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Violence at the workplace increases the risk of musculoskeletal pain among nursing home workers

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Abstract

Background—Despite the high prevalences of workplace physical violence and musculoskeletal symptoms among health care workers, very few studies have examined the relationship between these two phenomena.

Methods—We surveyed 920 clinical nursing home workers by questionnaire regarding musculoskeletal pain in the low back, shoulders, wrists or hands, and knees. Information was also collected on exposure to physical assaults at work during the preceding 3 months, other workplace safety features, physical workload and psychosocial work environment. Log-binomial regression was used to estimate the prevalence ratios (PR) with 95% CIs.

Results—Almost one-half of respondents reported being assaulted at least once during the preceding 3 months by a resident or resident's visitor. The prevalence of low back pain increased from 40% among non-assaulted workers to 70% among those assaulted three or more times. The highest risk was found for widespread pain (three or more areas), with an adjusted PR of 2.7 (95% CI 1.8 to 3.9) for workers assaulted three or more times. Good workplace safety buffered the effects, so that violence increased the risk of most pains considerably less in a work environment perceived to be safe.

Conclusions—To our knowledge, this is the first study to show a dose–response association between physical assaults and musculoskeletal pain in a health care setting where violence is a frequent occurrence. This emphasises the need to address violence as a workplace hazard through practical measures for prevention as well as in future aetiological research on musculoskeletal disorders.

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Introduction

Musculoskeletal symptoms are very common among workers in the healthcare industry.^{1–3} In a large Norwegian study, nine out of 10 nurse aides had experienced pain during the preceding 2 weeks, most often in the low back.⁴ Approximately every fifth nursing home worker is absent from work every year because of neck and shoulder complaints.² Several work-related risk factors have been identified in relation to musculoskeletal pain in this sector, especially frequent lifting, and twisting and bending related to patient transfer. Also psychosocial risk factors are frequently reported, such as low social support at work, low job satisfaction and night shift work.¹³⁵

Another important stressor in this sector is workplace violence. Healthcare workers experience violence at work frequently, and considerably more often than in other sectors. Employers in the State of California reported that the annual rate of non-fatal assaults was 465 per 100 000 hospital workers, much higher than the rate of 83 for all workers.⁶ Almost half of all non-fatal injuries from violent acts against US workers occur in the healthcare sector,⁷ and the most assaulted worker in the USA is the aide working in a nursing home.⁸ Official reports, however, are known to underestimate the frequency of assaults, and the true prevalence of workplace violence is still unknown.⁹¹⁰ Based on self-reports, up to 70% of nursing home staff are assaulted at least once a month.^{11–13} The increasing rates of workplace violence have induced a public discussion about an ‘epidemic’ of violence against healthcare workers.⁶¹⁴

Thus far, epidemiological studies on the health consequences of workplace violence are scarce and mainly focused on mental health outcomes.¹⁵¹⁶ Psychological reactions such as anger, sadness, frustration, irritability, fear, self-blame and depression are frequently experienced by assaulted workers.¹¹¹⁷¹⁸ Regarding physical symptoms, fatigue, sleep problems and headache are most often reported. Very few studies have examined whether musculoskeletal symptoms are also more prevalent among assaulted workers and which anatomical areas are most affected. The causal link between workplace violence and musculoskeletal pain is biologically highly plausible; in addition to scratches and bruises that cause pain, violence-induced stress may delay tissue healing, as well as alter adaptation mechanisms by affecting individual pain threshold and tolerance.¹⁹²⁰

The aim of this epidemiological study was to investigate the association between physical assaults and musculoskeletal pain among nursing home workers, and whether good workplace safety modified (buffered) the association.

Methods

Study population and study design

This cross-sectional study is based on a large, on-going multi-centre research project examining the effectiveness of worksite programs that combine occupational safety and health interventions with health promotion (The Center for the Promotion of Health in the New England Workplace). The study was approved by the Institutional Review Board of the University of Massachusetts Lowell and began in May 2006. The study population consisted

of all permanent full- and part-time clinical employees in 12 nursing homes within a single company, located in Maryland and Maine, USA. All clinical staff members were eligible to participate in the study; office, laundry, food service and janitorial staff were not eligible, nor were clinical staff from temporary agencies.

