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The social distribution of risk at work: Acute injuries and physical assaults among healthcare workers working in a long-term care facility

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Abstract

The roles of informal social ties in affecting healthcare workers' risk of injury and assault were investigated in a long-term care facility for the elderly in the US. The original hypothesis was that nurses and healthcare assistants who integrated more with their coworkers would have lower risk. A crude measure of familiarity and social integration with coworkers was constructed from staff attendance records. This variable, which indicates working a floor and shift one has routinely worked on in the past, was associated with a moderate *increase* in risk of being injured after controlling for lifting demands and a fairly strong *increased* risk of being assaulted after controlling for resident combativeness. An interaction between social integration and job title was found. The primary associations were in the opposite direction of what was expected. The results suggest that social forces among healthcare workers shape the distribution of risk among workers in a manner more complex than some theories of social integration have suggested. New hypotheses are proposed to explore how social norms and expectations affect the way workers interact with each other and shape the distribution of risk among workgroup members.

Keywords: USA; Injuries; Assaults; Occupational; Networks; Social integration

Introduction

Rates of acute injury and physical assault are high among healthcare workers (Bureau of Labor Statistics, 2002; Gerberich et al., 2004). Common approaches to studying and reducing the occurrence of these events have largely been behavioral or biomechanical in nature (Collins et al., 2004; Evanoff et al., 2003; Ferguson et al., 2005; Garg & Moore, 1992; Garg & Owen, 1992; Lavender et al., 2000; Owen, 1999, 2000; Owen & Garg, 1994; Pheasant & Stubbs, 1992; Smedley et al., 2003; Trinkoff et al., 2003; Ulin & Keyserling, 2004) or have recommended changes in individual behavior (Dyck & Roithmayr, 2004; Fell-Carlson, 2004; Geller, 2005; Goodman, 2004; Johnson & Hall,

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2005; Lingard, 2002; Nieuwenhuijsen, 2004; Turner et al., 2004). Over the past decade there has been an increasing call to focus on elements of the social environment as factors in, or even the root causes of, a variety of health outcomes (Diez-Roux, 1998; Krieger, 1994; Link & Phelan, 1995). This epidemiologic study was inspired by this perspective and investigated the role of the informal social environment of the workplace in generating risk of acute injuries and physical assaults among healthcare workers working in a long-term care psychiatric and medical facility.

Many sociological studies have used the social network perspective and related methods to quantify and demonstrate the effect of *connectedness*, fundamentally conceived as social ties among individual actors, on a variety of outcomes (Wasserman & Galaskiewicz, 1994). This set of tools and concepts has increasingly been applied to health and disease as the sub-field of social epidemiology has expanded. Researchers are now using sociometrics to investigate social capital and its association with various health outcomes (Kawachi & Berkman, 2001; Kawachi et al., 1996; Lochner et al., 1999). These outcomes include all-cause mortality (Berkman & Syme, 1979), cardiovascular disease, accidents, suicide and stroke (Kawachi et al., 1996), and mental health (Kawachi & Berkman, 2001). Sociometric methods have also been used to study the diffusion of sexually transmitted diseases including HIV/AIDS (Morris, 2004).

Much of the recent epidemiologic research on the work environment has focused on individual-level causal factors. In this type of research, largely built upon a biomedical model of health, attributes of individuals are seen as the causes of the outcome being investigated, while the environment in which the individual lives is ignored (Krieger, 1994). According to the social network perspective, one's position in a social group, a function of social ties among individuals, is the underlying cause of various outcomes. Observed associations between individual-level attributes and outcomes are seen as non-causal correlations that appear due to confounding between attributes and position in the social group.

According to social network theory, individuals with more ties to others have greater access to a variety of resources than those with fewer ties (Burt, 1982; Burton et al., 1992). For example, individuals with more ties get more information and get it faster than those not as connected to other individuals (Bonacich, 1987). Similarly, individuals with more connections to others receive greater instrumental and emotional support (Seeman & Berkman, 1988). Extending this perspective to the field of epidemiology, Link and Phelan (1995) theorize that connectedness to others may serve as a resource that may keep individuals healthy. This hypothesis led us to use the social network perspective to investigate the role that access to others in the workgroup, and the resources made available by these ties, might have in determining risk of injury and assault in the workplace.

In the workplace, the social network perspective and related methods have been used to study a variety of issues such as friendship patterns and culture (Krackhardt & Kilduff, 1990), power and influence (Ibarra & Andrews, 1993), and hysterical contagion (Kerchoff & Back, 1968). Among healthcare workers in particular, social network methods have been used to study absenteeism and turnover (Price & Mueller, 1986), job satisfaction (Myrtle & Robertson, 1979), stress and burnout (Anderson, 1991), and social support (MacPhee & Scott, 2002). While research has been done to investigate social factors influencing risk of injury at work (Dwyer, 1991; Dwyer & Raftery, 1991), to our knowledge no epidemiologic studies have been done in which social network measures were used to examine the relationship between social integration and risk of workplace injuries.

