

Physically Demanding Work and Inadequate Sleep, Pain Medication Use, and Absenteeism in Registered Nurses

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Pain and fatigue are early indicators of musculoskeletal strain. This study examined associations among eight physical demands and inadequate sleep, pain medication use, and absenteeism in 3727 working registered nurses (RNs). Among the demands, awkward head/arm postures were associated with each outcome (inadequate sleep: odds ratio [OR], 1.96; 95% confidence interval [CI], 1.41 to 2.72; pain medication: OR, 1.65; CI, 1.12 to 2.24; absenteeism: OR, 1.60; CI, 1.26 to 2.04). A dose-response relationship was present; as the number of demands increased, the likelihood of each outcome increased. Odds ratios for eight demands versus no demands were as follows: inadequate sleep (OR, 5.88; CI, 2.30 to 15.50), pain medication (OR, 3.30; CI, 1.34 to 8.11), and absenteeism (OR, 2.13; CI, 1.15 to 3.94). Adjustment using multiple logistic regression for lifestyle, demographics, and work schedule did little to alter the findings. Interventions to promote nurses' health should limit the physical demands of the work. (J Occup Environ Med. 2001;43:355-363)

Employees of nursing and personal care facilities have a musculoskeletal injury and illness rate of 4.62 per 100 workers per year, the highest among all three-digit Standardized Industrial Classification codes.¹ Nurses lift patients and heavy objects and reach for objects while using awkward postures. These activities are often combined with pushing or pulling heavy loads. As the health outcomes of physically demanding work become known, research on the potential consequences of excessive physical expectations merits serious attention.

Exposure to jobs that include physical factors such as intense, repeated, or sustained exertion; maintaining extreme and static body postures; and insufficient recovery time have been associated with increased risks of musculoskeletal disorders.² Lifting, bending, and twisting tasks required in transferring patients were found to be the primary work practices that place health care workers at risk of back injury.³ Physical demands associated with neck and shoulder pain include body placement in awkward postures that must be sustained for long periods of time.⁴ Health care examples of such work practices include holding or maintaining tension on instruments during surgical procedures and operating overhead equipment.⁵ In addition, studies cite the use and manipulation of dangerous equipment, such as lasers, monitors, ventilators, and other heavy items as risk factors for pain and fatigue.⁶⁻⁷

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Early indicators of musculoskeletal strain are likely to affect one's general health and well-being. Although physical demands might not always be sufficient to cause injury or problems severe enough to result in musculoskeletal disorder, they may be associated with pain, fatigue, and loss of productivity due to absenteeism.^{8,9} The impact of physical demands that exceed body tolerance levels can be additive, so that over time and in combination, multiple physical demands can pose an increased risk to a worker's health.^{2,10,11}

Nursing is often thought of as psychologically demanding work, yet the physical demands of nursing practice tend to be overlooked. This investigation aims to fill a gap in knowledge of the range, distribution, and potential consequences of physical demands among one of the largest group of health care providers, registered nurses (RNs), in the United States. This study begins by describing a range of physical demands reported by nurses working in a variety of specialties, jobs, and settings. It then examines the relationship of physical demands (individually and in combination) to pain medication use, inadequate sleep, and absenteeism.

Methods

Sample and Data Collection

Analyses were conducted using cross-sectional data collected from the Nurses Worklife and Health Study, Part I, collected in fall 1994 and winter 1995. Balanced stratified sampling was used to maximize the chance of selecting a sample representative of the US RN population. The sampling strategy combined probability sampling with model-based sampling and has been described in detail.¹² In brief, a simple random sample of 600 nurses was selected from each of 10 US states, for a total of 6000.

Data were collected with an anonymous mailed survey. Those in the sample received up to six contacts,

including three copies of the questionnaire. Seventy-eight percent of the 5706 nurses eligible to participate (ie, living, with valid addresses) responded with completed questionnaires ($n = 4438$), forming the study database. An additional 5% declined to participate. Only those currently employed in nursing ($n = 3727$) were included in this analysis.

The overall sample characteristics closely resembled US RN samples,¹³ though currently working nurses tended to be younger on average when compared with all RNs. The sample used in this analysis was 95% female with a mean age of 42.7 (SD, 10.1) years. Forty-seven percent were college graduates, 73% were married, 15% had children younger than 4 years old, and 93% were Caucasian.

