Occupational Injury Among Hospital Patient-Care Workers: What Is the Association With Workplace Verbal Abuse?

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Objective *To test the association between workplace abuse exposure and injury risk among hospital workers. We hypothesized that exposed workers would have higher injury rates than unexposed workers.*

Methods *Survey of direct-care workers (n = 1,497) in two hospitals. Exposure to workplace abuse was assessed through self-report; occupational injury reports were extracted from employee records. We tested associations between non-physical workplace violence and injury using log-binomial regression and multilevel modeling.*

Results *Adjusted prevalence ratio (PR) for injury associated with being yelled at was 1.52 (95% CI 1.19, 1.95); for experiencing hostile/offensive gestures 1.43 (1.11, 1.82); and for being sworn at 1.41 (1.09, 1.81). In analyses by injury subtypes, musculoskeletal injuries were more strongly associated with abuse than were acute traumatic injuries. Associations operated on group and individual levels and were most consistently associated with abuse perpetrated by patients.*

Conclusion *Exposure to workplace abuse may be a risk factor for injuries among hospital workers. Am. J. Ind. Med.* © 2013 Wiley Periodicals, Inc.

KEY WORDS: occupational injury; workplace violence; workplace harassment; workplace abuse; non-physical violence

INTRODUCTION

Health care workers are commonly injured at work. Nationally, this workforce had an annual incidence rate of 5.0 recordable injuries per 100 full-time equivalent (FTE) employees in 2011, a rate higher than industries such as construction (incidence rate 3.9/100 FTE) or manufacturing (4.4/100 FTE) [Bureau of Labor Statistics, 2012]. Injured workers may suffer short- and long-term adverse physical, emotional, and economic effects, and their employers also incur costs related to workers compensation, medical care, and workplace disruption. Thus, understanding the determinants of injury can lead to improved prevention, less suffering, and reduced costs.

Workplace abuse (which can take the form of abusive language, swearing, harassment, or ridicule) is also frequent in health care settings; the incidence rate for this exposure has

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been reported as 38.8 per 100 direct-care employees over a 12-month period [Gerberich et al., 2004]. However, while physical workplace violence has been studied as a determinant of injury risk [Kingma, 2001; McPhaul and Lipscomb, 2004; Miranda et al., 2011], less research has investigated the physical health consequences of non-physical workplace violence (a category that includes workplace abuse) [Lanza et al., 2006]. The majority of existing research on effects of workplace abuse has focused on mental health outcomes, such as depression and anxiety, and organizational consequences such as turnover and job dissatisfaction [Rowe and Sherlock, 2005; Johnson and Rea, 2009; Rodwell and Demir, 2012]. However, evidence suggests that exposure to several other types of psychosocial strains at work is associated with increased risk for musculoskeletal disorders [Melin and Lundberg, 1997; Farrell et al., 2006; Deeney and O'Sullivan, 2009; Stock and Tissot, 2011].

Study Aims and Hypotheses

This study investigates associations between reports of workplace abuse and occupational injuries among hospital patient-care workers. We hypothesized that exposure to each of several types of workplace abuse—yelling/screaming, hostile/offensive gestures, or swearing—would be associated with an increased risk of occupational injury, and that there would be a positive relationship between number of types of abuse reported by a given worker and risk of injury. We also hypothesized that musculoskeletal injuries would be more strongly associated with workplace abuse than acute traumatic injuries. Since prior studies found associations between workplace abuse and musculoskeletal disorders [Stock and Tissot, 2011], we were also interested in whether workplace abuse was particularly associated with musculoskeletal injuries versus acute traumatic injuries. Thus, by testing whether certain injury types were more strongly associated with workplace abuse exposure, we could begin to assess whether the mechanisms proposed in prior studies of workplace psychosocial strains and musculoskeletal disorders might also be at play in the present study, although the cross-sectional nature of our data precluded a full analysis of mechanisms.

METHODS

Study Population and Sampling

This is a cross-sectional study that used data collected as part of the "Be Well, Work Well" project of patient care workers at two large Boston hospitals. All registered nurses (RNs), licensed practical nurses (LPNs), and patient care associates (PCAs) who worked at least 20 hr per week in patient care services, had direct patient-care responsibilities, and had been employed at the hospital between October 1, 2008, and September 30, 2009, were invited to participate. Ineligible workers were allied health care professionals (e.g., physical therapy, occupational therapy), environmental services staff, or any worker on physical medicine units; workers on extended absence greater than 12 weeks; administrative staff; and rotating or contract/per-diem nurses. Workers sampled for this study were clustered in patient care units supervised by a nurse director. The study was approved by the Dana-Farber Cancer Institute Institutional Review Board for protection of human subjects, and written informed consent was obtained from all participants. Following a strict study protocol, names were never linked to any data in order to fully ensure confidentiality of study participants.

