment that jointly influence multiple wellness outcomes for patient care workers. In particular, low supervisor support and harassment on the job had implications for two of the three outcomes studied here. Efforts to improve the organization of work and social relations at work may contribute to improvements in worker health across multiple dimensions. Interventions intended to independently reduce LBP, sleep deficiency, or inadequate PA may benefit from synergy and coordination. These findings underscore the importance of attending to these key domains of social relationships and control over decisions at work as part of these intervention efforts. Simply put, from a public health perspective, focusing on both workplace hazards and worker health behaviors is important because it provides a more complete assessment of the risks workers face, compared to attending to one domain (eg, physical hazards on the job) to the exclusion of another (eg, health behaviors).[99] Understanding the shared influences of the work environment on multiple wellness outcomes has clear implications for interventions. There is increasing recognition that an integrated approach, which attends to workers' health behaviors as well as the potential for exposures on the job, holds promise for bolstering the impact of interventions. An integrated approach recognizes that the workplace acts as both an accelerator and a preventer of chronic disease and as a key determinant of individual health behaviors, through physical, social, organizational, and psychosocial mechanisms.[53]

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