The self-administered baseline questionnaire was distributed and collected by members of the study team between May 2006 and November 2007, prior to initiation of a 'no-lift' program. For those workers who could not be met in person, such as third-shift and weekend employees, a pre-stamped, addressed return envelope was provided. Compensation of US \$20 was offered in exchange for each questionnaire that was completed and returned with an informed consent form.

The questionnaire collected information on demographic characteristics (eg, age, gender, length of education, ethnic origin), working conditions, current and recent health endpoints (physician-diagnosed diabetes, hypertension, spinal disorder or elevated cholesterol), health locus of control and self-efficacy, and health behaviours. Most questions were based on previously published and validated items and scales.

Musculoskeletal symptoms

The outcome of this study was self-reported musculoskeletal symptoms. Workers were asked whether they had experienced pain or aching during the preceding 3 months in the low back, shoulders, wrists or hands, and knees (1=yes; 0=no). The particular body areas were indicated on the questionnaire by a body map diagram. The pain information from the four areas was summed (score ranging from 0 to 4). Those with the sum index of 3 or 4 were categorised as having widespread pain (reference category: 0–2 pain areas). In addition, severity of low back pain (only) was obtained with a separate item using five categories from 'no pain' to 'extreme pain'. For the dichotomous variable, 'moderate' and 'extreme' pain were combined and compared to 'no pain' or 'mild pain'.

Working conditions

Information about physical assaults at the workplace was elicited with the following question: 'In the past 3 months, have you been hit, kicked, grabbed, shoved, pushed or scratched by a patient, patient's visitor or family member while you were at work?'. The response categories were: no, not at all; 1 time; 2 times; 3 times; more than 3 times. After review of the response distribution, a three-class variable was formed: 0=no; 1=1–2 times; 2=3 or more times.

The questionnaire assessed a number of other work characteristics that were considered relevant for musculoskeletal symptoms. Psychosocial factors were psychological job demands, job control, co-worker support and supervisor support (all two items each, selected from the Job Content Questionnaire (JCQ)).²¹ Physical requirements at work were moving or lifting heavy loads (one item, JCQ), rapid and continuous physical activity (one item, JCQ) and awkward postures (three items, JCQ). The sum of these three exposures was defined as 'physically demanding work'. Regular night work was obtained from one question on usual work shift. Work–family interference was assessed with the sum of three items: 'After work I come home too tired to do some of the things I'd like to do', 'On the job,

I have so much work to do that it takes away from my personal interests' and 'My family and/or friends dislike how often I am preoccupied with my work while I am at home'.²² Perceived workplace safety was assessed with the sum of four items ('I am often required to do a task that makes me feel like I might be at risk of getting hurt', 'My work area is adequately staffed', 'People working in my department or unit are frequently exposed to dangerous or risky situations' and 'In this facility, management considers workplace health and safety to be important').²³

Data analysis

Associations between musculoskeletal symptoms and the exposures were assessed with log-binomial regression to estimate prevalence ratios (PR) with 95% CIs. If the log-binomial model failed to converge then the COPY method was used.²⁴ If the COPY method resulted in potentially unstable estimates, a Poisson estimate was calculated and compared to the COPY method estimates. In the multivariable modelling, all models included age (except if age-stratified), gender, and those additional covariates that were associated with both the outcome and the exposure. Regular night work and co-worker support were not included in the final models because they showed no associations with the independent variable.

Our secondary hypothesis was that good workplace safety may buffer the effects of physical assaults on musculoskeletal pain. Therefore, a five-class composite variable (1=no assaults to 5=being assaulted three or more times in a workplace with poor safety) was used to estimate the risk of pain, adjusted for the same variables as the main analyses. Statistical significance was also tested for the interaction term for violence and safety climate. The statistical analyses were carried out with the statistical software package SAS V.9.1.