From 7,019 eligible workers at the two hospitals (3,474 from one and 3,454 from the other), a random sample of eligible participants ($n = 2{,}000$) was invited via e-mail to complete the on-line survey. These workers were clustered within 104 patient care units. Email reminders were sent after the 4th, 6th, and 10th weeks, and paper versions of the survey were mailed to non-respondents. A total of 1,399 of workers completed at least half of the total number of questions in the online survey and thus were eligible for inclusion. In addition, 173 workers returned a paper version by mail. The final sample size is 1,572, reflecting a 79% response rate. Two workers were eliminated because their work unit was very small ($n = 2$) and their inclusion led to model instability when accounting for clustering by unit (see Analyses below). The final sample size was 1,497 after eliminating workers who were missing one or more of the three main workplace abuse variables ($n = 73$); workers missing these variables were not significantly more likely to be injured than workers with complete data ($P = 0.74$). There were 104 units represented, with an average of 22 workers per unit. Each respondent was given a $20 gift card for the completion of the survey.

In addition to the self-report survey, a separate occupational health database of injury reports from the hospital was used to determine injury during the year preceding the survey. After an injury occurs, workers can opt to complete an occupational health report to record injury details; thus, the outcome was collected prospectively during the year prior to the self-report survey. Participants were assigned a study ID number to permit tracking of survey responses and allow for linking of survey and administrative data while maintaining participant privacy and confidentiality.

MEASURES

Exposure: Workplace Abuse

Our primary exposure is workplace abuse, as measured by a reduced-five item version of the General Workplace Abuse (GWA) questionnaire [Richman et al., 1999; Krieger et al., 2006, 2008]. Participants were asked, "During the last

12 months how often has someone: (1) yelled or screamed at you; (2) made hostile or offensive gestures at you; (3) sworn at you; (4) treated you as inferior (talked down to you); (5) treated you as incompetent (as though you were not as good at your job as you really are)?" In the survey instrument on which these questions are based, the first three items are classified as "verbal abuse" and the fourth and fifth items are classified as "disrespectful behavior." For each question, individuals reported exposure as never, once, or more than once. We dichotomized individuals as exposed ("once" or "more than once") or unexposed ("never") to each of the five dimensions. Given our findings that the verbal abuse exposures (yelling/screaming, hostile/offensive gestures, swearing) were associated with reports of injury, at a $P > 0.05$, but the disrespectful behavior exposures were not, we summed the number of verbal abuse exposures to which workers were exposed and created a composite measure (range: 0–3 exposures) to assess associations between combined exposure to verbal abuse types and injury. For each question, those who responded "once" or "more than once" to experiencing a certain kind of abuse were asked "Who did this to you?" Response choices, of which respondents could select as many as applied, were: supervisor; coworker; patient or patient family; physician; other.

Outcome: All-Cause and Cause-Specific Injury

Our primary outcome was all-cause injury as extracted from the occupational health database. The injury data were linked with survey data and used to classify all workers in the sample as either injured or not injured in the same 12-month period covered by the survey. At the time of reporting, each injury was classified by workers along each of three dimensions: body part injured (back, neck/shoulder, arm/hand, leg, knee, head), cause of injury (slip/fall, lift/exertion, struck by, violence, sharps), and type of injury (pain/inflammation, contusion/bruise, puncture, sprain/strain, skin disease, blood/fluid pathogens). In addition, we categorized these injury types/causes as musculoskeletal in nature (back, arm/hand, lifting/exertion, pain/inflammation, sprain/strain) or acute traumatic in nature (being struck by an object, contusion).

Covariates

We considered known or suspected confounders of the association between reported workplace abuse and injury risk including age (under 30, 30–39, 40–49, 50+), gender (male/female), and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other); job type [staff nurse, patient care associate, other], and weekly hours worked [<30 hr/week, 30–34 hr/week, 35–39 hr/week, 40–44 hr/week, 45+ hr/week]. However, we opted not to include gender or race/ethnicity in our models, since nursing jobs are highly segregated by both factors and thus these measures could serve as proxies for exposure [Kaufman and Cooper, 2001]. In addition, since the sample was fairly homogeneous with respect to race/ethnicity and gender, inclusion of such factors could have resulted in statistical over-adjustment.