Nursing and personal care workers face numerous hazards including excessive manual lifting, psychological stress, chemical hazards, infectious agents, violent residents, and the handling and disposal of sharps (Sterling, 1994). In this hazardous setting, greater connectedness to other coworkers could provide the means of acquiring at least four forms of resources from fellow coworkers that might improve safety. First, *physical assistance* from coworkers may reduce the risks incurred when performing tasks such as lifting or restraining residents. Second, *information* could be obtained that might include safer procedures for conducting hazardous tasks. Third, *social support* which might come in the form of warnings about immediate hazards such as agitated residents, the presence of sharps, slippery floors, etc., may reduce risk. Finally, familiarity with coworkers' habits and work procedures, likely to increase with repeated interactions with others, may provide greater *coordination* during tasks such as lifting or

restraining residents thus reducing the chances for hazardous errors.

Access to physical assistance was measured directly as the number of coworkers present on the same shift, floor, and date whom each worker claims to be a person they approach for help. Access to information and support from one's coworkers, and greater coordination, was considered to be a function of embeddedness in the friendship network. This was measured as the number of coworkers present on each shift, floor, and date worked whom an individual identified as a friend. In addition, individuals working among coworkers with whom they had repeatedly worked in the past were hypothesized to similarly benefit from being a member of the workgroup. This additional measure of integration was created using routinely collected staff schedule data and did not rely on individual survey responses. This dichotomous variable, also measured for each shift each person worked, represented currently working on a floor and shift the worker had typically worked on previously. This was believed to represent a degree of membership not experienced by individuals who were not familiar to others in the group.

Methods

Study setting and population

This was a cohort study of nurses and certified nurse assistants (CNAs) working in a dual-diagnosis (psychiatric and physical) long-term care facility in the United States. The residents cared for in this facility all had psychiatric conditions and most had physical ailments; almost all were elderly. The institution was regularly at capacity (122 beds). The staff consisted of three employment categories. Standard employees worked full-time and had benefits while per diem employees had no benefits but received a 15% premium in pay. Per diem workers could not be forced to work while standard employees could be called in. Pool workers were employed by an external agency and were used as needed.

Twelve months of data were collected prospectively and combined with retrospective data for the preceding 4 months. Approximately 157 full-time equivalent person-years accumulated at this facility during this period. Data were gathered from several sources including administrative records (staff schedule data, staff rosters and injury, and assault incident reports) and self-administered survey questionnaires. Targeted employee interviews were conducted to determine floor-level lifting demands and resident combativeness.

Injuries and assaults

Injuries were restricted to events that occurred in the workplace during the 16-month period and were not due to abusive behavior by the residents. Assaults were all events in which a staff member reported intentional physical abuse by residents and could include events in which no physical harm was indicated. Thus, injuries and assaults were non-overlapping categories, and both were self-reported to facility administrators and catalogued by a Medical Records Director. Injury and assault severity data were obtained from incident reports and events were categorized as requiring no first aid, first aid only, requiring clinical care, and emergency room visits.

Physical exposures

Staff faced considerable risk of injury from patient lifting and risk of assault from residents' "combativeness." Thus, average expected daily lifting of residents and the average expected combative events by residents were the central measures of physical demands used in this study. Floor-level measures of exposures were obtained through targeted interviews with staff members. A CNA with experience on her particular floor (four CNAs total) was asked how often each resident required lifting and how often each became combative. The sum of expected lifting events and the sum of expected combative events for each floor represented exposures for CNAs working the day shift. These measures were adjusted for changes across shift and between job title using multipliers obtained through additional targeted interviews. Prompted to consider routine daily tasks, additional staff members estimated evening shift and overnight shift lifting demands and differences between nurses and CNAs. Assuming overall patient contact was correlated with lifting, these multipliers were also used to adjust exposure to combativeness by shift and job title. Person-shift scores for lifting and combativeness were grouped by quartile to analyze risk of injury and assault, respectively (see Myers et al., 2005 for more details).

Survey questionnaires

Surveys designed specifically for this study were distributed for employee self-administration. In an attempt to improve the response rate, the original 82-item questionnaire was shortened to 16 items and re-administered 3 months after the first survey. Subjects were informed that this was a study of injuries and assaults and they were being asked to identify coworkers on the survey, so that hypotheses about social integration and risk could be tested.

The surveys were used to gather social relations data. The help ties were intended to directly measure access to physical assistance available to each individual. The friendship ties were intended to capture social support, the exchange of information and coordination with coworkers. In separate questions, survey respondents were asked to provide names of any nurse, nurse manager, or CNA they "would ask for help when doing a physical task such as lifting or restraining residents" and they "considered to be friends."