Results

Questionnaires were received from 920 nursing home staff members, of whom 93% were direct providers of clinical care. The number of respondents per nursing home varied from 49 to 180. The most common occupational titles were certified nursing aide (CNA; n=459) (50%), certified medicine aide (CMA; n=110) (12%), licensed practical nurse (LPN; n=153) (17%) and registered nurse (RN; n=129) (14%).

The response rate was 72% of all eligible clinical staff listed on the workforce rosters (unweighted average of all 12 centres). We were unable to obtain an exact count of the eligible employees who were at work during the days the study team was on site, but from qualitative estimation it is likely that about 90% of those individuals returned questionnaires.

A total of 867 survey respondents provided information on age and gender; they were mostly female (92%) and African-American in origin (47%). Their average age was 42 (SD 13) years. These characteristics were almost identical to those of the total clinical workforce. The average length of time worked in the same type of job was 12 (SD 10) years, but one in four workers reported more than 19 years of seniority. Self-reported lifetime experience in the same type of work was 6–8 years higher than seniority in the current job (from workforce rosters). About one-half worked primarily full time (53%), and on day shifts (47%), consistent with the overall staffing patterns of these centres.

The prevalence of having been assaulted one or two times during the preceding 3 months was 26% and three or more times 22%. Workers younger than 40 years were more often exposed to physical assaults than older workers (55% vs 44%) and nursing assistants more often than other workers (56% vs 37%). By ethnic origin, the prevalence of recent assault was higher among non-Latino workers (50%) than among Latino workers (42%). Among those with 1–5, 6–15 and more than 15 years of experience in current occupation, the prevalence of assaults during the preceding 3 months was 49%, 54% and 44%, respectively.

The 3-month prevalence of pain in any of the body areas increased with the number of assaults (figure 1). In age- and gender-adjusted models, widespread pain was three times more prevalent among those reporting three or more assaults, compared to no assaults. The largest absolute increase (30%) was seen for the prevalence of low back pain (table 1). Adjustment for multiple covariates had relatively little effect on the risk estimates (table 2). The risk of knee pain was higher among younger workers, whereas the risk of shoulder pain and widespread pain was higher among older workers. When the severity of low back pain was used as an outcome, the associations with violence were stronger: for example, the age- and gender-adjusted PRs in table 1 increased from 1.2 and 1.6 to 1.4 (95% CI 1.1 to 1.8) and 1.8 (95% CI 1.4 to 2.2), respectively.

Many workers who were exposed to violent assaults also reported a less safe work environment (table 3). Moreover, those who perceived the safety of their workplace to be less safe were almost twice as likely to consider leaving their job in the next 2 years compared to those working in a good safety climate (age- and gender-adjusted PR 1.8, 95% CI 1.5 to 2.1). The combination of poorer workplace safety and violent assaults was associated with an increased risk of pain in most areas, being highest for widespread pain. Being assaulted in a safer work environment increased the risks less, if at all. The interaction term for violence and safety climate had a p value of greater than 0.05 for each of the outcome variables.

Discussion

Nursing home workers are frequently assaulted physically by the residents for whom they care, or by residents' visitors or family members. In our study of almost 1000 workers, one out of two had experienced such an incident at least once within the preceding 3 months, and one out of four had been assaulted several times. This high period prevalence is consistent with earlier studies among nursing home workers, although some studies have reported even higher estimates, for example, up to 70% of staff being assaulted at least once a month.^{11,13} In one of the few investigations to compute incidence rates, Myers *et al* reported that nurses and aides in a dual-diagnosis facility sustained 67.3 assaults per 100 person-years.²⁵ Approximately half of all nursing home workers are injured at least once during their career due to an assault.¹³

Within the healthcare sector, the workers most frequently exposed to violence are certified nursing assistants and other nurse aides.¹¹ In our study, aides were also most often the target, although other workers in direct and frequent contact with patients, such as nurses, also experienced assaults frequently. In our study, as well as in earlier research,¹⁰ those who were

less educated, younger and with fewer years in nursing work were assaulted more often. Increasing experience in nursing work may improve adaptation, control of time, patience, empathy and coping strategies.¹⁰ Alternatively, fewer assaults among older workers may be the result of a (self)-selection out of direct care jobs.²⁶ Violence may at least partly explain the very high employee turnover rates (25% to 150% annually) in nursing homes.²⁷