Analyses

Using the GLIMMIX procedure in SAS 9.2 (Cary, NC), in order for standard errors to reflect clustering of individuals within work units (with units specified as random effects), we used log-binomial regression to calculate prevalence ratios (PR) between each type of workplace abuse measured and risk of injury [Deddens et al., 1998]. We then calculated the PR for injury by number of types of verbal abuse exposures and tested for linear trend. We next examined the association between workplace abuse exposures and seven injury subtypes as described above. In this analysis, the comparison group was those who experienced no injuries during the year preceding the survey; we compared them with individuals who reported a given type of injury, adjusting for all key covariates.

Given the nested structure of employees clustered in work units, we then employed multi-level modeling to test whether the association between workplace abuse and injury was primarily a group-level or individual-level phenomenon; that is, whether individuals on units reporting higher levels of workplace verbal abuse overall had a higher frequency of injury reports. For each unit (n = 104, average n workers per unit = 22), we calculated the percentage of workers who reported exposure to each of the three verbal abuse variables (being yelled/screamed at, receiving hostile/offensive gestures, or being sworn at) to obtain a unit-level compositional measure of prevalence of each exposure. For each worker, we next subtracted the percentage of exposed workers on their unit from that worker's exposure status (1 = exposed, 0 = unexposed) to obtain a measure of individual exposure, centered at their unit-level mean. In order to avoid collinearity between individual and unit-level aggregated scores, for each of the three workplace abuse variables, we constructed random-intercepts models, allowing the outcome (all-cause injury) to vary across work units in order to examine the associations between both individual- and unit-level workplace abuse prevalence and an individual's risk of injury. The unit-level effect is the contextual effect of workplace abuse on injury *between* work units, while the worker-level effect is the individual effect of workplace abuse exposure *within* a work unit [Kawachi and Subramanian, 2006].

Finally, we tested whether the source of workplace abuse was associated with injury risk. As individuals were permitted to report as many perpetrators as applied for each type of workplace abuse (range: 0–5), and as we do not know the count of verbal abuse episodes for each individual, we were not able to simultaneously test the risk of injury associated with abuse from different perpetrators because individuals reporting multiple perpetrators would have been in two or more exposure categories. Rather, for each type of verbal abuse measured, we compared injury risk between those who did not report exposure to that type of abuse (and therefore reported no perpetrators), and those who reported exposure to that type of abuse by a given perpetrator type, regardless of the number of other perpetrators reported. We then compared injury risk between the unexposed and those exposed to abuse by a given perpetrator in adjusted models.

RESULTS

In this sample of 1,497 workers, approximately 49% reported exposure to being yelled or screamed at, 33% were subject to hostile or offensive gestures, 29% were sworn at, 65% were treated as inferior, and 36% felt treated as incompetent (Table I). Of the first three exposures, classified as verbal abuse, 42% reported exposure to zero forms, 23% to one, 16% to two, and 18% to three.

In total, 16% of workers (n = 242) reported injuries during the study period. Two hundred eleven workers reported one injury, 25 reported two injuries, and six reported three or more injuries. We stratified the sample by injury status to better understand exposure and covariate distribution among those who were injured. For each of the three verbal abuse exposures (yelled/screamed, hostile/offensive gestures, sworn), the distribution was significantly different ($P < 0.01$) by injury status. Injury distribution also varied significantly by occupation type ($P < 0.001$). However, injury did not vary significantly for two measures of unfair treatment or for gender, race, age, or hours worked per week.

In models adjusted for age, weekly hours worked, and job type (Table II), prevalence ratios (PRs) for injury associated with workplace verbal abuse were: 1.54 (95% CI 1.20, 1.97) for being yelled/screamed at; 1.46 (95% CI 1.14, 1.86) for hostile/offensive gestures; 1.39 (95% CI 1.08, 1.78) for being sworn at. These estimates were 1–10% higher than unadjusted models. We also examined the association between two types of disrespectful behavior and injury, finding that neither was significantly associated with workplace injury. The PR for being treated as inferior was 1.06 (95% CI 0.82, 1.37) and for being treated as incompetent was 0.93 (95% CI 0.72, 1.21). Given that the three workplace verbal abuse exposures were significant independent predictors of injury, we next tested whether the number of types of exposures reported was associated with additional risk of injury. We found a linear trend wherein the adjusted PR for one exposure was 0.95 (95% CI 0.66, 1.35), for two exposures was 1.46 (95% CI 1.04, 2.04), and for three exposures was 1.72 (95% CI 1.27, 2.34) (P for linear trend = 0.0001).

As it is possible that associations between violence and injury varied by age, race, and sex, we tested for statistical interaction between these factors and verbal abuse on injury risk; however no interaction term was statistically significant or near-significant.

