ORIGINAL ARTICLE

Association of occupation and safety practices with work-injury absence among public hospital employees in Latin America: a study from Costa Rica

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Background: Injury-related statistics in developing countries are rare.
Objective: To assess the relationship between occupational and safety-related risk factors and absences from work during the preceding 6 months due to work-related injury among public hospital employees in Costa Rica.
Methods: Data were used from a cross-sectional survey conducted in December 2000 among a stratified random sample of 1000 employees from 10 of the 29 public hospitals in Costa Rica. The questionnaire included sociodemographic data, occupational exposures, and organizational risk factors. A dichotomous variable was created to indicate work-injury absence. At-risk employees (n = 466) were classified as having had a work-injury absence if they reported having been absent for at least 1 day in the preceding 6 months because of a work-related injury. OR and 95% CI were calculated using unconditional logistic regression models.
Results: There is a greater likelihood of injury-related absence in non-professional occupational positions (ie, auxiliary personnel (OR = 2.29) and general services employees (OR = 5.55)) than in professional positions, and in employees who show poor compliance with safety practices (OR = 2.03) and have high interference from their job task (OR = 3.79) compared with their counterparts.
Conclusions: Work-injury absence appears not only to be a function of work injury, but also a function of occupation and degree of compliance with safety practices.

Absence from work because of sickness has traditionally been used as an indicator of workers' health in industrialized and developed countries. Owing to its impact on lost productivity, labor turnover costs, and long-term disability burden, sickness absence is considered an indicator of a country's economic performance. Consequently, in developed countries, sickness absence has attracted attention, over the years becoming a major public and occupational health concern.[1 2]

Sickness absence is also recognized as a valuable and useful economic and health indicator for developing countries.[3 4] However, most studies on sickness absence come from developed countries, whereas research in developing countries is rather limited.[5–15] Research from developed countries shows that sociodemographic, occupational, organizational, and labor market characteristics influence sickness absence.[16] Most of the research from developing countries has studied the healthcare working environment. Safety climate and compliance with safety practices are correlated in those environments.[17–24] Safety climate refers to shared assessments of safety policies, procedures, and practices,[25 26] and the perceptions and expectations that workers have of workplace safety.[27 28] High safety climate levels are associated with decreased occupational injuries,[29–33] which may decrease the incidence of absence due to disability and sickness.[34 35]

Very low levels of safety climate and safety practices among healthcare workers in developing countries have been documented.[7 9 10] A previous study in the Costa Rican public hospital system showed a very low safety climate level and an association with workplace injuries.[36] A subsequent study showed that the combination of low levels of both safety climate and safety practices has the strongest association with work-related injuries.[37] To date, no published studies have assessed the effect of these factors on work absence among that population. Examination of the factors associated with work-related absence has implications for research and prevention efforts aimed at reducing workplace health hazards and their consequences.[38] The present work extends earlier work by assessing the relationship of occupational and organizational risk factors with work-injury absence among public hospital employees in Costa Rica.

METHODS

Study design and sample selection

A cross-sectional survey was conducted in December 2000 among an initial random sample of 1000 employees. A total of 100 employees per hospital were selected from a stratified sample of 10 of the 29 public hospitals of the Caja Costarricense de Seguro Social (Costa Rican Social Security System, CCSS).[36] At the time of the study, there were only these 29 public hospitals, no private hospitals, and very few private clinics in the whole healthcare system. The University of Texas-Houston Health Science Center Committee for the Protection of Human Subjects approved the protocol. From the original sample, 859 employees were eligible after removal of those no longer employed (n = 62) or on sick leave or vacation (n = 79). Seventeen workers refused to participate. Thus, the total response rate was 98% (842/859). Further details can be found elsewhere.[36 37]

The 53-item questionnaire (available at http://ip.bmj.com/supplemental) included sociodemographic, occupational, and organizational factors. Answers to the latter two were 1 = never, 2 = rarely, 3 = sometimes, 4 = often, or 5 = always; if safety practices were not applicable, another option could be selected: ''does not apply to my job''. All items were scored in the same direction. Hospitals were defined by the CCSS as

