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Occupational Injuries Among Nurses and Aides in a Hospital Setting

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Background *Patient care workers in acute care hospitals are at high risk of injury. Recent studies have quantified risks and demonstrated a higher risk for aides than for nurses. However, no detailed studies to date have used OSHA injury definitions to allow for better comparability across studies.*

Methods *We linked records from human resources and occupational health services databases at two large academic hospitals for nurses (n = 5,991) and aides (n = 1,543) in patient care units. Crude rates, rate ratios, and confidence intervals were calculated for injuries involving no days away and those involving at least 1 day away from work.*

Results *Aides have substantially higher injury rates per 100 full-time equivalent workers (FTEs) than nurses for both injuries involving days away from work (11.3 vs. 7.2) and those involving no days away (9.9 vs. 5.7). Back injuries were the most common days away (DA) injuries, while sharps injuries were the most common no days away (NDA) injuries. Pediatric/neonatal units and non-inpatient units had the lowest injury rates. Operating rooms and the float pool had high DA injury rates for both occupations, and stepdown units had high rates for nurses. NDA injuries were highest in the operating room for both nurses and aides.*

Conclusions *This study supports the importance of a continuing emphasis on preventing back and sharps injuries and reducing risks faced by aides in the hospital setting. Uniform injury definitions and work time measures can help benchmark safety performance and focus prevention efforts.* Am. J. Ind. Med. 55:117–126, 2012.

KEY WORDS: occupational injuries; OSHA-recordable injuries; hospital injury rates; healthcare workers

Additional Supporting Information may be found in the online version of this article.

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INTRODUCTION

Healthcare workers sustain some of the highest overall injury rates in the United States [d'Errico et al., 2007; Bureau of Labor Statistics, 2009a]. The work force in healthcare is largely female with a distribution across race/ethnicity similar to the general population, although with a majority of non-white and immigrant groups employed as lower wage nursing aides with less training than nurses [Hoskins, 2006; Bureau of Labor Statistics, 2010]. Nursing aides appear to have higher reported injury rates of musculoskeletal injuries and contusions than nurses [Fuortes et al., 1994; Pompeii et al., 2009; Rodríguez-Acosta et al., 2009], while specific injuries such as blood and bodily fluid exposures associated with sharps, indicate lower rates among aides [Quinn et al., 2009; Rodríguez-Acosta et al., 2009]. Outside the U.S., high musculoskeletal injury rates and musculoskeletal symptoms among direct patient care workers have also been documented across the healthcare industry [e.g., Lagerström et al., 1995; Eriksen, 2003; Bos et al., 2007; Feng et al., 2007; Alamgir et al., 2008].

Among the suggested explanations for the high injury rates in healthcare occupations, and particularly among aides, are heavy physical work demands, such as patient handling [Collins and Owen, 1996; Pompeii et al., 2009]. Many hospitals have implemented ergonomic interventions to reduce injury rates, by installing patient assist or lift devices (such as ceiling lifts) [Collins and Owen, 1996; Collins et al., 2004; Pompeii et al., 2009]. However, even with the use of lifting devices [Evanoff et al., 2003], the number of occupational injuries in this group remains high. Sick leave and injuries both increase with declining socioeconomic status [Boyer et al., 2009; Kristensen et al., 2010]. In large part, this may be related to greater psychosocial and physical workload demands among lower-status workers [d'Errico et al., 2007].

Underreporting of workplace injuries in the U.S. is well documented [Azaroff et al., 2002; Rosenman et al., 2006; Boden and Ozonoff, 2008; Bonauto et al., 2010]. This is seen among healthcare workers in particular [Galizzi et al., 2010], and specifically for musculoskeletal injuries [Menzel, 2008]. Reasons for underreporting may include fear of job loss [Pransky et al., 1999; Azaroff et al., 2002], peer pressure not to report [Azaroff et al., 2002], and frustration with workers' compensation procedures [Siddharthan et al., 2006; Menzel, 2008]. Underreporting is also positively associated with poor safety climate [Probst et al., 2008; Probst and Estrada, 2010]. These factors may be associated with socioeconomic status [Azaroff et al., 2002; Scherzer et al., 2005]. To the extent that aides experience greater fear of job loss, peer pressure not to report, frustration with workers' compensation procedures, and so on, reported injury rates may underestimate the actual differences in injury rates between nurses and aides.