Variables Measured

Three variables were examined in relation to physical demands because of their association with musculoskeletal problems and their mention as early indicators in the development and management of such problems.^{8,14} Inadequate sleep was dichotomous and was defined as positive if respondents indicated that they daily or always did not get as much sleep as they thought they should. Respondents were considered positive for pain medication use when they indicated they had used over-the-counter pain medications (eg, Tylenol or Advil) anytime during the previous month. Absenteeism was measured as positive if the respondent reported missing any workdays in the previous month because of illness.

Eight physical demands were assessed: awkward positioning of the head or arms, awkward positioning of the body (other than head or arms), high degree of physical effort, moving or lifting very heavy loads, a lot of repetitive work, high activity level, use of dangerous equipment, and working very fast. A modified Job Content Questionnaire served as the basis to assess job demands.¹⁵

The single physical demand item (requires lots of physical effort) was expanded to include four additional items: often working for long periods with head/arms in physically awkward positions, often working for long periods with the body in physically awkward positions, rapid and continuous physical activity, and often moving or lifting very heavy loads.

When the modified Job Content Questionnaire was examined using principal components analysis with varimax rotation, the underlying dimensions extracted continued to incorporate the hypothesized properties of Karasek's theoretical model (control, psychological demands, and physical demands) when the factor extraction was restricted to three factors. All of the physical demand items loaded on the same factor, with lambdas ranging from 0.76 to 0.78. When the factor analysis was extended (eigenvalues ≥ 1), two additional items from the psychological demand dimension (requires working very fast and involves a lot of repetitive work: lambdas = 0.61 and 0.44) loaded on the expanded "physical demand" factor. Therefore, these items were also included in the analysis as physical demands. An eighth item, use of dangerous equipment, was added on the basis of literature supporting its inclusion as a physical demand in critical care and other nursing positions.^{6,16}

Response options for the physical demand items ranged from 1 (strongly disagree) to 4 (strongly agree) and were recoded such that an exposure was defined as a response of either "strongly agree" or "agree" to these items. For the eight items, a good internal consistency was achieved ($\alpha = 0.86$).

To describe the physical demands of jobs across the nursing profession, the proportion of nurses reporting the eight demands were compared among nursing specialties (eg, critical care), types of position (eg, staff/general duty, nurse manager), and

location of practice (eg, hospital, nursing home).

Because the impact of physical demands on nurses may be explained or moderated by personal behavior (fitness and smoking) and psychological well-being, we included measures of these factors in the logistic regression analysis as control variables. Fitness was defined as positive if respondents reported exercising vigorously on most days or always/daily (21.3% of nurses).

Cigarette smoking has been shown to affect physical endurance by decreasing lung volume and capacity and by interfering with oxygen exchange. Cigarette use was defined as positive if respondents reported smoking 10 or more cigarettes/day during the previous year (reported by 14.7% of respondents). The Center for Epidemiologic Studies-Depression scale (CES-D) was used as a measure of psychological well-being, because depressive symptoms can lead to exhaustion and result in diminished energy levels.¹⁷ The CES-D has been shown to be a reliable measure of depressive symptoms, with $\alpha = 0.85$ to 0.90 ¹⁸ ($\alpha = 0.91$, for this study). The cutoff score of 16 (18% of respondents) was used to indicate the presence of symptoms suggestive of depression.¹⁸

Because work schedules that deviate from the traditional sleep-activity cycle can have medical, physiological, and psychosocial consequences,¹⁹ work-schedule characteristics (overtime, shift length, shift, and weekends) also were included as control variables, dichotomized as follows: nurses were categorized as working overtime if they did so four or more times per month (38.4% of respondents). Shift length was categorized as positive if it averaged >8 hours per day (36.3% of respondents), shift was positive if respondent worked any other shift than the day shift (38.9%), and weekends if the respondent worked an average of 1 or more weekends per month (61.7%).

Demographic characteristics also may be related to physical demands

and the outcomes of interest in this study. Those included in this analysis were age, gender, ethnicity, marital status, and whether respondents had children under age 4. Women are at higher risk of experiencing symptoms related to musculoskeletal disorders, but it is not clear if this is a biological difference or if gender is a surrogate for job title or non-occupational expectations that lead to diminished recovery times.²⁰ As nurses age, they may be more vulnerable to health consequences from physically demanding jobs because of increased exposure time.²¹ There also may be ethnic differences in the level of physical demands as a result of differing economic and work opportunities.