We then conducted a series of analyses to examine injury subtypes (Table III). Being yelled at was a significant risk factor for injury associated with the back (PR 1.90; 95% CI 1.01, 3.54), lifting/exertion (PR 1.68, 95% CI 1.09, 2.60), pain/inflammation (PR 1.90; 95% CI 1.06, 3.41), and contusion (PR 1.87; 95% CI 1.14, 3.09). Exposure to hostile gestures was a significant risk factor for injuries associated with the back (PR 1.91, 95% CI 1.04, 3.50), lifting/exertion (PR 1.68; 95% CI 1.09, 2.60) and a near-significant risk factor for pain/inflammation and sprain/strain. Being sworn at was a significant risk factor for sprain/strain (PR 1.97; 95% CI 1.02, 3.80). There was no association between any of the verbal abuse exposures and arm/hand injury, being struck by an object, or slips/falls.

We also conducted a multi-level analysis to test the extent to which individuals' report of injury was associated with the overall level of workplace verbal abuse in their unit or workgroup (Table IV). In the first set of models (Model A), we calculated associations between group-level prevalence of each exposure and an individual's likelihood of outcome. In adjusted models, we found that there was a significant effect on individual injury reports associated with a unit's higher prevalence of being yelled at (PR 2.37, 95% CI 1.09, 5.15) or experiencing hostile or offensive gestures (PR 2.18, 95% CI 1.04, 4.57), but not for being sworn at (PR 1.60, 95% CI 0.77, 3.33). In the second set of models (Model B), we simultaneously modeled the group-level association and the individual-level association between exposure to each type of workplace abuse and an individual's risk of injury. We found that for being yelled at, the unit-level PR (2.34, 95% CI 1.08, 5.07) was statistically significant and similar to that of Model A, and there was also a significant individual-level association (PR 1.45; 95% CI 1.12, 1.87). The same pattern held for hostile/offensive gestures, with a unit-level PR of 2.15 (95% CI 1.03, 4.49) and an individual-level effect of 1.35 (95% CI 1.04, 1.75). For being sworn at, the unit-level term was not significant in either model specification, but the individual-level term was significant (PR 1.38, 95% CI 1.06, 1.81).

Finally, we tested whether workplace verbal abuse perpetrated by a certain type of individual was differentially associated with all-cause injury risk; such findings could have implications for intervention design. We found that, for all three types of workplace verbal abuse, perpetration by patients or their families was associated with statistically

TABLE I. Distribution of Exposures and Covariates in the Sample, for All Participants and by Injury Status During Year Preceding Survey

	All participants (n = 1,497)		Not injured (n = 1,255)		Injured (n = 242)		
	n	%	n	%	n	%	*P* for difference
Non-physical violence: yelled or screamed at in past year							0.003
No	768	51.3	665	53.0	103	42.6	
Yes	729	48.7	590	47.0	139	57.4	
Non-physical violence: made hostile or offensive gestures at in past year							0.003
No	1,008	67.3	865	68.9	143	59.1	
Yes	489	32.7	390	31.1	99	40.9	
Non-physical violence: sworn at in past year							0.007
No	1,066	71.2	911	72.6	155	64.1	
Yes	431	28.8	344	27.4	87	36.0	
Unfair treatment: treated as inferior in past year							0.815
No	513	35.0	431	35.1	82	34.3	
Yes	954	65.0	797	64.9	157	65.7	
Unfair treatment: treated as incompetent in past year							0.658
No	928	63.7	778	63.4	150	64.9	
Yes	530	36.4	449	36.6	81	35.1	
Age category							0.422
Under 30	310	22.0	256	21.6	54	23.9	
30–39	338	23.9	293	24.7	45	19.9	
40–49	356	25.2	294	24.8	62	27.4	
50+	408	28.9	343	28.9	65	28.8	
Gender							0.306
Male	139	9.6	121	10.0	18	7.8	
Female	1,307	90.4	1,094	90.0	213	92.2	
Race							0.631
Non-Hispanic white	1,141	79.6	961	79.7	180	79.3	
Hispanic	62	4.3	55	4.6	7	3.1	
Black	147	10.3	123	10.2	24	10.6	
Other	83	5.8	67	5.6	16	7.1	
Occupation							<0.001
Staff nurse	1,061	71.2	878	70.3	183	75.9	
PCA	117	7.9	88	7.1	29	12.0	
Other	312	20.9	283	22.7	29	12.0	
Hours worked per week							0.060
<30 hr	341	22.9	298	23.8	43	17.8	
30–34 hr	178	11.9	147	11.8	31	12.9	
35–39 hr	429	28.8	347	27.8	82	34.0	
40–44 hr	475	31.9	396	31.7	79	32.8	
Over 44 hr	68	4.6	62	5.0	6	2.5	
Unit type							0.036
Med-surg (adult and pediatric)	535	35.7	432	34.4	103	42.6	
Step-down, ambulatory	235	15.7	206	16.4	29	12.0	
Psychiatric	19	1.3	17	1.4	2	0.83	
ICU (adult and pediatric)	250	16.7	222	17.7	28	11.6	
OR and orthopedics	193	12.9	156	12.4	37	15.3	
Obstetrics	120	8.0	104	8.3	16	6.6	
ER	82	5.5	69	5.5	13	5.4	
Float pool	63	4.2	49	3.9	14	5.8	