Table 1 Sample demographic and exposure characteristics (n = 466). Costa Rica, 2000

Variable (n)	n (%)
Demographic	
Sex (n = 464)	
Female	288 (61.8)
Age in quartiles (n = 439)	
19–33 years	117 (26.6)
34–41 years	111 (25.3)
42–49 years	101 (23.0)
50+ years	110 (25.1)
Occupation (n = 462)	
Professional	179 (38.4)
Medical technician	38 (8.2)
Auxiliary	194 (41.6)
General services	51 (10.9)
Occupational	
Direct contact with patients (n = 453)	
Yes	419 (89.9)
Exposure to chemical products (n = 448)	
Yes	204 (43.8)
Exposure to radiation (n = 455)	
Yes	148 (31.8)
Exposure to biological hazards (n = 466)	
Yes	376 (80.7)
Exposure to physical hazards (n = 466)	
Yes	107 (23.0)
Organizational	
Type of hospital (n = 466)	
National	243 (52.1)
Regional	128 (27.5)
Peripheral	95 (20.4)
Management safety training (n = 457)	
No	362 (77.7)
Workers' safety training (n = 458)	
No	325 (69.7)
Personal protective equipment (n = 433)	
No	229 (49.1)
Administrative controls (n = 466)	
Low level	431 (92.5)
Job tasks interfere with safety practices (n = 466)	
High level of interference	349 (74.9)
Safety practices (n = 466)	
Low level	248 (53.2)
Safety climate (n = 466)	
Low level	388 (83.3)

national, regional, or peripheral according to the type and complexity of services provided. Mean scales scores were calculated if at least 80% of the scale items were complete. All scales had high internal consistency ($\alpha \geq 0.70$). Participants were coded as exposed (≤ 3) or non-exposed (>3) on the basis of the mean scales scores.

Work-injury absence

Work-injury absence was measured as the number of absent days resulting from an injury experienced during the preceding 6-month period. A range of zero to six or more was set to limit response bias. Twenty five employees had missing absence data. Those reporting absence days but no injuries were excluded (n = 2). There were 262 days of absence due to work-injury, but only among 96 (15%) employees. Eighty eight (14%) employees had more than 1 day absent, and more than half (n = 49, 8% of total) of them reported 6 or more days absent. This distribution precluded analyzing the number of days of absence. A dichotomous variable was created indicating whether or not a worker had taken at least 1 day off because of work-related injury in the preceding 6 months.

Preliminary analysis

A preliminary analysis showed that, for 121 (15%) employees, none of the safety practices applied. Their job titles suggested that they were not at high risk of work-injury absence. Workers not meeting the completion criteria were excluded (n = 215; 26%). Six administrative and seven maintenance employees were excluded because results from such small groups would be of limited validity. The final sample consisted of 466 at-risk employees.

Compared with the total excluded group (n = 349), the final sample included significantly ($p<0.05$) more females, more professionals and auxiliary personnel, more employees with direct patient contact, and fewer medical technicians and general service employees, and their exposure to occupational and organizational risk factors was greater. The results for those excluded on the basis of job tasks and those not meeting the completion criteria were similar. The proportion of work-injury absence in the final sample (12.7%) was slightly greater than in the total excluded group (10.6%), slightly greater in those not meeting the completion criteria (14.0%), and two and a half times lower among workers reporting safety practices to be not applicable (5.0%).

Statistical analysis

Crude and adjusted odds ratios (ORs) and 95% CIs were calculated using unconditional logistic regression. Variables significantly ($p<0.05$) associated with work-injury absence were selected for the multivariate model. After covariate adjustment, non-significant ($p>0.05$) variables were removed. The adequacy of removing these variables was tested with log-likelihood ratio tests.[39] The final model fit was examined with the Hosmer-Lemeshow goodness-of-fit test.[39] STATA SE 8.2 (Stata Statistical Software, Release 8.0, 2003; Stata Corporation, College Station, Texas, USA) was used.