Data Analysis

Descriptive analyses were first conducted using the Statistical Package for the Social Sciences (SPSS) to identify the proportion of nurses in different specialties, type of nursing position, and locations of practice reporting each of the eight physical demands. Comparisons were made within specialty by combining emergency, adult critical care, and operating room/post-anesthesia care unit (OR/PACU) nurses into a group, and chi-squared tests of significance were conducted on the level of physical demands between this group versus all other specialties. Similar comparisons were done for type of position (staff/general duty/private duty vs other positions) and for location of practice (hospital vs other locations).

Next, estimates of the odds of each outcome (inadequate sleep, pain medication use, and absenteeism) in relation to the eight individual physical demand items were generated in SPSS using logistic regression. To ensure adequate stability of the model estimates, it was necessary to limit the covariates adjusted for in the individual physical demand models. Therefore these were adjusted for age, gender, and frequency of exercise, whereas the summed phys-

ical demand models described below included the full set of covariates.

Finally, because combinations of physical demands have been shown to increase the likelihood of adverse consequences, hierarchical logistic regression models were generated summing the physical demands for each respondent. These models were used to estimate the relation of the number of physical demands (range, 1 to 8) to the likelihood of inadequate sleep, pain medication use, and absenteeism. Because we entered covariates hierarchically (personal lifestyle covariates, demographics, work schedule) we were able to assess the potential explanatory role of each set of covariates on the relation of physical demands to inadequate sleep, pain medication use, and absenteeism by examining changes in the odd ratios across the hierarchical models as each additional group of covariates was added. Nurses who indicated that their jobs did not expose them to any of the eight physical demand items were defined as the reference group ($n = 215$).

For the hierarchical models summing the number of physical demands, model 1 contained the crude odds ratios (ORs) for number of physical demands on the job in relation to each outcome (sleep, pain medication use, and absenteeism, respectively). Model 2 included adjustment for personal lifestyle behaviors (smoking, frequency of exercise, and depressive symptoms), with the reference categories being non-smoking, frequency of exercise (most days or always/daily), and CES-D scores <16 , respectively. Model 3 included all covariates from model 2, *plus* demographics: age (continuous), ethnicity, marital status, gender, and having children under age 4. Reference categories for the demographic variables were Caucasian ethnicity, married, female, and no children under age 4. Model 4 included all covariates from model 3 *plus* adjustment for work-schedule characteristics: overtime, shift length, shift, and weekends, with the reference category

TABLE 1

Physical Demands by Specialty Reported by Currently Working Registered Nurses, 1994 to 1995*

	<i>n</i>	Head Awkward (%)	Body Awkward (%)	Physical Effort (%)	Heavy Lifting (%)	Repetitive Work (%)	Rapid Activity (%)	Dangerous Equipment (%)	Working Fast (%)
Adult critical care	416	17.8	19.4	78.1	68.6	69.5	58.8	32.1	84.0
Pediatric critical care	107	15.9	18.7	42.1	25.2	69.2	33.6	27.6	75.5
Emergency	175	19.4	20.0	81.0	57.1	65.1	74.3	41.4	95.4
OR/PACU*	354	22.6	22.9	63.3	53.4	76.3	53.0	50.3	94.8
Medical/surgical	598	9.7	11.0	71.8	56.8	73.4	52.9	23.6	80.4
Home/community/public health	441	8.4	8.8	24.9	12.5	61.6	14.8	11.2	49.4
Gerontology	282	7.1	6.7	52.8	32.5	78.1	20.0	11.9	63.1
Oncology	97	11.3	14.6	62.9	45.4	66.0	51.5	28.1	80.8
Psychiatry	180	6.1	5.6	29.4	15.6	53.3	20.6	7.1	56.7
Rehab	76	11.8	13.0	55.8	41.6	68.8	43.4	14.9	68.3
Administration	197	9.6	5.1	23.5	10.2	55.8	10.2	12.0	70.3
General pediatrics	123	12.2	14.6	43.4	25.2	65.9	40.2	13.1	76.1
General practice/school/occupational	180	5.9	5.9	26.1	7.2	70.2	30.2	12.6	60.1
Women's health	219	14.2	17.7	51.6	24.5	61.4	42.5	34.5	76.2
Other/non-clinical	187	10.7	10.7	49.7	30.6	65.8	36.8	24.0	69.4
Total	3,632	12.3	13.0	53.2	37.7	67.9	41.1	23.1	72.7

* OR/PACU, operating room/post-anesthesia care unit.

ries for these items defined as <4 times/month, $\leq$ 8-hour shift length, day shift, and no weekends.