TABLE II. Associations (Prevalence Ratio [PR], 95% CI) Between Individual Types of Verbal Abuse and Occupational Injury

	Bivariate		Adjusted[a]	
	PR	**95% CI**	**PR**	**95% CI**
Non-physical violence: yelled or screamed at				
No	1.00		1.00	
Yes	1.40	1.11, 1.78	1.54	1.20, 1.97
Non-physical violence: received hostile or offensive gestures				
No	1.00		1.00	
Yes	1.42	1.12, 1.80	1.46	1.14, 1.86
Non-physical violence: sworn at				
No	1.00		1.00	
Yes	1.37	1.08, 1.75	1.39	1.08, 1.78
Unfair treatment: treated as inferior				
No	1.00		1.00	
Yes	1.01	0.79, 1.30	1.06	0.82, 1.37
Unfair treatment: treated as incompetent				
No	1.00		1.00	
Yes	0.93	0.73, 1.19	0.93	0.72, 1.21
N non-physical violence exposures				
0	1.00		1.00	
1	0.87	0.62, 1.23	0.95	0.66, 1.35
2	1.42	1.03, 1.96	1.46	1.04, 2.04
3	1.59	1.18, 2.15	1.72	1.27, 2.34
P for linear trend	0.0004		0.0001	

[a]Adjusted for age, race, gender, job type, weekly hours worked.

significant increased risk of injury, compared with risk among who did not experience that type of abuse. In addition, being yelled at by a coworker or physician was associated with increased risk of injury, and experiencing hostile/offensive gestures and being sworn at by "other" was associated with increased risk as well (Table V).

TABLE III. Associations (Prevalence Ratio [PR], 95% CI) Between Exposure to Three Types of Non-Physical Workplace Violence and Injury Subtypes

		Yelled at		Hostile gestures		Sworn at	
	N workers with injury type	**PR**	**95% CI**	**PR**	**95% CI**	**PR**	**95% CI**
Body part injured							
Back	48	**1.90**	**1.01, 3.54**	**1.91**	**1.04, 3.50**	1.13	0.58, 2.19
Arm/hand	76	1.37	0.86, 2.19	1.25	0.78, 2.02	1.12	0.68, 1.86
Cause of injury							
Lifting/exertion	89	**1.68**	**1.09, 2.60**	**1.78**	**1.17, 2.73**	1.37	0.87, 2.14
Struck by	56	1.59	0.91, 2.81	1.33	0.77, 2.32	1.23	0.69, 2.18
Slip/fall	34	1.29	0.63, 2.63	1.16	0.54, 2.47	1.82	0.87, 3.79
Type of injury							
Pain/inflammation	55	**1.90**	**1.06, 3.41**	*1.72*	*0.98, 3.05*	0.98	0.52, 1.84
Sprain/strain	38	1.38	0.72, 2.65	*1.71*	*0.89, 3.28*	**1.97**	**1.02, 3.80**
Contusion	68	**1.87**	**1.14, 3.09**	1.42	0.87, 2.34	1.34	0.80, 2.26

All models adjusted for age, occupation type, and hours worked per week.
Reference group for each outcome is those who were not injured during follow-up (n = 1,255) italics: $P < 0.10$. Bold: $P < 0.05$.

TABLE IV. Multilevel Models Modeling Associations (Prevalence Ratio [PR], 95% CI) of Effects of Group-Level Violence Exposure and Group-Level Plus Individual-Level Violence Exposure on Injury Risk

	Yelled at		Gestures		Sworn at	
	PR	95% CI	PR	95% CI	PR	95% CI
Model A: group effect						
Unit-level effect	2.52	1.16, 5.44	2.16	1.03, 4.53	1.62	0.78, 3.38
Model B: group + individual						
Unit-level effect	2.50	1.16, 5.38	2.14	1.03, 4.46	1.64	0.79, 3.40
Worker-level effect	1.46	1.13, 1.88	1.38	1.07, 1.79	1.36	1.04, 1.77

All models adjusted for age, occupation type, and hours worked per week.