While survey data provided the identities of helpers and friends each subject had among the entire nurse and CNA staff, we followed the advice of Price and Mueller (1986) and focused on ties within one's immediate workgroup defined as the coworkers present on the same floor, shift, and date for each 8-h work-shift (person-shift[1]). Availability of physical assistance is only relevant during tasks and therefore only people one can approach for help on one's shift are significant. While safer task performance may have been learned from a coworker from friends not currently on one's shift, our initial hypothesis was that support in the form of information, coordination, and the support of others requires the presence of those considered friends.

Since individuals did not work every day, and often worked on different floors or shifts, the composition of the workgroups, and therefore the number of friends and helpers in the group, changed from person-shift to person-shift. The social ties data gathered in surveys were used in conjunction with staffing records to measure the ties each worker had with coworkers on each person-shift. This was done for both help and friendship relations. These were our initial measures of connectedness of each staff member to coworkers for every person-shift in the sample.

The number of friends or helpers in each subject's workgroup was divided by the number of coworkers in the group to produce a measure standardized by the workgroup's size (Wasserman & Faust, 1994). This produced scores representing the fraction of coworkers in the immediate workgroup, who were considered friends or who may be called upon for help during physical job tasks. The effect of social isolation (having no friends, no helpers, and no friends or helpers) on one's shift was analyzed. In order to explore non-linear associations, the raw and group-size standardized number of helpers and friends were modeled as log-transformed and as quadratic variables.

"Workgroup regular" staff members

In addition to social relations data gathered in surveys, each subject's integration with coworkers was assessed from staffing records. Since repeated appearances with coworkers are prerequisite for becoming a member of the peer group (Jablin & Putnam, 2001), we assumed that working the same floor and shift repeatedly would indicate a familiarity with coworkers that put one in qualitatively different standing compared to those not acquainted with the group. This "workgroup regular" variable was believed to indicate greater integration and therefore access to the resources that could help reduce risk of injuries and assaults.

A nurse or CNA was deemed a workgroup regular for a given person-shift, if s/he appeared on that floor and shift most of the time in the previous 2 months. The moving window of 2 months was arbitrarily chosen. To empirically identify workgroup regulars, we used a ratio of five (or more) appearances on the same floor and shift out of the previous seven observations in the data sample. A denominator of seven observations was used because it took seven prior observations in the study sample to accumulate an average period of 60 d. Five was chosen as the numerator cutoff because workers would occasionally staff a floor or shift other than the one they usually worked on and the purpose was to identify the workgroup in which the person *regularly* worked.

Fig. 1 illustrates the construction of the workgroup regular variable.[2] These represent the first 12

[1] A person-shift is one 8-h period worked by one individual.

[2] For nurses and aides hired before the start of the study period, the first 60 days of the study period were treated as a blackout period during which their status as regulars was unknown and recorded as missing. For those hired after the start of the study period, the first seven dates were defined as non-regular since it was known that they had not worked with others in the past.

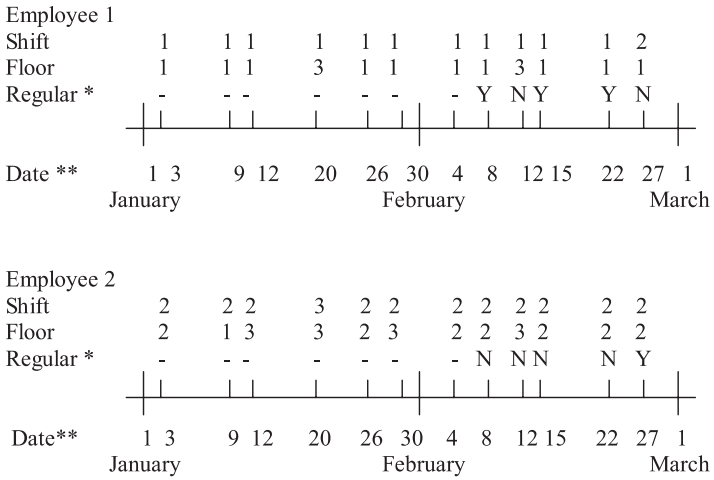

Fig. 1. Construction of the workgroup regulars variable for two hypothetical employees. * Employee's workgroup regular status: "-", status was undeterminable for the first seven observations in the data; "N", not a workgroup regular on that day; "Y", was a workgroup regular that day. ** Dates shown are days on which the individual worked *and* on which at least one injury or assault was reported.

person-shift observations to appear in the staff schedule data for two hypothetical employees. Note that these are (hypothetical) case–control sample dates (explained below), not daily records of work attendance, and reflect only those days on which an injury or assault occurred. Actual employees almost certainly worked on dates in between those in the sample.