Results

Distribution and Range of Physical Demands Among Nurses

Nurses working in the OR/PACU comprised the highest proportion of respondents indicating that they often worked with their head or body in awkward postures (23% for both head and body) (Table 1). Emergency and critical care nurses also reported working in awkward body postures in high proportions (19% to 20%). In addition, critical care, emergency, and medical/surgical nurses were most likely to say that their job often required heavy lifting and physical effort. Use of dangerous equipment was reported by half of all OR/PACU nurses, compared with 23% of all nurses combined. About two-thirds of all nurses reported having a lot of repetition in their jobs, with almost no variability by specialty. To compare the nurses by specialty, nurses in emergency, adult critical care, and OR/PACU were combined and compared with all

other nurses. Other than for repetition, all physical demands were significantly higher for the emergency/adult critical care/OR/PACU group versus all other nurses (χ^2 , 1 df: $P < 0.0001$).

For nursing positions, staff and private duty nurses reported some similar demands, including the largest proportions reporting heavy lifting and repetitious work, though there were two distinctions between these two groups (Table 2a). The proportion of private duty nurses reporting awkward postures was three times that for staff nurses (35% to 45% vs 15% to 16%). In contrast, twice the proportion of staff nurses said their job required a high work pace, with 53% reporting rapid and continuous physical activity versus 25% for private duty nurses, and 78% of hospital nurses reporting working fast versus 25% of private duty nurses. Because there were only 20 private duty nurses, these results must be interpreted with caution. In addition to staff and private duty nurses, clinical specialists were more likely to indicate that they were often required to work in awkward postures. When examining general staff and private duty nurses combined

versus all other nursing positions, the general/staff/private duty group reported proportions double that for all others for each of the eight physical demands (χ^2 , 1 df: $P < 0.0001$ for all demands).

For location of practice, a significantly higher proportion of hospital nurses versus non-hospital nurses reported all physical demands (χ^2 , 1 df: $P < 0.0001$) except repetition, for which there was no difference. Hospital versus non-hospital nurses agreed that they had very active jobs (51% vs 25%) and jobs that often required awkward body postures (16% vs 8%), using dangerous equipment (29% vs 13%), and heavy lifting (51% vs 16%) (data not shown). Heavy lifting was also prevalent in long-term care settings (31.5%). Only nurses based in schools of nursing reported a lower rate of repetition in tasks (39%) (Table 2b).

Potential Consequences of Physical Demands

Inadequate sleep. Of the nurses surveyed, 7% indicated that they daily or always got less sleep than they thought they should. Nurses who reported inadequate sleep were

TABLE 2

Physical Demands by Nursing Position and Location of Practice Reported by Currently Working Registered Nurses, 1994 to 1995

	<i>n</i>	Head Awkward (%)	Body Awkward (%)	Physical Effort (%)	Heavy Lifting (%)	Repetitive Work (%)	Rapid Activity (%)	Dangerous Equipment (%)	Working Fast (%)
a. Nursing position									
Staff/general duty	2,125	14.7	16.1	66.6	49.8	72.9	52.8	27.1	78.2
Private duty	20	35.0	45.0	75.0	60.0	85.0	25.0	11.1	25.0
Head nurse/supervisor	475	8.6	8.6	51.4	33.5	66.6	37.6	22.1	70.3
Other nursing administration	203	6.4	3.9	24.6	13.3	49.8	12.4	11.2	65.7
Clinical specialist	162	12.3	13.6	31.7	19.8	63.0	27.2	25.9	69.6
Educator/researcher	199	5.0	5.5	25.3	13.6	49.5	14.6	12.4	56.1
Other	425	9.0	8.2	23.8	10.4	62.8	18.9	14.5	62.7
Total	3,609	12.3	13.0	53.4	37.7	67.9	41.1	23.1	72.7
b. Location of practice									
Hospital, agency employee	129	13.8	19.2	58.5	49.2	69.8	44.2	33.9	76.0
Hospital	2,036	14.7	15.7	66.9	51.6	68.0	51.7	28.9	80.6
Long-term care/nursing home	294	7.1	6.5	53.4	31.5	78.6	38.6	12.8	63.6
HMO/office	251	9.2	8.8	29.5	8.8	70.1	34.7	13.4	74.5
Home health	279	7.9	9.3	22.2	11.8	62.7	13.0	10.8	48.0
School of nursing	77	3.9	3.9	27.3	5.2	39.0	10.4	10.5	45.5
Other school/government/community	245	6.9	6.9	24.8	10.6	68.1	15.0	7.6	53.1
Other	225	12.8	11.9	31.6	19.8	65.9	25.7	23.0	70.7
Total	3,536	12.2	13.0	53.2	37.8	67.9	41.0	23.0	72.7