Workplace violence has other consequences besides high turnover. It has been associated with reduced productivity, increased absenteeism and counselling costs, decreased staff morale and reduced quality of life.²⁶ Psychological reactions like anger, sadness, frustration, irritability, fear, self-blame, helplessness and depression are also frequently experienced.¹¹¹⁷ Post-traumatic stress disorder is also not uncommon among assaulted workers.¹⁸ Among physical symptoms, fatigue, sleep problems and headache are reported most often.

It appears that musculoskeletal symptoms have rarely been assessed as an outcome of workplace violence, although Myers reported a weak increase in back and shoulder problems among nursing home staff caring for physically abusive or resistant individuals on evening and night shifts.²⁸ In our study, the 3-month prevalence of musculoskeletal pain was relatively high (range 21–52% by body region). These figures are consistent with earlier studies of nursing home work as well as other physically demanding occupations, such as kitchen work.³²⁹³⁰ A new finding is the dose–response relationship between violent assaults and pain: the prevalence of pain increased linearly with the increasing number of assaults, being on average double or even triple among those assaulted three or more times. The risk was even higher when low back pain cases were restricted to those with more severe pain. After adjusting for several covariates, the largest increase, threefold, was detected among older workers with widespread pain.

Although we found no major difference in the frequency of physical assaults between the workplaces that were perceived to be generally safe and those that were not, having been assaulted increased the risk of most pains mainly in the non-safe environment. Violence creates a stressful work environment, but stress can probably be decreased with measures such as improving the physical environment to better accommodate nursing home residents, as well as workers' behavioural management skills training, better co-worker and supervisor support, and management's demonstrated priority of workplace safety. A safe workplace may also lower the turnover rate. This is supported by the finding in our study that those reporting poorer workplace safety were more often considering leaving their job in the next 2 years.

The mechanism(s) by which exposure to workplace violence might cause musculoskeletal pain are unclear. While some pain may result directly from scratches, cuts and bruises, this does not seem to account for the magnitude of the associations observed. One plausible explanation could be related to stress and consequent delayed tissue healing, as well as altered pain tolerance. The particularly high risk related to widespread pain supports this assumption. Finestone recently addressed the links between psychological and social factors and recovery from musculoskeletal injuries, identifying the biochemical and physiological processes that mediate this relationship.¹⁹ Several animal and human studies have demonstrated that exposure to stress can exaggerate subsequent pain experience and lower

pain thresholds.³¹³² Frequent and prolonged threats of violence may produce constant anticipation of pain, which itself may be even worse than the actual pain experience.³³ Recent functional MRI studies have demonstrated that the anticipation of pain causes activation in the pain-sensitive areas in the cortex of the brain.³⁴ Cumulative stress has been associated with a number of physiological changes in the brain and body that reflect dysregulated hormonal and autonomic activity. Exposure to violence is likely to increase vulnerability to the somatic pain syndromes such as fibromyalgia and temporomandibular disorder and also to contribute to symptom expression and severity.²⁰

This study has both strengths and limitations. The survey response rate was relatively high among those who were at work during the days that the investigators were on site, and participants were very similar to the entire workforce in age, gender, race/ethnicity and the distribution of clinical job titles between aides and nurses. Job stress has been shown to reduce survey participation among healthcare workers.³⁵ In our study, such a selection effect (ie, lower participation by those experiencing violence and feeling stressed about it) would most likely have led to an underestimation of the associations reported here.

The associations would also be diluted if there was non-differential exposure misclassification, in this case meaning misclassification of workers' reported assault history. While it seems unlikely that a worker would not recall whether or not such incidents had occurred during the preceding 3 months, recurring events might reduce her/his ability to accurately quantify the number of assaults. Moreover, differential misclassification of the exposure could cause bias away from the null value. For example, those with no symptoms might recall their prior assault history more accurately. Some subjects may have a reporting behaviour that leads to higher reporting both of exposure and adverse health symptoms, and hence, to overestimated risk estimates. To be certain of excluding these biases, a cohort study starting from a symptom-free population is needed. However, this would require a very large study size given the high prevalence of musculoskeletal symptoms among nursing home workers.