In the United States, many occupational injury studies rely on workers' compensation data. Because workers' compensation rules and practices differ from state to state, it is difficult to compare results across studies in different states. For example, states have waiting periods that vary between 3–7 days, during which cash benefits are not required to be paid for time lost from work. States also vary in benefit levels, ease or difficulty of filing a claim, roadblocks to receiving benefits for specific injury types, whether the worker or employer has the right to choose medical care providers, litigiousness, and so on. These factors and others can affect the probability that a claim will be filed.

Because of the state-to-state variation in workers' compensation systems, this study uses OSHA-recordable injury rates to allow better comparisons of findings through the use of criteria that are standard across the U.S. Any injury involving death, days lost from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness is recordable. A case involving days away from work is defined as one for which the worker misses at least one full day of work after the date of injury.

Of course, underreporting remains a problem [Rosenman et al., 2006; Boden and Ozonoff, 2008; Bonauto et al., 2010]. Also, changes in OSHA reporting rules can also make it difficult to compare injury rates over time [Friedman and Forst, 2007]. Differences in reporting completeness between individual workplaces may still make comparisons challenging, but using consistent injury definitions remains superior to the alternative.

In this study, we have gathered data from two large tertiary care hospitals in Massachusetts and have described OSHA-recordable injury rates that were reported at these hospitals. We hypothesize that aides experience higher injury rates than nurses. We expect back injuries to be the most common and exertion (including lifting) to be the major cause of injuries involving days away from work.

MATERIALS AND METHODS

This study was conducted as part of the program of research of the Harvard School of Public Health Center for Work, Health and Wellbeing. It is one of a group of studies whose goal is to identify the relationships among worksite policies, programs and practices and worker health and economic outcomes, through analysis of employee record data, a review of policies, and an examination of their implementation. This study was approved by the applicable Institutional Review Board for protection of human subjects.

Data

This study uses data from the integrated administrative databases for nurses and aides in patient care units of two large academic hospitals in the Partners' HealthCare System in the metropolitan Boston area. Information from three systems was combined into a single research database using the worker identifier as the linking variable. These were: (1) a human resources database; (2) the staffing database, which includes all scheduled and worked shifts for all workers; (3) the occupational health services database, which includes OSHA recordable injuries. The staffing database used in this study, ANSOS One-Staff™, was used to select patient care units. The human resources database, PeopleSoft™, differentiates between vacation, sick time, and worked hours charged to each patient care unit on a weekly basis. As a result, we could derive an accurate measure of actual hours worked within each of our study units. For the integrated research database, all employees and units were coded with study identification numbers, and all identifying information was removed to protect the identity of the worker and the unit.

Human resources and staffing databases were used to restrict the study cohort to Patient Care Services units and to identify the type of unit. A total of 106 units at the two hospitals (55 at one hospital and 51 at the other) were defined for the study. Individual nurses and aides were selected for inclusion in the database if they were assigned to a patient care unit as their primary work unit or were working on the unit at least 1 hour during the relevant study period. The study population consists of all nurses and aides working in patient care units during the study period.

We extracted age, gender, race, and date of hire of individual patient care workers from the human resources database and information on the number and types of jobs, job role and title, unit, and hours worked from the staffing database. Job tenure (employment duration) was calculated as the study year (2009) minus the year of hire.

We collected data for all nurses and aides providing direct patient care for September 28, 2008 to September 26, 2009. We excluded jobs not involved in direct patient care, like nurse director, clinical educator, operations associate, and environmental services employee. All patient care units were included in the study, and all others were excluded. We calculated working hours by summing actual hours worked at a unit based on data from the staffing database. A total of 5,991 nurses and 1,543 aides contributed 3,964 and 1008.5 full-time equivalent workers (FTEs), respectively, to this study, where one FTE was defined as 2,000 hr.

The occupational health services database contains all reported incidents and injuries for employees in the two hospitals. Injured workers report work-related incidents by completing either a hard copy form or an Intranet web-based form. Injury descriptors include employee identifier (the linking variable), date of injury, body parts affected, nature of injury, cause of injury, and workers' compensation medical, indemnity, and administrative and legal costs. Also available is Occupational Health and Safety Administration (OSHA) recordkeeping information—whether the event was OSHA recordable, number of restricted days and days away from work. This study is based on OSHA recordable injuries experienced by the study population during the study year. Injuries were assigned to the unit in which the nurse or aide worked the most hours in the week of the injury, based on payroll data in the human resources database. If more than one unit had the same number of hours, injuries were assigned to the worker's home unit. In 3% of injuries, the worker showed hours in more than one unit during the week of injury. We applied the tie-breaking rule for only one injury.