The first hypothetical employee worked on the first shift and first floor on six of the first seven person-shift observations in the sample. On the eighth observation, she again worked the first shift and first floor and we defined her as a workgroup regular because on that day she worked on the floor and shift we have established as the one she has "regularly" worked on in the past. That is, for at least five of the previous seven person-shifts, she worked the same shift and floor and is currently working on that shift and floor. The second hypothetical employee worked many different shift and floor combinations in her first seven appearances in the sample. She has not established a stable pattern of multiple appearances on the same shift and floor and was not scored as a workgroup regular on her eighth through her 11th appearances. Her staffing pattern begins to stabilize as of her fifth appearance and by her 12th appearance she meets the criteria of having worked five of the prior seven person-shifts on the same floor and shift and is scored as a workgroup regular for that person-shift.

To determine the validity of the workgroup regular variable, a comparison was done with a questionnaire item that asked whether the respondent usually worked the same floor and shift. In order to compare the cross-sectional survey results with the time-varying workgroup regular variable, a new variable, "primary group member," was made. This static variable dichotomized individuals into those who were identified as workgroup regulars more or less than half of the person-shifts worked in the sample.

Sampling strategy

In the 16-month study period (spanning 485 d) approximately 39,285 person-shifts accumulated as the facility required, on average, 81 nurses and aides to provide coverage for the three shifts occurring on each 24 h period (485 d times 81 person-shifts per day equals 39,285 total person-shifts). A nested case–control sampling strategy was employed for the sake of efficiency. Staff shift records were entered for all 153 d on which at least one injury or assault was reported, generating a sample of 12,467 person-shifts that were worked on these days. Cases and controls were matched on date. Since injuries were reported on 85 d, the maximum number of person-shifts used in any regression model to analyze injury outcomes was 6855 (85 clusters containing all person-shifts worked on these days). Similarly, since assaults occurred on 88 d the maximum number of person-shifts used in any regression model to analyze assault outcomes was 7261 (88

clusters containing all person-shifts worked on these days).

Data linkages

The staff schedule records which identified the employee, floor, shift, and date for each person-shift observation in the sample were the foundation for the data structure. Injury and assault reports, roster data, and survey data were merged with the person-shift observations using employee identification numbers. Date, shift, and floor were also used to merge the injury and assault reports with the person-shift records. Physical exposure scores (described below) were assigned to person-shifts based on floor, shift, and job title. The workgroup regular variable was constructed using date, floor, and shift recorded in the staff schedule data itself.

Statistical analyses

Descriptive demographic statistics for individuals (as opposed to person-shifts) were compared using χ^2-tests and two-tailed *t*-tests. Injury and assault incidence rates (IRs) were calculated as the number of events per 200,000 h, and relative risks (IRRs) were computed from tabulated data.

The unit of analysis for all regression models was the person-shift. Conditional logistic regression was used for analyses. Case and control observations were matched on date. A score of one was assigned to a person-shift on which an injury or assault was reported; all other person-shifts were scored zero. Injuries and assaults were modeled separately.

In addition to the lifting and combativeness scores described above, physical exposures were modeled as floor and shift categorical variables. When models were restricted to subgroups, such as job title or level of severity, only the continuous lifting and combativeness exposure variables were used.

Because repeated injuries within subject violate the independence assumption of linear regression, we conducted alternative analyses using generalized estimating equations, with adjustment for correlations within-person (exchangeable correlation structure). Results of these models did not differ importantly from those presented. Also, unconditional logistic regression was used to assess bias that might have arisen from any omission of individuals who may have been systematically absent on days on which injuries or assaults occurred. The unconditional models used data for all dates on which an injury *or* assault occurred and reduced the likelihood of bias that may have been produced by the sampling strategy. These results did not differ substantially from those presented here. Only matched results are presented.

Results

The majority of the employees were "standard" payroll employees, with a minority of per diem (19.3%) and pool workers (24.8%). The median age was 34 and included 233 CNAs and 102 nurses (Table 1). Eighty-nine percent of the population was female. Ninety injuries and 109 assaults were reported, resulting in injury and assault IRs of 55.6 and 67.3 per 200,000 h worked, respectively. After repeated efforts to obtain employee cooperation, only 29% (98) of the nurses and CNAs completed surveys.