RESULTS

Table 1 shows sample characteristics. Nearly two thirds were women (62%), and more than half (55%) were younger than 42 years. Most workers (80%) were either auxiliary (42%) or professional personnel (38%), and 90% reported direct contact with patients. Occupational exposures varied from 23% exposed to physical hazards to 81% exposed to biological hazards. The distribution by hospital type (52% national, 28% regional, and 20% peripheral) was consistent with the distribution of hospital employees in the CCSS system (50%, 30%, and 20%, respectively). Approximately three quarters of the managers (78%) and the employees (70%) had not received any safety training, and 49% of the workers reported that personal protective equipment was lacking. Nearly the entire sample (92%) reported a low level of administrative controls, 75% reported that their job tasks interfered greatly with their ability to comply with safety practices, 53% reported low levels of compliance with safety practices, and 83% a low safety climate. A simultaneous low level of safety climate and practices was reported by 47%, and only 10.5% reported high levels of both measures. Only 6.2% reported a high level of climate and low level of practices, whereas 36.3% reported the reverse situation.

Work-injury absence

Table 2 shows an increasing proportion of work-injury absence from professionals (7.3%) to general services (27.5%). Medical technicians (OR = 1.50) and auxiliary (OR = 2.15) and general services employees (OR = 4.83) showed a greater risk of work-injury absence than the professional personnel, although the former category was not significant. Exposures to chemicals and radiation (both with OR = 1.77) were related to work-injury absence. Job task interference with safety practices (OR = 4.10) and low level of safety practices (OR = 2.41) were associated with work-injury absence. The combination of safety climate and safety practices showed a greater proportion of

Table 2 Association of organizational and occupational factors with work-injury absence experienced in a 6-month period by public hospital-based workers (n = 466). Costa Rica, 2000

Variable (reference)	Employees with absence* n (%)	OR ORc (95% CI)	OR ORa (95% CI)
Demographic			
Sex (male)	26 (14.8)	1	–
Female	32 (11.1)	0.72 (0.41 to 1.26)	–
Age in quartiles (19–33 years)	21 (17.9)	1	–
34–41 years	13 (11.7)	0.61 (0.29 to 1.28)	–
42–49 years	9 (8.9)	0.45 (0.19 to 1.03)	–
50+ years	12 (10.9)	0.56 (0.26 to 1.20)	–
Occupation (professional)	13 (7.3)	1	1
Medical technician	4 (10.5)	1.50 (0.46 to 4.88)	1.53 (0.46 to 5.12)
Auxiliary	28 (14.4)	2.15 (1.08 to 4.30)	2.29 (1.11 to 4.73)
General services	14 (27.5)	4.83 (2.10 to 11.13)	5.55 (2.25 to 13.68)
Occupational			
Direct contact with patients (no)	2 (5.9)	1	–
Yes	57 (13.6)	2.52 (0.59 to 10.80)	–
Exposure to chemical products (no)	24 (9.8)	1	1
Yes	33 (16.2)	1.77 (1.00 to 3.11)	1.47 (0.79 to 2.75)
Exposure to radiation (no)	33 (10.8)	1	1
Yes	26 (17.6)	1.77 (1.01 to 3.09)	1.53 (0.81 to 2.90)
Exposure to biological hazards (no)	11 (12.2)	1	–
Yes	48 (12.8)	1.05 (0.52 to 2.12)	–
Exposure to physical hazards (no)	43 (12.0)	1	–
Yes	16 (15.0)	1.29 (0.71 to 2.40)	–
Organizational			
Type of hospital (national)	35 (14.4)	1	–
Regional	16 (12.5)	0.85 (0.45 to 1.60)	–
Peripheral	8 (8.4)	0.55 (0.24 to 1.23)	–
Management safety training (yes)	14 (14.7)	1	–
No	43 (11.9)	0.78 (0.41 to 1.50)	–
Workers safety training (yes)	15 (11.3)	1	–
No	43 (13.2)	1.20 (0.64 to 2.24)	–
Personal protective equipment (yes)	23 (10.8)	1	–
No	34 (14.9)	1.45 (0.82 to 2.55)	–
Administrative controls (high level)	6 (17.1)	1	–
Low level	53 (12.3)	0.68 (0.27 to 1.71)	–
Job tasks interference with safety practices (low level of interferance)	5 (4.3)	1	1
High level of interference	54 (15.5)	4.10 (1.60 to 10.50)	3.79 (1.30 to 11.03)
Safety practices (high level)	17 (7.8)	1	1
Low level	42 (16.9)	2.41 (1.32 to 4.37)	2.03 (1.07 to 3.83)
Safety climate (high level)	8 (10.3)	1	–
Low level	51 (13.1)	1.32 (0.60 to 2.91)	–