Statistical Methods

We used the integrated human resources and injury data to describe the study population, including age, gender, race, job tenure, occupation, and both days away (DA) and no days away (NDA) OSHA recordable injury rates. We examined crude injury rates per 100 FTEs for nurses and aides separately to determine the most common types of injury within both occupations by body part, cause of injury, and nature of injury. In addition, we calculated crude injury rates for both occupations by age group, length of employment, gender, and race. Finally, we determined variation in crude rates by patient care unit category.

We then estimated injury rates using Poisson regression with the individual worker as the unit of analysis. Separate regressions were used for nurses and aides and for DA and NDA cases, and aide-to-nurse rate ratios and 95% confidence intervals were calculated assuming a Poisson distribution. The rate denominator was the FTE equivalent of hours worked, so the offset term was log(FTE). The multivariate model included all potential risk factors available in the administrative data: age, tenure groups, gender, race, and unit type. We tested for overdispersion in bivariate Poisson models for DA, NDA, and all OSHA recordable injuries. The ratio of the Pearson chi-square to its degrees of freedom (the dispersion factor) was 0.74, 0.57, and 0.69, respectively. Because the dispersion factor was less than 1, there was little evidence of overdispersion in the Poisson models.

Multivariate Poisson regression produced adjusted rate ratios that were close to the unadjusted rate ratios. For clarity of presentation, we do not present adjusted rate ratios. Poisson regression results are available as

Supporting Information Online. All analyses were carried out using SAS Statistical software, version 9.2 (SAS Institute, Cary, NC).

RESULTS

Population Characteristics and Injury Rates

The average age of nurses in the study population was more than 40 years, almost 4 years older than that of aides. A substantially greater proportion of aides than nurses was under the age of 30 (Table I). Both nurses and aides were predominantly female. Over 90% of nurses were white, compared with only around 40% of aides. Nurses' average tenure was almost twice that of aides, with more than 40% of nurses having stayed at the same hospital for at least 10 years (Table I). Table II displays the distribution of FTEs by unit type.

The reported nurses' overall injury rate per 100 FTEs was 12.9 (Table III). For aides, this rate was about 60% higher (Table III). The disparity in injury rates was similar for DA and NDA injuries. For both nurses and aides, over half of all injuries (56% and 53%, respectively) involved DA from work.

TABLE I. Population Characteristics: Partners Hospitals Nurses and Aides

Demographics	Nurses	Aides
Age in years: mean ± SD	40.40 ± 11.65	36.68 ± 13.22
Median	40.00	36.00
Age group (years)		
<30	23.5% (1,409)	39.3% (606)
30–39	25.4% (1,520)	17.9% (276)
40–49	24.8% (1,483)	21.9% (338)
50+	26.4% (1,579)	21.0% (323)
Gender		
Male	6.8% (410)	16.9% (260)
Female	93.2% (5,581)	83.1% (1,283)
Tenure (years): mean ± SD	10.91 ± 9.79	5.89 ± 7.45
Median	8.0	3.0
Tenure group		
<5 years	34.6% (2,071)	58.7% (905)
5–<10 years	24.0% (1,435)	20.4% (315)
10+ years	41.5% (2,485)	20.9% (323)
Race		
White	90.3% (5,410)	42.7% (659)
Black	4.8% (289)	41.5% (641)
Other/unknown	4.9% (292)	15.7% (243)
FTE: mean ± SD	0.66 ± 0.25	0.65 ± 0.36
Median	0.73	0.76
Number of FTEs	3964.2	1008.5
N	5,991	1,543

For percentages, the number of patient care workers is in parentheses.