Survey reports of assault cannot be reliably validated against formal reports because official workplace injury reports and compensation claims by definition exclude assaults without a physical manifestation or with only minor injury. Hence, official reports and compensation claims are likely to provide an underestimation of the true frequency of workplace assaults, and survey data are often presumed to give more reliable estimates of violent incidents. It has been estimated that 55–90% of violent episodes are not officially reported.⁹²⁵²⁶³⁶³⁷ There are many reasons for worker under-reporting, in addition to the absence of physical injury or lost work time. Some of these are common to injury reporting in general: lack of reporting policies and practices; reporting considered to be too time-consuming; doubts about the benefit of reporting; the perception that assaults are to be expected in this job; and feeling sorry for the patients or residents.⁸³⁸ Also, concerns that assaults may be viewed as a result of poor job performance or worker negligence may lead to fears about job security. Thus, violence may be less often reported by casual, temporary and part-time workers who, according to some surveys, experience more assaults.³⁹ In studies using administrative records only, the risk of assault was reported to be higher among full-time workers compared to per diem or pool agency staff,²⁵ and among those who were working in their

usual unit and shift.²⁸ These associations may be true or they may result from differential under-reporting.

Although the temporal sequence of violence and pain cannot be confirmed with a cross-sectional study design, several features of this study support the hypothesis that workplace violence is a causal factor for musculoskeletal pain: the strength of the associations with dose–response effect; the relatively high risk estimates that did not change with adjustment for multiple covariates (reducing the likelihood of an alternative explanation); and a plausible mechanism. More observational studies are needed to investigate prospectively the role of violence in musculoskeletal symptoms and particularly whether experiencing physical assaults leads to prolonged or more severe symptoms, and eventually to disability. One form of workplace violence not assessed in our study is verbal abuse. It is known to occur even more frequently than physical violence in nursing work²⁶ and its health effects deserve further attention from occupational researchers. Intervention studies that aim at reducing any form of workplace violence and improving workplace safety in order to decrease the occurrence of musculoskeletal symptoms are also warranted.

Healthcare is the largest sector in the US economy, accounting for over 3% of the total US labour force with almost 11 million employees. Long-term care represents a large and growing segment of healthcare, so the high prevalence of hazards in this work has important public health consequences. This is the first study to show a dose–response association between physical assaults and musculoskeletal pain in a healthcare sub-sector in which violence is a frequent and considerable workplace hazard. This emphasises the need to address workplace violence in future aetiological research as well as to implement violence preventive measures in long-term care practice. Musculoskeletal disorders are a leading reason for sick leaves and permanent disability in most occupations, particularly in healthcare. Good workplace safety in nursing homes is likely to protect against these and many other adverse effects of violence.

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What this paper adds

- Musculoskeletal symptoms are very prevalent among workers in the healthcare industry.
- Workplace violence is a frequent and considerable workplace hazard, particularly in long-term care units, such as nursing homes.
- The role of workplace violence as a risk factor for musculoskeletal symptoms in healthcare workers has rarely been investigated.
- This study shows a dose–response association between the number of physical assaults and the prevalence of musculoskeletal pain in nursing home workers.
- Good workplace safety in nursing homes is likely to protect against the adverse effects of violence.

Figure 1.

Exposure to physical assaults at the workplace and the prevalence of musculoskeletal pain (both measured during the preceding 3 months) (n=889).

Table 1
Age- and gender-adjusted associations between violent assaults and musculoskeletal pain (n=841)

Violent assaults	LBP		Shoulder pain		Wrist/hand pain		Knee pain		Widespread pain	
	PR*	95% CI	PR*	95% CI	PR*	95% CI	PR*	95% CI	PR*	95% CI
No assaults	1.0		1.0		1.0		1.0		1.0	
1–2 assaults	1.2	1.0 to 1.4	1.1	0.9 to 1.5	1.4	1.0 to 2.0	1.3	1.0 to 1.7	1.6	1.0 to 2.4
3 or more assaults	1.6	1.4 to 1.8	1.8	1.4 to 2.3	2.1	1.5 to 2.8	1.5	1.2 to 1.9	3.0	2.1 to 4.3

* Adjusted for age and gender.