DISCUSSION

In this sample of patient-care workers, risk of injury was elevated among those reporting three different forms of workplace abuse (being yelled/screamed at, receiving hostile/offensive gestures, being sworn at), and injury report frequency was linearly related to the number of these exposures experienced by workers during the preceding year. However, exposure to disrespectful behavior was not associated with injury. In general, verbal abuse by patients or patient families was more highly associated with injury than abuse originating from coworkers, supervisors, or physicians. In analyses by injury subtype, exposure to workplace abuse was generally a stronger risk factor for musculoskeletal injuries, such as back injuries, lifting/exertion, sprain/strain, and pain/inflammation than for injuries associated with acute traumatic events, such as being struck by an object. The associations between workplace verbal abuse and all-cause injury were found to operate on both group and individual levels.

Possible Physiological Pathways Between Workplace Verbal Abuse and Injury

In addition to identifying an overall association between workplace verbal abuse and injury reporting, our analysis also examined specific injury causes to test whether certain types of injuries were more highly associated with verbal abuse than others. We found that, in general, outcomes or injury subtypes associated with musculoskeletal disorders—back pain, lifting/exertion, sprain/strain, or pain/inflammation—were more common among those reporting verbal abuse exposures. In contrast, outcomes more related to acute traumatic events—contusion or being struck—were not generally associated with verbal abuse. While the cross-sectional nature of the study precludes conclusions about cause and effect, this finding suggests that workplace abuse may not be a strong risk factor for acute traumatic injuries, such as being struck. Rather, these exposures may be associated with chronic injury risk via more indirect

TABLE V. Associations (Prevalence Ratio [PR], 95% CI) (PR, 95% CI) Between Perpetrators of Three Types of Non-Physical Violence and Risk of Injury

	Yelled at			Hostile/offensive gestures			Sworn at		
	Frequency	PR	95% CI	Frequency	PR	95% CI	Frequency	PR	95% CI
Not abused	768	1.0		1,008	1.0		1,066	1.0	
By supervisor	89	1.59	0.99, 2.55	50	1.56	0.87, 2.82	12	1.75	0.61, 4.99
By coworker	359	1.70	1.29, 2.27	192	1.17	0.81, 1.70	97	1.34	0.84, 2.14
By patient or family	450	1.45	1.10, 1.92	323	1.57	1.19, 2.05	336	1.40	1.05, 1.85
By physician	248	1.84	1.34, 2.53	375	1.34	0.75, 2.41	51	1.31	0.70, 2.45
By other	132	1.47	0.95, 2.28	56	1.80	1.07, 3.00	44	2.59	1.59, 4.21

Since individuals could report more than one perpetrator per type of violence, within types of non-physical violence we compared the risk of injury between those who did not experience a given type of non-physical violence (reference group) with those who reported that type of non-physical violence from a given perpetrator. All models adjusted for age, occupation type, and hours worked per week.

physiological mechanisms, similar to studies of the relationship between workplace psychosocial exposures and injury risk shown by other studies [Gillen et al., 2007; Rugulies and Krause, 2008].

While the lack of information about circumstances surrounding each injury precludes definitive conclusions about cause and effect, both theoretical models and empirical studies of the association between psychosocial risk factors at work and musculoskeletal injuries suggest that abuse may precede injury. There are several ways in which increased muscular activity and tension associated with an episode of workplace abuse could increase risk for injury over time. One potential mechanism is that exposure to abuse is theorized to produce both psychological stress responses (e.g., inattention) and physiological stress responses (e.g., muscle tension), both of which could increase risk of injuries. Further, the combined psychological and physiological stress response may not immediately attenuate when the stimulus is removed, but rather might cause a more protracted physiological stress response (e.g., chronic inattention and/or muscle tension) that increases musculoskeletal injury risk over time [Melin and Lundberg, 1997; Deeney and O'Sullivan, 2009].

Workplace abuse could also increase muscular activity and tension that may lead to an injury. Moreover, workplace abuse may be correlated with physical work tasks, such as bending or lifting, that are common among patient-care workers. Muscles may fatigue more quickly as a result of dual activation from both physical tasks and mental distress, and tasks within the range of the worker's normal capability may thus over-strain a worker in an abusive situation; repeated exposure to such situations may lead to chronic injury [Sjøgaard et al., 2000]. The dual-activation hypothesis was the theory behind another study, by Krieger and coworkers. However, they did not find an association between workplace abuse and systolic blood pressure in a multiethnic sample of blue-collar and service workers. This null finding was attributed to exposure levels above 70% and thus insufficient variation in the exposure level to detect an effect [Krieger et al., 2008].