TABLE II. Population Characteristics: Number of Full-Time Equivalents (FTEs) by Unit

Unit type	Nurses	Aides
Emergency room	232.3	53.5
Operating room	415.4	267.4
Adult medical/surgical	1458.4	357.4
Adult intensive care	606.2	84.7
Stepdown	188.3	63.8
Pediatric/neonatal	231.2	6.4
Psychiatry	27.1	10.9
Obstetrics-postpartum	311.4	38.4
Float pool	105.4	73.5
Ambulatory/consultation/education	388.5	52.5
Total	3964.2	1008.5

Columns may not sum to totals because of rounding.

Injury Characteristics

For injuries that involve days away from work (Table IV), back injuries were substantially more common among both nurses and aides than were injuries to other parts of the body. Exertion, including lifting, was the major cause of DA injuries. Finally, the most common nature of injury for both nurses and aides was pain/inflammation, followed by sprains and strains and then by contusions.

We saw a very different distribution of injury characteristics for injuries that did not result in DA (Table V). For both nurses and aides, upper extremity (shoulder, arm, wrist, hand, and finger) injuries were the most frequent, with head injuries next in frequency for both occupations. In the Partners system, sharps injuries were coded both as cause of injury and nature of injury, and they were by far the most frequent in both. Exertion as a cause of injury was a much lower proportion of NDA cases (21% among nurses and 16% among aides) than DA cases (66% and 54%, respectively). For both nurses and aides, this category had less than half the number of NDA cases as did sharps injuries. Although there were only three sharps DA cases in total, sharps cases accounted for almost half the NDA cases for both occupations. In virtually every injury category, both DA and NDA injury rates were higher for aides than for nurses.

Worker Characteristics

Table VI shows that DA injury rates were higher for nurses and aides from 30 to 49 years old than for younger and older patient care workers, although confidence

TABLE III. Injury Rates at Partners Hospitals, Nurses and Aides

	Nurses			Aides				
Injury category	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
Days away	285	7.19	6.40–8.07	114	11.30	9.41–13.58	1.57	1.27–1.95
No days away	226	5.70	5.00–6.50	100	9.92	8.15–12.06	1.74	1.37–2.20
Total	511	12.89	11.82–14.06	214	21.22	18.56–24.26	1.65	1.40–1.93

intervals are wide. Nurses with less than 5 years of job tenure had lower DA injury rates, but tenure had no discernable impact on aides' DA rates. Nurses' NDA injury rates were similar for all age and tenure categories (Table VII). Among aides, those over 50 years of age had the lowest DA rates. The 5- to 10-year tenure group had the highest NDA rates. Again, confidence intervals for this analysis are wide.

Among nurses, men had lower DA and NDA injury rates than women. This was also the case for DA rates among aides, but not for NDA cases. DA rates were almost identical for Black and White nurses, but Black aides had higher DA rates than their White counterparts (Table VI). On the other hand, Black nurses and aides had lower NDA injury rates than their White counterparts (Table VII). Aide–nurse rate ratios were greater than one in every category for both DA and NDA cases.

Hospital Units

Both nurses and aides in the operating room and the float pool (patient care workers who move from one unit to another as needed) had elevated DA rates, as did nurses in stepdown units (Table VIII). The lowest DA rates were