ORc, crude odds ratio of work-injury absence; ORa, adjusted odds ratio for the significant ($p<0.05$) variables on the bivariate crude analysis.
*Workers with at least 1 day of absence in the preceding 6 months due to work-related injury.

absence among workers with low safety practices independent of the safety climate level, but differences between high (6.1% among workers with high safety climate and 8.3% among workers with low safety climate) and low (17.2% among workers with high safety climate and 16.9% among workers with low safety climate) safety practice levels were not significant.

The log-likelihood ratio tests comparing the final multivariate model before and after removal of non-significant variables were significant ($p<0.05$). Thus, these variables were kept in final models. Model fit was adequate ($p = 0.81$). In the final model, auxiliary (OR = 2.29) and general services (OR = 5.55) personnel were significantly associated with work-injury absence, whereas exposures to chemicals (OR = 1.47) and radiation (OR = 1.53) were not. Low safety practice levels (OR = 2.03) remained associated with work-injury absence. A strong association with absence was found in employees whose job tasks were felt to interfere greatly with their ability to comply with safety practices (OR = 3.79) compared with their counterparts.

DISCUSSION

Low levels of safety practices and job tasks that interfere with the ability to comply with safety practices significantly increased the likelihood of having a work-injury absence. Non-professional occupations also had a greater likelihood of work-injury absence than professional occupations. These findings add to the sparse literature specifically assessing the impact of safety issues on work-related outcomes in the healthcare sector in developing countries. To our knowledge this is the first description of the relationship between occupational and organizational risk factors and work-injury absence among public hospital employees in Latin America.

Developing countries heavily influence global workforce demographics. Over 80% of the world's workers are in developing countries, with Latin America experiencing one of the greatest increases in working populations.[40] In countries of comparable development status, such as in Latin America, there is a high occurrence of occupational illnesses and injuries, but only 5–10% of the workers have access to competent occupational health services.[41] Barriers to prevention and reduction of occupational injuries include the lack of awareness of the importance of safe work and of reliable data on the nature, severity, and magnitude of occupational risks. Accurate information is therefore critical to be able to identify and control occupational risks, prioritize public health issues,

monitor trends, and evaluate intervention effectiveness. We hope that our work will help to overcome some of these barriers.

Potential explanations

Our findings are consistent with longitudinal research from developed countries.[42] Although not specifically for absence due to injury, certain occupational groups (blue-collar workers) have more absences than professionals or managers.[42] In our study, non-professional groups (auxiliary and general services) had a significantly greater likelihood of work-injury absence than professional groups. A possible explanation is that non-professionals have fewer injuries, but no differences in the overall injury rate were found between occupations.[37] Professionals may have fewer absences because they have less severe injuries leading to absence. Also, they might have better health status and thus may end up having fewer work-related absences. Work-injury absence was not collected by injury type, but injury rate differences by injury type between occupations were inconsistent in nine out of the ten injury types surveyed.[37] Only rates of injury due to falls were much greater among auxiliary (32.5) and general services (41.2) employees than among professionals (9.5) and medical technicians (7.9). It is reasonable that a greater rate of falls with injury will lead to a greater proportion of absences.