Physical exposures

Risk of injury in the top quartile of lifting exposure was nearly three times higher than in the lowest quartile (IRR = 2.9, 95% CI [1.5, 6.3]). Risk of assault was similarly elevated when comparing top and bottom quartiles of resident combativeness (IRR = 3.1, 95% CI [1.6, 6.6]). Non-parametric regression scatter-plots showed curvilinear relationships between the number of lifts per shift and risk of injury and the combative events per shift and risk of assault. In each the risk increased but leveled off in the upper range. Log-transformations of the

Table 1
Population demographics

	All		Nurses		CNAs	
	%	N^*	%	N	%	N
Sex						
Female	88.9	302	93.1	102	87.1	233
Male	11.1	37	6.9	7	12.9	30
Job title (% total)	100	335	30.5	102	69.5	233
Employment status (% per category)						
Standard employee	55.9	185	43.1	44	61.6	141
Per diem	19.3	64	23.5	24	17.5	40
Pool agency	24.8	82	33.3	34	21.5	48
		N		N		N
Age in years (median)	34	92	44	22	30.5	70
Tenure in years (median)	1.3	225	2.7	65	1.2	160

$^*N$ = number of employees.

variables revealed highly linear associations. To control for these exposures, the lifting and combativeness variables were modeled as their natural logarithms throughout the analysis.

Social network variables

The subset of participants who responded to the questionnaires reported, on average, 5.4 friends and 8.0 helpers throughout the facility (Table 2). When considering only coworkers on one's person-shift, there were on average 2.3 friends and 3.0 helpers present. Differences in network size between job titles were not statistically significant.

Among those who completed surveys, the numbers of friends and helpers working on one's person-shift were not associated with either injury or assault risks (Table 3). Controlling for physical exposures did not change these results, nor did adjustment for shift, floor, or job title. Alternative approaches to modeling this association yielded similarly negative results (modeling the number of ties standardized by the size of the group, log-transformed and quadratic variables and dichotomous variables representing social isolation).

Workgroup regulars

Fifty-eight percent of the person-shifts in the sample were workgroup regular person-shifts (Table 4). Workgroup regulars appeared more often on the first shift ($p<0.001$) and varied slightly by floor. Job title was not associated with likelihood of being a workgroup regular but there was a marked gradient with employment status ($p<0.001$). Seventy-one percent of the shifts worked by standard employees were identified as workgroup regular person-shifts compared to about 20% of shifts worked by per diem employees and only 5.7% worked by pool workers.

The validation of the workgroup regulars variable using the questionnaire data revealed that 94% of those defined as "primary group members" using the shift records indicated on surveys that they usually worked the same floor and shift. Sixty-eight percent of those identified as not primary workgroup members claimed to usually work different floors and shifts ($p<0.001$).

A modest excess risk of injury was found among workgroup regulars after controlling for lifting demands, modeled as either the continuous variable or floor and shift (OR = 1.5 95%, CI [0.9, 2.5]). This point estimate was further reduced when variables for employment status (standard, per diem, pool) were included (Table 5). A greater excess risk of assault was found among workgroup regulars even after controlling for residents' combativeness (OR = 1.9, 95% CI [1.2, 3.0]). Inclusion of the employee status variables did not change this result.

Table 2
Descriptive statistics for social ties data

	Friends and helpers in facility[a]			Friends and helpers in workgroups[b]		
	All	Nurses	CNAs	All	Nurses	CNAs
Friends						
Mean	5.4	4.2	5.8	2.3	2.1	2.4
SD	(4.9)	(4.4)	(5.1)	(2.4)	(2.4)	(2.4)
Individuals	85	21	64	—	—	—
Person-shifts	—	—	—	6370	1527	4843
Helpers						
Mean	8.0	7.5	8.2	3.0	3.2	2.9
SD	(4.8)	(4.3)	(5.0)	(2.9)	(3.0)	(2.8)
Individuals	61	15	46	—	—	—
Person-shifts	—	—	—	6350	1536	4814

[a]Ninety-five individuals provided data on friendship ties and 92 individuals provided data on helper ties. Ten individuals claimed to be friends with everyone in the facility and 31 individuals claimed they went to anyone in the facility for help. These observations could not be used to calculate mean scores indicated above.

[b]For person-shift measures, subjects who claimed that all coworkers in the facility were friends or helpers were assigned a score of the workgroup size minus one (the subject) times an arbitrary multiplier of 0.8. This was to reflect that, while they may be highly social individuals, these subjects did not actually view every coworker as a friend or helper.

Table 3
Risk of injuries and assaults associated with number of friends and helpers in workgroup (odds ratios and 95% CIs)

Conditional logistic regression (OR (95% CI))				
Model	1	2	3	4
Injuries				
Friends on shift	1.03 (0.93, 1.15)	1.02 (0.91, 1.14)	—	
Helpers on shift	—	—	1.04 (0.95, 1.15)	1.03 (0.93, 1.14)
Lifts per shift[a]	—	1.35 (1.01, 1.81)	—	1.30 (0.97, 1.73)
N (person-shifts)	2171	2171	2129	2129
Assaults				
Friends on shift	0.99 (0.90, 1.10)	0.99 (0.90, 1.09)	—	—
Helpers on shift	—	—	1.00 (0.92, 1.09)	0.99 (0.90, 1.08)
Combative events[a]	—	1.26 (1.02, 1.56)	—	1.29 (1.03, 1.61)
N (person-shifts)	2666	2666	2576	2576

[a]Natural logarithm.