TABLE IV. Days Away Injury Rates by Injury Characteristics, Nurses and Aides

	Nurses			Aides				
Injury category	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
All injuries	285	7.19	6.40–8.07	114	11.30	9.41–13.58	1.57	1.27–1.95
Body part								
Back	115	2.90	2.42–3.48	35	3.47	2.49–4.83	1.20	0.82–1.75
Neck/shoulder	44	1.11	0.83–1.49	10	0.99	0.53–1.84	0.89	0.45–1.78
Arm/hand	36	0.91	0.66–1.26	21	2.08	1.36–3.19	2.29	1.34–3.93
Legs	25	0.63	0.43–0.93	13	1.29	0.75–2.22	2.04	1.05–4.00
Head	11	0.28	0.15–0.50	10	0.99	0.53–1.84	3.57	1.52–8.41
Other	19	0.48	0.31–0.75	7	0.69	0.33–1.46	1.45	0.61–3.45
Multiple	35	0.88	0.63–1.23	18	1.78	1.12–2.83	2.02	1.15–3.57
Cause of injury								
Struck by/struck against	31	0.78	0.55–1.11	21	2.08	1.36–3.19	2.66	1.53–4.63
Lift/exert	187	4.72	4.09–5.44	61	6.05	4.71–7.77	1.28	0.96–1.71
Slip/fall	42	1.06	0.78–1.43	19	1.88	1.20–2.95	1.78	1.03–3.06
Violence	2	0.05	0.01–0.20	0	0.00	N/A	N/A	N/A
Sharps	3	0.08	0.02–0.23	1	0.10	0.01–0.70	1.31	0.14–12.60
Other cause	20	0.50	0.33–0.78	12	1.19	0.68–2.10	2.36	1.15–4.82
Nature of injury								
Sprain/strain	71	1.79	1.42–2.26	29	2.88	2.00–4.14	1.61	1.04–2.47
Pain/inflammation	124	3.13	2.62–3.73	40	3.97	2.91–5.41	1.27	0.89–1.81
Blood/bodily fluid exposure	0	0.00	N/A	2	0.20	0.05–0.79	N/A	N/A
Contusion	38	0.96	0.70–1.32	21	2.08	1.36–3.19	2.17	1.27–3.70
Skin disease	0	0.00	N/A	1	0.10	0.01–0.70	N/A	N/A
Puncture	11	0.28	0.15–0.50	4	0.40	0.15–1.06	1.43	0.46–4.49
Sharps	2	0.05	0.01–0.20	1	0.10	0.01–0.70	1.96	0.18–21.68
Other nature	39	0.98	0.72–1.35	16	1.59	0.97–2.59	1.61	0.90–2.89

TABLE V. No Days Away Injury Rates by Injury Characteristics, Nurses and Aides

	Nurses			Aides				
Injury category	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
All injuries	226	5.70	5.00–6.50	100	9.92	8.15–12.06	1.74	1.37–2.20
Body part								
Back	30	0.76	0.53–1.08	9	0.89	0.46–1.72	1.18	0.56–2.48
Neck/shoulder	13	0.33	0.19–0.56	4	0.40	0.15–1.06	1.21	0.39–3.71
Arm/hand	114	2.88	2.39–3.46	58	5.75	4.45–7.44	2.00	1.46–2.74
Legs	11	0.28	0.15–0.50	3	0.30	0.10–0.92	1.07	0.30–3.84
Head	42	1.06	0.78–1.43	18	1.78	1.12–2.83	1.68	0.97–2.93
Other	8	0.20	0.10–0.40	5	0.50	0.21–1.19	2.46	0.80–7.51
Multiple	8	0.20	0.10–0.40	3	0.30	0.10–0.92	1.47	0.39–5.56
Cause of injury								
Struck by/struck against	12	0.30	0.17–0.53	12	1.19	0.68–2.10	3.93	1.77–8.75
Lift/exert	48	1.21	0.91–1.61	16	1.59	0.97–2.59	1.31	0.74–2.31
Slip/fall	18	0.45	0.29–0.72	7	0.69	0.33–1.46	1.53	0.64–3.66
Violence	0	0.00	N/A	2	0.20	0.05–0.79	N/A	N/A
Sharps	102	2.57	2.12–3.12	47	4.66	3.50–6.20	1.81	1.28–2.56
Other cause	46	1.16	0.87–1.55	16	1.59	0.97–2.59	1.37	0.77–2.41
Nature of injury								
Sprain/strain	22	0.55	0.37–0.84	9	0.89	0.46–1.72	1.61	0.74–3.49
Pain/inflammation	30	0.76	0.53–1.08	11	1.09	0.60–1.97	1.44	0.72–2.88
Blood/bodily fluid exposure	29	0.73	0.51–1.05	11	1.09	0.60–1.97	1.49	0.74–2.98
Contusion	20	0.50	0.33–0.78	12	1.19	0.68–2.10	2.36	1.15–4.82
Skin disease	0	0.00	N/A	0	0.00	N/A	N/A	N/A
Puncture	4	0.10	0.04–0.27	7	0.69	0.33–1.46	6.88	2.01–23.50
Sharps	102	2.57	2.12–3.12	46	4.56	3.42–6.09	1.77	1.25–2.51
Other nature	19	0.48	0.31–0.75	4	0.40	0.15–1.06	0.83	0.28–2.43