Conversely, release of the stress hormone cortisol associated with a abuse episode may activate a "fight or flight" response that increases pain thresholds, leading workers to undertake tasks that exceed their physical capabilities and, over time, increase vulnerability to musculoskeletal injuries [Theorell et al., 1993]. Sympathetic nervous system activation during periods of psychosocial stress may influence both muscle activity and pain perception [Stock and Tissot, 2011]. While we cannot conclude that any of these mechanisms are responsible for the associations observed in this study, the general patterns that emerge merit further attention in prospective studies to more precisely determine potential causal pathways for the associations observed here.

Implications for Workplace Practices and Policies

Our multi-level analysis tested the extent to which observed associations occurred at individual and work-group levels. We found that work-groups with higher prevalence of yelling and offensive gestures were also linked with individuals' higher frequency of injury reports, independent of individuals' age, race and gender and occupation. In addition, group-level exposure was still associated with higher injury risk, even after accounting for individual-level exposures. These results underscore recommendations that injury prevention efforts in the workplace include measures to improve the psychosocial work environment [Amick et al., 2000; Sorensen et al., 2011]. Also, these findings suggest that administrative efforts to reduce workplace verbal abuse may be most effective if they simultaneously address the overall social context of the unit and specific interactions between a worker and an workplace abuse perpetrator [DeJoy, 2005]. Our findings are consistent with research showing that adverse psychosocial exposures in the health care workplace can affect the health not only of the worker being bullied or harassed, but also of those who witness the exposures [Johnson, 2009]. This study extends those prior analyses in two ways: first, by looking at a broader range of exposures, and second by looking at physical health outcomes.

Intervention efforts could be deployed at the organizational, interpersonal and individual levels in order to reduce prevalence of abuse and its associated risk of injury. At the organizational level, efforts must begin with a culture and climate that supports workers and protects against abuse. Organizations that make modifications to the physical (e.g., temperature, noise, ergonomic factors) work environment may reduce both perceived levels of adverse psychosocial exposures and the risk of aggression [Neuman and Baron, 1998]. Organizational leaders and managers could explicitly convey expectations that physical and verbal abuse towards workers is not tolerated from co-workers, patients and visitors. In addition, abuse prevention strategies, such as informative discussion, could be incorporated into workers' training, and procedures for reporting and investigating incidents both physical and workplace abuse in a swift and anonymous manner should be implemented at the organizational level [Gillespie et al., 2010; Mohr et al., 2011; Hahn et al., 2012].

At the interpersonal level, organizations can provide conduct guidelines between workers but also between patients, their families, and health care providers [Rippon, 2000]. Workplace social norms against abuse and other organizational climate factors like trust and cooperation have been associated with lower harassment prevalence [Neuman and Baron, 1998]. To reduce abuse at the individual level, studies have suggested steps such as monitoring

situations that may elicit aggressive behaviors, and if feasible separating workers with conflicts from the same work group [Neuman and Baron, 1998].

Researchers have differentiated Type II (client-on-worker) from Type III (worker-on-worker) violence [Howard, 1996] and established that antecedents and consequences are distinct. Given that our study found the strongest associations between abuse by patients or their families and injury risk, intervention policies and programs are less straightforward than in industries where violence originates from co-workers and supervisors [Love and Morrison, 2003]. However, by establishing a zero-tolerance policy towards workplace abuse, including abuse originating from patients and families, the organization could enforce an explicit commitment to workers' rights to a workplace free of verbal abuse. While legislative efforts, such as classifying assaults of health care workers as felonies, are important for reducing the prevalence or severity of physical violence, the ubiquity and indirect physical risk associated with verbal abuse make legislative approaches more challenging. Although reducing the impact of patient-originated workplace abuse in hospitals will likely center on providing training and managerial support to staff, without a genuine change in organizational policies and practices, such prevention programs may be experienced by nurses as victim-blaming by making the worker solely responsible for diffusing abusive situations [Lanza et al., 2011].