Occupation is a proxy for working conditions. Professional and non-professional employees differ in job duties and hazardous exposures. Although exposure to chemical products or radiation was controlled for, other hazards that differ by occupation remained uncontrolled for and may explain differences in work-injury absence. From the perspective of psychosocial work factors, professionals may have fewer absences because they have more job autonomy and can better manage their injuries, thereby possibly reducing the likelihood of related absences. An alternative argument is that professionals have fewer absences because they are more satisfied and motivated by their work. Further research is needed to clarify which explanation is more likely.

Unexpectedly, safety climate was not associated with work-injury absences, although it was associated with work-related injuries in this sample.[37] Employees reporting low safety climate had 1.5-fold greater rates of injury than those with high safety levels. Work injury and work-injury absence may not be related to the same work factors. However, as employees who reported work-injury absence were a subset of people with work-related injuries, we believed that workers with a low safety climate would also have a greater likelihood of being absent from work as the result of injury. The likelihood of being absent may correlate with increasing injury severity, so it could be that most injuries were not severe. Or workers may have been working while injured and did not take time off to recover because of fear of losing income or job. Unfortunately, specific data on neither injury severity nor job security were available.

Strengths and limitations

As the purpose of the survey was not exclusively to assess the impact of either occupational or organizational factors on work-injury absence, the findings should be interpreted with caution. Secondary analyses have the advantage of using data already collected to examine a relevant research question, but further ad hoc surveys should be conducted to assess whether or not our findings can be replicated. Causality cannot be established with cross-sectional designs. Data were collected by retrospective self-report of the preceding 6-month period, which may introduce recall bias.[43] The scarcity of reliable and valid injury registries in developing countries, however, made self-reports the only data available. The potential overestimation of absences was reduced by limiting the maximum number of days reportable.

Unconditional logistic regression was used despite the fact that the number of days of absence due to work injury in the preceding 6 months can be assumed to be a countable variable with values 0,1,2,… without a determined limit. Analysis showed that 85% of the workers had not had a day off, preventing meaningful analyses of number of days. However, to test whether different results could have been obtained, we complementarily fitted a zero-inflated negative binomial model using days as a count variable. This model is divided into an inflated portion, modeling the likelihood of an individual of having any days of absence, and a count portion, determining the number of days of absence of a worker given that she/he had any. No significant associations were observed in the count portion, and the results from the inflated portion were in line with the logistic regression results.

The initial response rate was 98%, but the actual response rate was 73.0% once participants not meeting the completion criteria were excluded. Those excluded were considered to be not at risk, and showed significantly reduced risk factors compared with the final sample, had less direct patient contact, and, overall, had less exposure to occupational and organizational risk factors. The proportion of employees with work-injury absence in the final sample (12.7%) was greater than the proportion of employees who indicated that safety practices were not applicable (5.0%), and only a little lower than the proportion of the group not meeting the completion criteria (14.0%). Less restrictive completion criteria would have allowed the inclusion of incomplete data which would bias the analyses toward the null, making it easier to commit a type II error.[36 44] Also, the validated scales had good internal consistency. All these factors should have attenuated some of the biases.

If participants were healthier and had fewer absences than non-respondents, the reported associations might be underestimated.[45] However, only a few employees were unavailable for the survey: 6.2% were no longer employed and 7.9% were on sick leave or vacation. In addition, the measurement of absences due to injury referred to the preceding 6-month period, and some injuries may have occurred before—for example, for employees with long-term, and probably more severe, injuries. However, these would be rare. Despite unavailability of data on severity, with the high injury rate previously observed in this sample,[37] the hospitals studied could only continue to function if most of the injuries were not severe.