TABLE VI. Days Away Injury Rates by Worker Characteristics, Nurses and Aides

	Nurses			Aides				
Worker category	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
Age group (years)								
<30	56	5.64	4.34–7.33	27	10.68	7.32–15.57	1.89	1.20–3.00
30–39	72	7.78	6.18–9.81	29	14.73	10.24–21.20	1.89	1.23–2.91
40–49	85	8.86	7.16–10.96	36	12.87	9.28–17.84	1.45	0.98–2.14
50+	72	6.63	5.26–8.35	22	7.89	5.19–11.98	1.19	0.74–1.92
Tenure								
<5 years	81	5.81	4.67–7.23	50	10.59	8.02–13.97	1.82	1.28–2.59
5–<10 years	85	8.83	7.14–10.92	33	12.80	9.10–18.00	1.45	0.97–2.17
10+ years	119	7.40	6.19–8.86	31	11.14	7.83–15.84	1.50	1.01–2.23
Gender								
Male	12	3.97	2.25–6.99	14	7.47	4.43–12.62	1.88	0.87–4.07
Female	273	7.46	6.62–8.39	100	12.18	10.01–14.82	1.63	1.30–2.05
Race								
White	254	7.15	6.32–8.09	30	9.32	6.52–13.33	1.30	0.89–1.90
Black	16	7.65	4.69–12.49	61	11.74	9.13–15.09	1.54	0.89–2.66
Other/Unknown	15	7.38	4.45–12.24	23	13.77	9.15–20.72	1.87	0.97–3.58

TABLE VII. No Days Away Injury Rates by Worker Characteristics, Nurses and Aides

	Nurses			Aides				
Worker category	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
Age group (years)								
<30	63	6.34	4.96–8.12	37	14.63	10.60–20.19	2.31	1.54–3.46
30–39	47	5.08	3.82–6.76	21	10.67	6.96–16.36	2.10	1.26–3.51
40–49	57	5.94	4.58–7.70	23	8.22	5.46–12.37	1.38	0.85–2.25
50+	59	5.43	4.21–7.01	19	6.81	4.35–10.68	1.25	0.75–2.10
Tenure								
<5 years	84	6.03	4.87–7.46	55	11.65	8.94–15.17	1.93	1.38–2.71
5–<10 years	53	5.50	4.20–7.20	26	10.08	6.87–14.81	1.83	1.15–2.93
10+ years	89	5.54	4.50–6.82	19	6.83	4.35–10.70	1.23	0.75–2.02
Gender								
Male	9	2.98	1.55–5.72	19	10.14	6.47–15.90	3.41	1.54–7.53
Female	217	5.93	5.19–6.77	81	9.87	7.93–12.27	1.66	1.29–2.15
Race								
White	210	5.91	5.16–6.77	42	13.05	9.65–17.66	2.21	1.58–3.07
Black	3	1.43	0.46–4.45	38	7.31	5.32–10.05	5.10	1.57–16.52
Other/unknown	13	6.39	3.71–11.01	20	11.97	7.72–18.55	1.87	0.93–3.76

in pediatric and neonatal units (although aide hours were too small to calculate a stable rate), as well as units that were unlikely to involve inpatient handling activities (ambulatory/education/consultation). NDA injuries were highest in the operating room for both nurses and aides, but patterns in other units were unclear, in some cases because there were few FTEs and injuries (Table IX). In most units and for both DA and NDA injuries, aide-to-nurse rate ratios were greater than one.

DISCUSSION

In the hospitals in this study, aides had higher DA and NDA injury rates than nurses, and this finding held for most injury and worker characteristics, thus strongly supporting the hypothesis that injury rates were higher among aides than among nurses. Other studies have also found higher injury rates among aides when compared with nurses. A study based on workers' compensation data found that aides had over three times the back injury rate of nurses [Fuortes et al., 1994]. A Swedish study, also based on workers' compensation data, found the back injury risk for aides to be 50% higher than for nurses [Engkvist et al., 2000]. A study using workers' compensation data conducted at several North Carolina hospitals [Pompeii et al., 2009; Rodríguez-Acosta et al., 2009] directly compared injury rates of nurses and aides and also found that injury rates were substantially higher