Table 4
Distribution of workgroup regular person-shifts

	Total person-shifts (%)	*N* (person-shifts)
Workgroup regular	58.1	6855
Workgroup non-regular	41.9	4941
Total	100.0	11,796
	Person-shifts counted as workgroup regulars (%)	***N* (person-shifts)**
*Shift**		
7:00 AM–3:30 PM	69.1	3,487
3:00 PM–11:30 PM	49.4	2,264
11:00 PM–7:30 AM	51.0	1,104
*Floor**		
Ground	54.0	1,304
First	61.3	2,312
Second	58.3	1,933
Third	57.0	1,306
Job title		
Nurses	42.1	1,494
CNAs	41.8	3,443
*Employment status**		
Standard (full-time)	71.0	6,386
Per diem	19.8	436
Pool agency	5.67	33

*$p<0.001$ from χ^2 statistic.

The effect of being a workgroup regular, for both injuries and assaults, was modified by job title. The effect was much stronger among nurses, particularly for injury outcomes. When restricted to nurses, workgroup regulars had a greater than five-fold increase in risk of injury (OR = 5.6, 95% CI [1.3, 25.3]). Among CNAs, the association with injury was close to null (OR = 1.2, 95% CI [0.7, 2.0]). For assaults, the effect of being a workgroup regular was stronger among nurses than among CNAs (3.1, 95% CI [1.0, 10.0]), although among CNAs workgroup regulars still had elevated risk (OR = 1.7, 95% CI [1.0, 2.8]).

To check for reporting bias, analyses were stratified by severity of injury and assault (Table 6). The relationship became stronger across level

Table 5
Effect of being a workgroup regular on risk of injuries or assaults (odds ratios and 95% CIs)

	Model 1	Model 2	Model 3	Model 4	Model 5
Injuries					
Workgroup regular	1.7 (1.0, 2.7)	1.5 (0.9, 2.5)	1.5 (0.9, 2.5)	1.3 (0.8, 2.3)	1.3 (0.7, 2.2)
Lifts per shift		1.3 (1.0, 1.7)	—	1.3 (1.0, 1.6)	—
Shift 1[a]			3.1 (1.3, 7.3)	—	3.0 (1.3, 7.1)
Shift 2			2.1 (0.9, 5.1)	—	2.1 (0.9, 5.1)
Floor 0[b]			1.5 (0.7, 3.1)	—	1.6 (0.8, 3.3)
Floor 1			1.0 (0.5, 2.1)	—	1.1 (0.5, 2.2)
Floor 2			1.7 (0.9, 3.3)	—	1.7 (0.9, 3.4)
Standard employee[c]				3.0 (0.4, 22.8)	3.4 (0.5, 25.6)
Per diem				2.3 (0.3, 18.2)	2.5 (0.3, 19.4)
N (person-shifts)	6206	6206	6206	6198	6198
Assaults					
Workgroup regular	2.0 (1.3, 3.2)	1.9 (1.2, 3.0)	2.0 (1.2, 3.1)	1.9 (1.1, 3.1)	1.9 (1.1, 3.1)
Combative events per shift		1.4 (1.2, 1.7)	—	1.4 (1.2, 1.7)	—
Shift 1			2.9 (1.3, 6.5)	—	2.9 (1.3, 6.5)
Shift 2			2.5 (1.1, 5.7)	—	2.6 (1.1, 5.8)
Shift 3			—	—	—
Floor 0[b]			0.4 (0.2, 0.9)		0.4 (0.2, 0.9)
Floor 1			0.6 (0.3, 1.0)	—	0.6 (0.3, 1.0)
Floor 2			1.1 (0.6, 1.8)	—	1.1 (0.6, 1.9)
Floor 3			—	—	—
Standard employee[c]				1.6 (0.4, 6.7)	1.8 (0.4, 7.8)
Per diem				1.6 (0.3, 7.1)	1.8 (0.4, 8.4)
N (person-shifts)	6369	6369	6369	6359	6359

[a]Third shift is referent category.
[b]Third floor is referent category.
[c]Pool workers are referent category.

of injury severity and remained basically flat across level of assault severity. Controlling for exposure to physical demands did not change these patterns. For the higher levels of severity, statistical power was reduced and confidence intervals became wide.