significantly older (mean age, 43) than those who did not (mean age, 40). When the eight physical demands were examined separately, each of the demands was significantly associated with inadequate sleep (Table 3). Nurses in jobs requiring awkward postures of the head/arms (OR, 1.91; confidence interval [CI], 1.39 to 2.64), moving or lifting very heavy loads (OR, 1.91; CI, 1.48 to 2.47), or rapid and continuous activity (OR, 1.89; CI, 1.46 to 2.44) were twice as likely as other nurses to report inadequate sleep. After adjustment, the association of physical demands to inadequate sleep was unchanged.

As shown in Table 4, as the number of physical demands increased, the likelihood of inadequate sleep increased as well. Overall, nurses with physically demanding jobs were two to six times more likely to report inadequate sleep compared with those without such demands. This association was still present after adjustment for all control variables, though it was slightly diminished after the work-schedule variables were controlled. Thus, lifestyle fac-

tors, demographics, having children under age 4, and work-schedule characteristics did not explain the association, though work schedule did diminish the odds somewhat.

Pain medication use. Eighty-eight percent of the nurses surveyed indicated that they had used a pain medication in the previous month. Several sociodemographic differences were evident. Non-white nurses were significantly less likely to use pain medications (OR, 0.68; CI, 0.49 to 0.99), as were male nurses (OR, 0.55; CI, 0.37 to 0.82), whereas married nurses were more likely to use medications. The mean age for users was 2 years younger than for non-users (data not shown).

Several of the eight physical demand items were significantly related to pain medication use in the previous month (Table 3). Nurses having jobs that often required working in awkward postures were over 50% more likely to use pain medications, compared with those having jobs that did not (head/arms awkward: OR, 1.59; CI, 1.12 to 2.27; body awkward: OR, 1.55; CI, 1.10 to 2.18). Nurses in jobs requiring lots of

physical effort were also significantly more likely to use pain medications (OR, 1.54; CI, 1.26 to 1.88). Analysis of the summed physical demands in relation to pain medication use showed that nurses were more likely to use medications as the number of physical factors they were exposed to increased. ORs were largely unchanged in magnitude after adjustment for the covariates (Table 5).

Absenteeism. Almost one-fifth (17%) of the sample reported using at least 1 sick day because of illness in the previous month. The only demographic variable with differences in absenteeism was age, with nurses who took more sick days in the previous month being younger (mean age, 41) than those who took fewer days (mean age, 43).

Of the eight physical demands, nurses in jobs with their head/arms in awkward postures were significantly more likely to be absent than those without such demands OR, 1.60; CI, 1.26 to 2.04 (Table 3). Furthermore, nurses in jobs that often required awkward postures were twice as likely to miss 4 or more days in the previous month compared with

TABLE 3

Frequency and Association of Individual Physical Demands With Inadequate Sleep, Pain Medication Use, and Absenteeism*