Finally, most of the final sample had direct contact with patients on the job, greater exposure to some of the risk factors,

Key points

- Non-professional occupational groups (ie, auxiliary and general services) had a significantly greater likelihood of having a work-injury-related absence than professional groups.
- Exposure to low levels of safety practices and job tasks that interfere with ability to comply with safety practices significantly increased the likelihood of having a work-injury-related absence.
- These findings are useful in the design intervention programs for the improvement of safety practices at the public hospital systems in developing countries.
- The development of a reliable and valid injury registry is a necessary step in many developing countries.

and a greater work-injury absence proportion than the excluded, facts that may have overestimated the associations. At the time of the study, there were only public hospitals, no private hospitals, and very few private clinics in the healthcare system in Costa Rica. Although job tasks of healthcare workers are expected to be similar across facilities, whether public or private, the policies and management practices that influence work-related health outcomes of the employees may differ. However, most of the private healthcare workforce in Latin America also works in the public healthcare system because of relatively low wages and increasing opportunities for dual-employment with private pay providers. So although the occupational health policies and management systems of public and private providers may differ, the workforce is essentially the same, which highlights the need for employee-focused interventions as well as system-level prevention strategies.

Furthermore, despite many social, cultural, and political similarities of healthcare systems throughout Latin America, there may be differences among developing countries, and it may not be appropriate to consider them all as having similar safety hazards and safety perceptions. Costa Rica is a developing country, but has one of the highest levels of development in Latin America.[46] Given these caveats, our findings are generalizable to public hospital-based employees with direct patient contact in the Costa Rican public hospital system and to the hospital systems throughout Central America. They may be applicable to similar hospital systems in Latin America as well.

Implications for prevention

Our study contributes to the limited scientific literature on the relationship between safety measures and workplace absenteeism due to injury among healthcare workers of public hospital systems in developing countries. Despite data limitations, the results are useful for guiding intervention programs to improve the implementation of safety practices at public hospital systems in developing countries. A desirable step in this direction would be the development of reliable and valid injury registries. Our research has already been the impetus for the development of a national training program for worker safety in public hospitals in Costa Rica.[47] An improvement in levels of safety practice, traditionally reported to be deficient, would be expected to reduce work-injury absenteeism. Until 2002 the program trained more than 3700 workers in 10 hospitals in basic hospital safety issues. Since 2003, the Department of Occupational Health of the CCSS has continued a modified training program for 150–300 safety committee members per year from all public hospitals, which in turn provide training to local hospital workers. Future plans include an assessment of these programs to evaluate the changes in safety issues and the impact on health-related outcomes.

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An appendix is available online at http://ip.bmj.com/supplemental

LACUNAE

Accidents kill 100 000 Chinese children every year

Accidents are the biggest cause of death for Chinese children under 14 years of age, with 100 000 children dying from accidents every year, says a report released by the Chinese Center for Disease Control and Prevention in May. Traffic accidents and drowning are the main causes of death, and slips and animal attacks are the main causes of child injuries, according to the report. The center obtained the results by analyzing children's accident documents published during the past half a century and checking data from the center's disease monitoring stations nationwide. It is estimated that 10.1 million Chinese children are injured every year, but only 8 million see doctors. Accidents are the cause of death of about 101 000 children and the cause of handicaps for 404 000, figures from the report show. However, the report said that China's child death rate had dropped substantially during the past 50 years, from 1.82% in 1957 to 0.2% in 2000. Meanwhile, the infant death rate dropped from 20% in the 1950s to 3.2% in 2000. But there was no obvious drop in the rate between 1991 and 2000. The statistics from the National Working Committee on Children and Women under the State Council show 42.5 million elementary and middle school students are injured every year, inflicting total economic losses of 3.26 billion yuan (US$418 million, €313 million). The committee quoted a survey as saying that 26.1% of children died of accidental injury. ''The number is still rising at the rate of 7 percent per year,'' it warned, noting that unintentional injury to children has brought about both huge economic loss for the families and irreversible physical and psychological hurt to themselves. The committee blamed rapid urbanization and industrialization and the changes in road, transportation, and urban facilities for the increasing deaths as they increased daily risks for children. China's Ministry of Education has called for local educational departments to step up safety measures and conduct safety training of students and parents to prevent such tragedies from reoccurring.

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