The possibility that the increased risk to regulars was due to fatigue, burnout or decreased resilience could not be fully addressed. We examined proxies for these conditions using age, hours per week worked, and tenure. Age and hours per week worked were gathered by surveys and, therefore, unavailable for about half of all person-shift observations. Available data were analyzed in regression models to examine associations with risk and changes in the magnitude of coefficients for the workgroup regular variable (Table 7). None of the fatigue-related variables was associated with risk. The effect of being a regular on risk of injury was diminished when age, tenure, and hours per week worked were included (OR = 1.4, 95% CI [0.7, 2.8]). For assaults, results showed a slight increase in the coefficient for workgroup regulars when these fatigue-related variables were included in models (OR = 2.2, 95% CI [1.2, 3.9]).

We investigated the hypothesis that the associations between social network measures and injury and assault risk were biased by systematic differences between those who did or did not complete surveys. Results indicate non-respondents had lower risk of injury (OR = 0.66, 95% CI [0.43, 1.01]) and assault (OR = 0.61, 95% CI [0.41, 0.91]). In addition, non-respondents were less often workgroup regulars (OR = 0.49, 95% CI [0.31, 0.75]).

Discussion

We explored the role of informal social relations at work among long-term healthcare workers, employed in a single American healthcare facility, in the occurrence of workplace injuries and assaults. The social network measures were not associated with risk of injury or assault. However, a measure of the integration of staff members showed an

Table 6
Effect of being a workgroup regular on injuries and assaults analyzed by level of severity (odds ratios and 95% CIs)

	Crude odds ratios		Odds ratios adjusted for lifting		
Severity	OR	95% CI	OR	95% CI	*N* (person-shifts[a])
Injuries					
All injuries	1.7	(1.0, 2.7)	1.5	(0.9, 2.5)	6206
At least first aid	2.4	(1.1, 5.5)	2.2	(0.9, 5.0)	2555
More than first aid	4.5	(1.4, 14.2)	4.1	(1.3, 13.2)	1994
	Crude odds ratios		Odds ratios adjusted for combativeness		
Severity	OR	95% CI	OR	95% CI	*N* (person-shifts[a])
Assaults					
All injuries	2.0	(1.3, 3.2)	1.9	(1.2, 3.0)	6369
At least first aid	2.5	(0.9, 7.0)	2.1	(0.7, 5.9)	1585
More than first aid	2.1	(0.4, 10.5)	1.9	(0.4, 9.8)	674

[a]Person-shifts are identical for crude and adjusted models.

Table 7
Effect of being a workgroup regular on risk of injury and assault, adjusted for fatigue-related variables (odds ratios and 95% CIs)

	Injuries		Assaults	
	OR	95% CI	OR	95% CI
Workgroup regular	1.4	(0.7, 2.7)	2.0	(1.1, 3.5)
Resident lifting	1.2	(0.9, 1.7)	—	
Resident combativeness	—		1.3	(1.0, 1.6)
Age	1.01	(0.99, 1.04)	0.99	(0.96, 1.01)
Tenure	0.99	(0.90, 1.08)	0.97	(0.89, 1.06)
Hours per week	0.99	(0.96, 1.02)	1.01	(0.99, 1.04)
N (person-shifts)	1859		2383	

unexpected *increase* in risk of injury and assault, particularly among nurses.

Survey data used to create the network variables were very incomplete. In addition, staff turnover could have created considerable misclassification in the network variables. This may explain why the network variables showed no associations, in contrast to the surrogate measure of integration, which was available for the entire cohort. In addition, the survey questions used to measure social integration may have been inappropriate for determining access to protective resources. Friendship ties, in particular, may not be a valid measure of access to information, coordination, or support hypothesized to lower risk in the workplace. Also, subjects may not have accurately recalled coworkers they are friends with or approach for help.

Employees who did not complete the survey had lower rates of injuries and assaults and were less often workgroup regulars than those who did. It is possible that this group would score lower on social integration measures. If this were the case, more complete social network data could reveal associations similar to those found for the workgroup regular variables, i.e., higher rates of injury and assault among the more integrated workers.

These findings suggest a utility in measuring some dimension of social integration by simply considering repeated interactions among individuals. This method might be reasonably effective in such cases as this where attendance records were routinely gathered for all workers. More work is needed to validate this substitution but future work might consider the value of such a measure when sufficient survey data are not available.

It is possible that being familiar with the physical environment and work routines leads to a level of carelessness that those less familiar with the surroundings and tasks might not possess. However, results of this study do not support this hypothesis. CNAs have higher overall physical exposures than nurses do, yet there is less of a differential in risk among them associated with familiarity with their environments than there is among nurses. In addition, in a similar healthcare setting new CNA employees, who by definition lack familiarity with their work settings, had higher rates

of injury than more senior coworkers (Myers, Silverstein, & Nelson, 2002). It remains possible that familiarity leads to carelessness among nurses for unknown reasons and that this explains the excess risk among workgroup regulars.