LBP, low back pain; PR, prevalence ratio.

Multivariable models of the associations between violent assaults and musculoskeletal pain among all subjects and by age group

Table 2

Violent assaults	No. of exposed	LBP		Shoulder pain		Wrist/hand pain		Knee pain		Widespread pain	
		PR*	95% CI	PR*	95% CI	PR*	95% CI	PR*	95% CI	PR*	95% CI
All subjects (n=758)											
No assaults	386	1.0		1.0		1.0		1.0		1.0	
1–2 assaults	195	1.2	1.0 to 1.4	1.1	0.8 to 1.4	1.4	1.0 to 2.0	1.3	1.0 to 1.7	1.5	1.0 to 2.2
3 or more assaults	177	1.5	1.2 to 1.7	1.6	1.2 to 2.1	2.1	1.5 to 2.8	1.3	1.0 to 1.7	2.7	1.8 to 3.9
Younger than 40 years (n=352)											
No assaults	160	1.0		1.0		1.0		1.0		1.0	
1–2 assaults	84	1.2	1.0 to 1.6	0.9	0.5 to 1.4	1.2	0.6 to 2.2	1.2	0.7 to 1.9	1.0	0.5 to 2.1
3 or more assaults	108	1.6	1.3 to 2.0	1.2	0.8 to 1.9	1.7	0.9 to 3.0	1.4	0.9 to 2.2	1.9	1.0 to 3.5
40 years or older (n=406)											
No assaults	226	1.0		1.0		1.0		1.0		1.0	
1–2 assaults	111	1.1	0.9 to 1.4	1.1	0.8 to 1.6	1.5	1.0 to 2.2	1.4	1.1 to 1.9	1.8	1.1 to 2.9
3 or more assaults	69	1.5	1.1 to 1.8	1.9	1.3 to 2.7	2.0	1.4 to 2.8	1.1	0.8 to 1.7	3.0	1.8 to 4.9

* Adjusted for age (if not stratified), gender, ethnic background, education, organisational unit, physical demands of work, psychological demands of work, job control, supervisor support and work–family imbalance.

LBP, low back pain; PR, prevalence ratio.

Table 3
Violent assaults in the workplace and workplace safety in relation to musculoskeletal pain (n=758)

Workplace safety and violent assaults	No. of exposed	LBP		Shoulder pain		Wrist/hand pain		Knee pain		Widespread pain	
		PR*	95% CI	PR*	95% CI	PR*	95% CI	PR*	95% CI	PR*	95% CI
No assaults	386	1.0		1.0		1.0		1.0		1.0	
Exposed to 1–2 assaults in a safe workplace	103	1.1	0.9 to 1.4	0.9	0.6 to 1.4	1.4	1.0 to 2.2	1.1	0.8 to 1.6	1.1	0.6 to 2.0
Exposed to 3 or more assaults in a safe workplace	68	1.4	1.2 to 1.7	1.3	0.9 to 2.0	1.5	0.9 to 2.5	0.9	0.6 to 1.5	2.1	1.2 to 3.8
Exposed to 1–2 assaults in a less safe workplace	92	1.2	1.0 to 1.5	1.2	0.8 to 1.7	1.4	1.0 to 2.2	1.6	1.2 to 2.1	1.8	1.1 to 2.9
Exposed to 3 or more assaults in a less safe workplace	109	1.5	1.2 to 1.8	1.8	1.3 to 2.5	2.4	1.7 to 3.3	1.5	1.1 to 2.1	3.0	2.0 to 4.5

* Adjusted for age, gender, ethnic background, education, organisational unit, physical demands of work, psychological demands of work, job control, supervisor support, and work–family imbalance.
LBP, low back pain; PR, prevalence ratio.