Current Job Situation	Inadequate Sleep			Pain Medication			Absenteeism		
	%	Crd OR/CI	Adj OR/CI	%	Crd OR/CI	Adj OR/CI	%	Crd OR/CI	Adj OR/CI
Head awkward									
No	6.8	1.00		87.4	1.00		16.3	1.00	
Yes	12.3	1.91/1.39–2.64	1.96/1.42–2.72	91.7	1.59/1.12–2.27	1.58/1.10–2.28	23.8	1.60/1.26–2.04	1.56/1.22–2.00
Body awkward									
No	6.5	1.00		87.4	1.00		16.6	1.00	
Yes	11.3	1.83/1.33–2.52	1.81/1.30–2.50	91.5	1.55/1.10–2.18	1.48/1.04–2.10	21.6	1.38/1.09–1.76	1.34/1.04–1.71
Physical effort									
No	5.8	1.00		85.5	1.00		15.4	1.00	
Yes	9.0	1.60/1.23–2.09	1.52/1.16–2.00	90.1	1.54/1.26–1.88	1.43/1.16–1.76	18.9	1.28/1.08–1.53	1.24/1.04–1.49
Heavy lifting									
No	5.8	1.00		87.0	1.00		15.6	1.00	
Yes	10.5	1.91/1.48–2.47	1.88/1.45–2.45	89.4	1.26/1.02–1.55	1.21/0.97–1.50	20.1	1.36/1.14–1.62	1.30/1.08–1.56
Repetitive work									
No	5.4	1.00		87.2	1.00		15.3	1.00	
Yes	8.6	1.63/1.21–2.20	1.61/1.19–2.19	88.3	1.10/0.89–1.36	1.08/0.87–1.34	18.2	1.23/1.01–1.48	1.22/1.00–1.48
Rapid activity									
No	5.7	1.00		87.1	1.00		16.2	1.00	
Yes	10.2	1.89/1.46–2.44	1.80/1.38–2.34	89.1	1.21/0.98–1.49	1.14/0.92–1.41	18.9	1.21/1.01–1.44	1.15/0.96–1.38
Dangerous equipment									
No	6.8	1.00		88.1	1.00		16.5	1.00	
Yes	10.4	1.58/1.20–2.09	1.53/1.15–2.03	88.5	1.03/0.81–1.32	1.02/0.79–1.32	19.1	1.19/0.97–1.46	1.14/0.93–1.41
Working fast									
No	5.0	1.00		86.8	1.00		16.8	1.00	
Yes	8.4	1.74/1.25–2.42	1.63/1.16–2.28	88.4	1.16/0.93–1.44	1.10/0.88–1.38	17.4	1.04/0.85–1.26	0.96/0.78–1.18

* Models are adjusted for age, gender, and frequency of exercise. Crd OR, crude odds ratio; Adj OR, adjusted odds ratio; CI, 95% confidence interval.

TABLE 4

OR for Inadequate Sleep by the Number of Physical Demands Exposed to by Nurses*

No. of Physical Demands	n	Model 1		Model 2		Model 3		Model 4	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
0	215	1.00		1.00		1.00		1.00	
1	534	1.72	0.70–4.26	0.70	0.69–4.22	1.63	0.66–4.07	1.65	0.66–4.13
2	540	1.54	0.62–3.85	1.45	0.58–3.61	1.37	0.55–3.44	1.35	0.54–3.40
3	385	2.34	0.94–5.82	2.22	0.89–5.54	2.02	0.81–5.07	1.91	0.76–4.81
4	442	3.78	1.58–9.02	3.50	1.46–8.39	3.17	1.32–7.62	2.90	1.20–7.04
5	414	3.39	1.40–8.18	3.02	1.25–7.32	2.60	1.07–6.38	2.30	0.93–5.68
6	220	4.96	2.01–12.23	4.23	1.71–10.51	3.72	1.49–9.29	3.29	1.31–8.30
7	107	5.51	2.07–4.65	4.60	1.72–12.32	4.03	1.49–10.85	3.40	1.25–9.26
8	110	5.88	2.30–15.50	4.80	1.80–12.78	4.24	1.58–11.36	3.74	1.38–10.11
Total	2,967								

* OR, odds ratio; CI, confidence interval. Model 1: Crude OR and 95% CIs. Model 2: Adjustment for personal lifestyle factors (smoking, depression, and frequency of exercise). Model 3: Model 2 plus demographic (age, ethnicity, marital status, gender, and having children <age four). Model 4: Model 3 plus work schedule (overtime, shift length, shift, and weekends).

nurses in jobs without awkward postures (head/arms: OR, 2.02; CI, 1.16 to 3.55; body: OR, 2.41; CI, 1.22 to 4.06) (data not shown).

For the summed physical demands, crude ORs showed increased absenteeism with increased numbers

of physical demands. The adjusted models partly attenuated the association. The control variables that appeared to reduce the original association most were the model 2 covariates: smoking, depressive symptoms, and frequency of exercise

(Table 6). Adjustment for demographics and work schedule did not seem to alter the findings any further.