Analyses stratified by injury and assault severity discount the likelihood that workgroup regulars differentially reported events. In addition, fairly stable results were observed after adjusting for possible confounding by fatigue-related variables. Therefore, we consider two other related hypotheses for the unexpected finding that risk of injury and assault increased among workgroup regulars: the "social distribution of risk" hypothesis and the "culture of nursing" hypothesis.

The social distribution of risk

Since physical exposures were measured at the level of the floor, adjusted for shift and job title, these variables reflected the amount of work that the group had to do during the shift. The distribution of this workload among workgroup members could, and quite possibly did, vary along lines of group membership.

To gain membership with a group, individuals must adhere to its norms and expectations (Giddens, Duneier, & Applebaum, 2003). Repeated interactions, the key determinant used to identify workgroup regulars, are necessary for the understanding and acceptance of norms and therefore integration with the group (Schein, 1992). Adherence to, and enforcement of, the norms of the group may differ according to membership status. Integrated workgroup members may be subjected to the expectations of their coworkers in ways others are not because they are more likely to be rewarded for adhering to norms or face sanctions for failing to do so in future interactions. In contrast, non-integrated workers who do not frequent the same workgroup might not feel obligated to meet coworkers' expectations because they are not likely to consistently face the same group in the future. They may be less influenced by social rewards or sanctions and feel less pressure to assume additional exposure and risk.

In addition, non-regular workers may face different expectations. This may consist of fewer demands placed upon them out of gratitude, for example, for helping out, possibly working a second shift in a row, perhaps being asked to stay on with little notice or called in on a day off.

The culture of nursing

The stronger effect of being a workgroup regular among nurses compared to CNAs calls attention to the many differences between these two occupations. Different social and cultural forces operating in the two groups may explain this finding.

In certain cultural contexts, integrated individuals may be socially obligated to put themselves at greater risk in order to maintain the acceptance of their peers. Under such circumstances workers may receive an increase in respect from coworkers—a form of symbolic recompense—by performing dangerous tasks (Dwyer, 1991). Individuals may receive non-material rewards, such as prestige and acceptance, for performing tasks considered risky or undesirable by others. In a study of Native American steelworkers, Hass (1977) described how workers performed dangerous tasks because doing so fit with their culture of heroism. They were rewarded with status and prestige, and their heroic identity was confirmed, for the bravery demonstrated by doing dangerous work. It is possible that there exists a similar phenomenon within the culture of nursing.

Nurses have developed a profound culture of caring (Leininger, 1984; Reverby, 1987), which is considered their primary value and a professional ethic instilled during training. It is possible that nurses show their adherence to the group's norms and values of care-giving through a high degree of patient contact. In so doing, they may gain status, approval, and acceptance from coworkers. In a dangerous environment, such as this dual-diagnosis long-term care facility, these efforts to gain and maintain the acceptance of the group could bring with them a greater risk of injury and assault.

In contrast, CNAs are not subjected to the extensive training required to be a nurse, they may not have the same professional identity, they are not as well paid and they may work in a different normative environment. This may explain the weaker workgroup regular and risk association among CNAs.

We hypothesize that the group's differential enforcement of expectations along lines of membership, combined with the culture of care-giving among nurses, may explain the increase in risk of injury and assault found among the workgroup regulars and why this effect was strongest among nurses. Integrated nurses, and to a lesser degree CNAs, may work in a normative setting that

rewards or pressures them into assuming more risk while working with their peer group.

Finally, it is possible that the measurement of workgroup regulars is a proxy for some other unmeasured variable that may explain the elevated risk to those in this group. While we believe that individual-level physical exposure is the unmeasured variable associated with being a workgroup regular, there may be one or several other factors not considered here.

Conclusions

While social integration has typically been thought of as providing access to protective resources (Link & Phelan, 1995), recent literature suggests it may not be positive under all conditions (Kushner & Sterk, 2005). We conclude with a hypothesis that suggests, in this case, group membership may have come with a cost. Integrated nurses may be more strongly subjected to the ethos of the nursing profession and may put themselves at increased risk, as they are expected to engage in greater patient contact. This expectation may be strongest when working with coworkers with whom one has become socially integrated. We do not wish to suggest that culture alone determines the overall level of risk in healthcare workplaces but we do believe the group's culture may informally affect the distribution of work and risk among its members.

This perspective suggests a potentially crucial role of workplace culture in how social support is conceived and measured in occupational health studies of injuries, assaults, and possibly stress.

If a group's norms demand individuals expose themselves to workplace hazards in order to achieve social inclusion, then support measured as integration may predict greater risk. We conclude that cultural and structural elements of the workplace should be taken into account when attempting to understand how resources and hazardous exposures are distributed among actors based on degree of social integration. Consideration of the components of workplace culture could lead to a more complete understanding of the dynamics of social integration and social support.

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