TABLE VIII. Days Away Injury Rates by Unit Category, Nurses and Aides

	Nurses			Aides				
Unit type	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
Emergency room	17	7.32	4.55–11.77	5	9.35	3.89–22.45	1.28	0.47–3.46
Operating room	52	12.52	9.54–16.43	42	15.71	11.61–21.25	1.23	0.82–1.85
Adult medical/surgical	89	6.10	4.96–7.51	40	11.19	8.21–15.26	1.83	1.26–2.66
Adult intensive care	51	8.41	6.39–11.07	5	5.90	2.46–14.18	0.70	0.28–1.76
Stepdown	27	14.34	9.84–20.91	5	7.83	3.26–18.82	0.55	0.21–1.42
Pediatric/neonatal	5	2.16	0.90–5.20	0	0.00	N/A	N/A	N/A
Psychiatry	0	0.00	N/A	0	0.00	N/A	N/A	N/A
Obstetrics-postpartum	24	7.71	5.17–11.50	4	10.43	3.91–27.78	1.35	0.47–3.90
Float pool	12	11.38	6.46–20.04	10	13.61	7.32–25.29	1.20	0.52–2.77
Ambulatory/consultation/education	8	2.06	1.03–4.12	3	5.72	1.84–17.73	2.78	0.74–10.47

TABLE IX. No Days Away Injury Rates by Unit Category, Nurses and Aides

	Nurses			Aides				
Unit type	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Injury count**	**Rate per 100 FTEs**	**95% CI**	**Aide–nurse ratio**	**95% CI**
Emergency room	18	7.75	4.88–12.30	5	9.35	3.89–22.45	1.21	0.45–3.25
Operating room	42	10.11	7.47–13.68	47	17.58	13.21–23.39	1.74	1.15–2.64
Adult medical/surgical	82	5.62	4.53–6.98	26	7.28	4.95–10.69	1.29	0.83–2.01
Adult intensive care	30	4.95	3.46–7.08	5	5.90	2.46–14.18	1.19	0.46–3.07
Stepdown	4	2.12	0.80–5.66	1	1.57	0.22–11.12	0.74	0.08–6.60
Pediatric/neonatal	8	3.46	1.73–6.92	1	15.59	2.20–110.7	4.50	0.56–36.02
Psychiatry	0	0.00	N/A	0	0.00	N/A	N/A	N/A
Obstetrics-postpartum	20	6.42	4.14–9.96	0	0.00	N/A	N/A	N/A
Float pool	5	4.74	1.97–11.40	7	9.52	4.54–19.98	2.01	0.64–6.33
Ambulatory/consultation/education	17	4.38	2.72–7.04	8	15.25	7.62–30.49	3.48	1.50–8.07

among aides. However, another workers' compensation based study, this one in Massachusetts, found higher rates among nurses [Boyer et al., 2009]. Finally, a Massachusetts study based on OSHA-recordable injuries, estimated higher rates among aides [d'Errico et al., 2007].

Injuries to the back, sprains/strains, and exertion (including lifting) were the predominant body part, nature of injury, and cause of reported DA cases, while sharps injuries were by far the most common among NDA cases. These results were not surprising, as lifting is a well-known important hazard among patient care workers, and the Occupational Safety and Health Administration requires employers to record all blood/bodily exposure cases, which very rarely lead to illness involving time lost from work.

Previous research has also found high back and sharps injury rates among direct patient care workers, both in the U.S. and in other countries [Fuortes et al., 1994; Engkvist et al., 2000; Bos et al., 2007; Alamgir et al., 2008; Pompeii et al., 2009; Rodríguez-Acosta et al., 2009]. However, unlike our study, two recent studies found lower sharps injury rates among aides than among nurses [Quinn et al., 2009; Rodríguez-Acosta et al., 2009]. Along with the high overall injury rates among aides, studies confirm the importance of a continuing emphasis on preventing back and sharps injuries and of paying particular attention to risks faced by aides in the hospital setting.

This study found some clear injury rate differences among hospital unit categories (Tables VII and VIII). Pediatric units at Partners exhibited relatively low injury rates. This makes sense, given the relatively low physical demands involved in patient lifting in pediatric units. There were no injuries in psychiatric units, but exposure in these units was only 27.1 nurse and 10.9 aide FTEs, so limited weight should be placed on this finding. Both nurses and aides had significantly higher DA and NDA injury rates in the emergency room. DA rates were elevated in the float pool, and nurses had elevated DA rates in stepdown units. These findings suggest a focus on these units to determine whether risks specific to them can be identified and controlled.