Discussion

This study examined a comprehensive array of physical demands,

TABLE 5

OR for Pain Medication Use by the Number of Physical Demands Exposed to by Nurses*

No. of Physical Demands	n	Model 1		Model 2		Model 3		Model 4	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
0	216	1.00		1.00		1.00		1.00	
1	536	1.22	0.78–1.89	1.20	0.78–1.87	1.15	0.73–1.80	1.15	0.74–1.10
2	546	1.31	0.84–2.05	1.29	0.82–2.01	1.25	0.79–1.96	1.25	0.79–1.96
3	384	1.69	1.03–2.78	1.66	1.00–2.73	1.52	0.92–2.51	1.50	0.91–2.50
4	448	1.62	1.00–2.61	1.58	0.98–2.58	1.54	0.95–2.50	1.53	0.94–2.50
5	414	1.99	1.20–3.30	1.92	1.15–3.18	1.81	1.08–3.02	1.78	1.05–3.02
6	221	1.43	0.83–2.48	1.37	0.79–2.38	1.31	0.75–2.30	1.27	0.72–2.25
7	109	1.88	0.89–3.97	1.78	0.84–3.78	1.69	1.79–3.59	1.61	0.75–3.45
8	110	3.30	1.34–8.11	3.10	1.26–7.64	2.89	1.16–7.17	2.74	1.10–6.85
Total	2,984								

* OR, odds ratio; CI, confidence interval. Model 1: Crude OR and 95% CIs. Model 2: Adjustment for personal lifestyle factors (smoking, depression, and frequency of exercise). Model 3: Model 2 plus demographics (age, ethnicity, marital status, gender, and having children <age four). Model 4: Model 3 plus work schedule (overtime, shift length, shift, and weekends).

TABLE 6

OR for Absenteeism by the Number of Physical Demands Exposed to by Nurses*

No. of Physical Demands	n	Model 1		Model 2		Model 3		Model 4	
		OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
0	214	1.00		1.00		1.00		1.00	
1	529	1.48	0.92–2.39	1.40	0.87–2.27	1.41	0.87–2.28	1.37	0.85–2.24
2	543	1.31	0.81–2.11	1.22	0.75–1.98	1.21	0.74–1.98	1.20	0.74–1.96
3	382	1.69	1.03–2.76	1.58	0.96–2.60	1.55	0.94–2.56	1.54	0.93–2.55
4	439	1.38	0.84–2.26	1.29	0.79–2.12	1.19	0.72–1.97	1.18	0.71–1.97
5	408	1.77	1.09–2.88	1.58	0.97–2.58	1.42	0.86–2.33	1.42	0.85–2.36
6	218	2.03	1.20–3.45	1.76	1.03–3.01	1.58	0.92–2.71	1.59	0.91–2.75
7	109	2.70	1.49–4.90	2.30	1.26–4.22	2.16	1.17–3.98	2.23	1.21–4.20
8	108	2.13	1.15–3.94	1.76	0.94–3.30	1.63	0.87–3.08	1.66	0.87–3.17
Total	2,984								

* OR, odds ratio; CI, confidence interval. Model 1: Crude OR and 95% CIs. Model 2: Adjustment for personal lifestyle factors (smoking, depression, and frequency of exercise). Model 3: Model 2 plus demographics (age, ethnicity, marital status, gender, and having children <age four). Model 4: Model 3 plus work schedule (overtime, shift length, shift, and weekends).

such as lifting and awkward postures, that occurred in a large sample of RNs working in many locations, positions, and specialties. The descriptive analysis of physical demands found that nurses practicing in hospitals; in staff/general/private duty positions; and in emergency, critical care, or OR/PACU specialties reported the highest level of physical demands present in their work.

As the number of self-reported physical demands increased, so did the likelihood of inadequate sleep, pain medication use, and absenteeism. Although studies have shown physical demands to be associated with occupational injuries, less is known about other manifestations of

such bodily exertion (eg, inadequate sleep, medication use, and absenteeism) that could portend the occurrence of a musculoskeletal problem. These findings could serve to target primary preventive interventions by identifying groups with altered health as a result of physical demands.

All physical demands included in the study were significantly associated with inadequate sleep. The association between multiple physical demands and inadequate sleep was somewhat diminished after adjustment for work schedule, suggesting that difficult work schedules could increase the likelihood of inadequate sleep because of the additional demands of such jobs.