LIMITATIONS AND STRENGTHS OF ANALYSIS

This analysis has several limitations. The unknown temporal ordering of exposure and outcome is the primary threat to the validity of the study; both occurred during the year preceding the survey, but we do not know whether the exposure pre-dated the outcome. This is an inherent threat in cross-sectional studies but is especially so in studies with long retrospective periods such as ours. It is possible that employees injured on the job were subsequently more likely to be treated badly after suffering or reporting an injury. If this were the case, we would expect that the measures for being treated as incompetent or inferior would also be highly related to injury. However, we found that effect estimates for these measures of disrespectful behavior on injury were near-null and were not statistically significant. A healthy-worker survivor bias in the overall sample, in which workers who were either injured at work or more sensitive to harassment had left their jobs as a result of either circumstance prior to the survey, could produce a downward bias [Applebaum et al., 2007]. Future research could address these weaknesses by employing a prospective design or a case-crossover analysis [Fisman et al., 2003] that could better capture causal ordering and limit selection bias.

Prior studies have documented that harassment at hospitals often comes from co-workers and/or supervisors as well as patients or their family and friends [McPhaul and Lipscomb, 2004]. While we were able to test the associations between different perpetrators of violence and injury outcomes, these measures were not ideal because harassed workers were permitted to report as many perpetrators as were applicable for a given type of harassment. Our finding of largely non-significant associations between violence and injury originating from coworkers, supervisors, or physicians may well be a Type II error because of the measure's lack of precision. Future studies that more precisely measure the source and intensity, as well as the type, of abuse directed towards these workers would help generate more precise intervention recommendations.

The study assessed a limited range of workplace abuse exposures using validated, although relatively simple, self-reported measures [Krieger et al., 2006]. However, the use of more comprehensive instruments to measure the exposures would improve the ability to understand the components of each type of harassment or abuse most strongly associated with reports of injury. We also did not have measures of several potentially important covariates. Data on the tasks performed by workers (e.g., bathing, wound-dressing) would have helped understand the occupational environment and potential precipitating factors for both abuse and injury. We also do not have data on experience of physical violence; given that workplace abuse may be a precipitating factor for physical violence [Lanza et al., 2006], and the latter is a known risk factor for workplace injury, there is a possibility of omitted variable bias in our results. Future studies examining the associations tested here should thus include measures of daily work tasks and physical violence to address these limitations, especially because nursing tasks, coupled with administrative issues such as long wait times that may escalate patient and family frustrations, may put them at risk for verbal abuse, physical abuse, and injury [Smith-Pittman and McKoy, 1999; Findorff et al., 2004].

Additionally, very few workers reported some injuries; consequently, we did not have enough statistical power to examine the association between the exposures and these specific types of injuries. A larger sample might have better allowed us to test for associations with less common injuries, such as those associated with needlesticks and bloodborne pathogens. Likewise, the associations observed could be different by race/ethnicity or by gender, but perhaps because of the relative racial and gender homogeneity of our sample (90% women, 80% non-Hispanic white), it was not possible to conduct stratified analyses. Finally, exposure to workplace abuse is likely underreported, perhaps systematically so for those most likely to suffer from it, including racial or ethnic minorities and those of low socioeconomic status [Bergman et al., 2002; Sofield and Salmond, 2003]. Thus, exposure prevalence may have been underestimated in a non-random way.

In contrast to other cross-sectional studies of similar phenomena, a strength of this study is that ours is less likely to have rating-behavior bias in which respondent characteristics (such as negative affect) leads to systematic over- or under-estimation of both exposure and outcome [Toomingas et al., 1997]. The occupational injury data were collected independently by the hospitals as part of ongoing occupational health surveillance for a year prior to the study survey being distributed. However, it is possible that individuals who are more prone to report injuries overall are also more prone to report abuse on the survey, especially given that not all injuries incurred at work are generally reported to supervisors or administrators [Azaroff et al., 2002; Shaw et al., 2006].

Conclusions and Next Steps

This paper suggests that workplace verbal is associated with a higher risk of injury among workers in the health care setting, particularly when such abuse is perpetrated by patients or their families. It is possible that involuntary increased muscular activity and tension associated with verbal abuse may make a worker more subject to injury, though that hypothesis could not be adequately explored in the present study. Future studies could expand on these findings by integrating more detailed information on perpetrators of workplace abuse and by also collecting data on physical violence or abuse. The analysis could also be replicated in other health care settings, namely nursing homes and long-term care facilities that have high rates of injury among workers [Collins et al., 2004]. Interventions to reduce the prevalence of this type of workplace abuse may benefit both the worker (in the form of decreased injury and other consequences of the stress of workplace abuse) and the employer (in the form of potentially decreased costs associated with worker injury). This dual benefit highlights the imperative of addressing workplace abuse in workplaces, particularly those in which employees are at high risk for injury.

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