Like this study, Rodríguez-Acosta et al. [2009] examined injury rates by hospital unit. Both studies found low injury rates in newborn and neonatal units, but units with relatively high injury rates for nurses and aides differed between the two studies. This raises a question about whether work organization or other factors can account for these differences, and it also points out the need for hospitals to determine for themselves the areas with high injury rates.

Our data are comparable to those used in the d'Errico et al. [2007] study in two Massachusetts hospitals based on injuries occurring in 1997–2002. The OSHA-recordable injury rates reported in that study were 9.2 for nurses and 10.1 for aides. We report rates of 12.9 and 21.2, respectively. We cannot offer a clear answer about why the Partners' rates were substantially higher, especially for aides. Galizzi et al. [2010] found that less than 60% of injuries in the hospitals they studied were reported on the OSHA log. We do not know the proportion of injuries reported in the two hospitals taking part in this study, but reporting may partially explain the differences. There may also have been differences in the intensity of the workload, as the Partners hospitals are both large academic medical centers, while the d'Errico et al. [2007] hospitals are moderate-size community hospitals. Finally, it is of course possible that injury rates were higher among nurses and aides in the Partners hospitals.

Bureau of Labor Statistics (BLS) OSHA-recordable rates for acute care hospitals in the U.S. were 1.7 per 100 FTEs for DA cases and 5.9 per 100 FTEs for NDA cases [Bureau of Labor Statistics, 2009a]. Massachusetts rates in 2008 were 2.8 per 100 FTEs and 4.9, respectively [Bureau

of Labor Statistics, 2009b]. Injury rates for all workers in the two Partners hospitals in this study were lower than the Massachusetts average—2.32 per 100 FTEs for DA cases and 2.86 per 100 FTEs for NDA cases. A notable difference is that the ratio of DA to NDA injuries was much higher for the studied hospitals than for the either Massachusetts or the U.S. This was also the case for nurses' and aides' rates (Table III).

We suggest two reasons for this disparity, both of which point to ways in which workplace policies can affect injury reporting. First, both Partners hospitals provide wage continuation during the 5-day Massachusetts workers' compensation waiting period. Because they do not lose income while they are not working, injured workers may be more likely to stay off work while recovering from their injuries. Also, for nurses and aides in these two hospitals, transitional duty usually can only be arranged after several days have passed. This makes return by the day after injury less likely and thus makes it more likely that injuries will result in DA cases.

The administrative data used in this study allow us to describe differences in reported injury rates between nurses and aides but limit our ability to understand the causes of these differences. One possible cause is differences in reporting of injuries. We currently lack information that would shed light on how differential reporting might affect our conclusions. It seems likely, however, that underreporting is more likely for aides than for nurses. Nurses are more educated, so reporting may be easier, and they may be less concerned about losing their jobs if they report injuries.

The administrative data also do not provide information about individual and workplace factors that may affect injury risk. These include education, obesity, and physical fitness at the individual level. At the unit level, the administrative data lack information on ergonomic risks, safety climate, and management style. Additional research to assess the contribution of a number of these potential risk factors is ongoing.

CONCLUSIONS

In this study, we found that aides had significantly higher injury rates than nurses. As hypothesized, for both occupations, back injuries were the most common DA cases, and sharps injuries were the most common NDA cases.

Examining our results in the light of other studies highlights several important unanswered questions: Why do injury rates of patient care workers vary a great deal from hospital to hospital? Can we identify the factors associated with between-hospital variation in the units with the highest injury rates? To what extent were these differences related to reporting?

Differences among studies in overall injury rates also point to the importance of using comparable injury and exposure definitions across studies before attempting to draw conclusions about the potential underlying determinants of observed differences. State workers' compensation systems have different compensability rules, waiting periods, and practices, so it is difficult to compare results across studies that use workers' compensation data. Also, using human resources payroll data, which include vacation, overtime, holiday, and sick time, leads to underestimates of injury rates and may distort comparisons among groups working under different payroll policies. The staffing database used in this study provides a relatively accurate measure of hours worked, because it does not count paid time off work, overtime, or holiday pay differentials. Similar data collection across hospital settings can help benchmark safety performance and identify injury categories and unit types on which hospitals can focus prevention efforts. However, since even with data collected using uniform injury and time at risk definitions, institutional and study population variation resulting in differential reporting can make cross-study comparisons misleading. Differences should thus be interpreted with caution.

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