Difficult work schedules, such as those with longer hours and those requiring weekends, overtime, and/or shift rotation,²² have been associated with adverse physical effects and can lead to decreased recovery time for nurses who may not be getting adequate sleep.²³ Working longer hours, such as 12-hour shifts, can result in fatigue due to extended exposure to physical demands combined with insufficient recovery time.²⁴ Nurses on schedules requiring frequent shift rotation and long hours may be at higher risk for injuries.²⁵

Among the eight physical demands, maintaining awkward head and body postures was significantly associated with an increased likelihood of inadequate sleep, pain med-

ication use, and absenteeism. This finding is supported by a study of four nursing homes in the Netherlands, where working in awkward postures was reported by 47% of this large sample of nurses and was associated with musculoskeletal complaints.²⁶ Standing in bent and twisted postures was related to shoulder and neck pain in home care personnel.⁴ Back pain was exacerbated by static postures.²⁷ Heavy lifting, another of the physical demands, has also been associated with back injury in nurses.²⁷

The association between absenteeism and physical effort was diminished, though still present, after adjustment for depressive symptoms, smoking, and frequency of exercise. Because absenteeism usually occurs for health reasons and these three variables among the covariates were most related to health status, this finding was not unexpected. Individuals who did little exercise, smoked, and/or had depressive symptoms¹⁷ may not tolerate physical demands as well as those without these risk factors for many chronic health problems.²⁸ Conversely, research has indicated that those who are more physically fit were less adversely affected by physical demands.²⁸ Similarly, nurses without depressive symptoms may be less likely to be absent from work and less affected by physical demands of the work.²⁹

Limitations of the study include the use of self-reports to collect all data. An examination of the validity of self-reported physical demands has shown that data are affected by length of recall.³⁰ Respondents also may overestimate the extent of their physical demands at work,³¹ leading to misclassification of exposure, which could bias the findings. Differential and non-differential misclassification of outcomes is also possible. Nonetheless, self-report data have been found to be acceptable for classifying study respondents into risk groups in relation to adverse health outcomes.^{32,33} In addition, all data were cross-sectional,

which limited our ability to identify the directionality of any of the interrelationships described above.

Only 6% ($n = 215$) of nurses indicated that they were not exposed to any of the physical demands. It is possible for these respondents to have experienced some of the demands but not often enough to agree with the stated items. For example, the heavy lifting and two posture items were required to occur often to be counted as positive for these demands. Other demands were required to occur "a lot." Although this may have led to some misclassification errors, any bias, if introduced, should be toward the null.

We did not measure musculoskeletal pain/disorders in this, the original Nurses Worklife and Health Study. Instead, some potential early markers of pain and injury, namely inadequate sleep, pain medication use, and absenteeism, were examined. Recognizing that these outcomes also may be associated with other types of adverse health effects, such as headaches, we found it noteworthy that these three outcomes were all associated with the work-related risk factors for musculoskeletal pain and disorders measured by the eight physical demands included in our survey.

In conclusion, the data reported suggest that nurses with jobs containing more physical demands had a significantly greater likelihood of inadequate sleep, with work schedule explaining some of the findings. Pain medication use and absenteeism were also associated with physical demands. These findings suggest areas of job design that may be modifiable, such as scheduling and reducing excessive physical demands. Nurses working in emergency, critical care, and OR areas reported the highest proportions of physical demands, along with hospital-based nurses and staff nurses, who were also largely hospital-based. Evaluation of interventions that limit the occurrence of awkward postures also

may be indicated, based on this report and similar findings cited above. Future research will examine the impact of physical demands on neck, shoulder, and back problems.

Acknowledgment

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Harper's Index

Average number of brand-name items requested per shopping trip by a US child between the ages of 4 and 12: 14.

Minimum annual "baby bonus" that the government of Singapore pays couples who have a second child: \$500.

Maximum number of people who may legally congregate outdoors in Burma without government authorization: 5.

Percentage change since 1987 in the jellyfish population off the Louisiana coast: +400.

Chances that a young black man living in Los Angeles' Watts neighborhood is unemployed or in prison: 70%.

Percentage change in the number of Roman Catholic priests ordained annually in Brooklyn and Queens since 1980: -92.

Year in which Colin Powell complained: "I'm running out of villains. I'm down to Castro and Kim Il Sung": 1991.

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