

Letters

RESEARCH LETTER

Needlestick and Sharps Injuries Among Resident Physicians

Needlestick and other sharps injuries (NSI) are an important occupational hazard, and approximately 600 000 to 800 000 NSI events were reported annually in US hospital settings as of 1999.¹ These events carry risk of bloodborne pathogen transmission, as well as psychosocial and financial burdens. The cost associated with an NSI could range from \$500 to \$3000 (as of 2000), depending on the treatment provided.² Protecting health care workers against NSIs is an important component of workplace safety, and resident physicians are among those at risk. Physicians in training, particularly surgical residents, frequently report NSIs.³

Current epidemiology reports of NSIs among resident physicians are predominantly from survey-based studies. In contrast, studies sourcing data from occupational health offices are few in number and have small sample sizes.⁴ This study reviews reported NSIs to more comprehensively evaluate differences in NSI incidence rates among house staff across medical and surgical specialties. To develop targeted approaches to NSI prevention, we evaluated the influence of the academic calendar by calculating rates of NSIs per month.

Methods | A deidentified data set of NSIs reported to New York University Langone Health's Occupational Health Services by employees following injury between January 2000 and February 2020 was analyzed by employee type, specialty, and month of injury. House staff were defined as either surgical, based on the American College of Surgeons classification,⁵ or medical/nonsurgical (Table). The study was submitted to the New York University Grossman School of Medicine institutional review board and designated as not human subjects research, given that all data were provided in a deidentified data set and contained no protected health information.

Incidence rates were calculated using mean house staff program size data by specialty from July 2012 to July 2019. Statistical analysis was performed using χ^2 tests, Fisher exact tests, and linear regression. All *P* values were deemed statistically significant at *P* < .05. Odds ratios were reported with 95% CIs. Statistical analysis was performed with Excel version 16.32 (Microsoft).

Results | There were 5395 injuries reported to Occupational Health Services. Of these, 715 (13.3%) were reported by house staff and 4680 injuries by non-house staff health care workers. Of the 715 injuries among house staff, 367 (51.3%) were reported among staff in medical/nonsurgical specialties and 348 (48.7%) were reported among staff in surgical specialties. The mean NSI incidence rates were 4.7 and 9.4 events per 10 individuals for medical/nonsurgical and surgical specialties, respectively. The highest NSI incidence rates were seen among

house staff in urology (16.0 events per 10 individuals), orthopedic surgery (14.1 events per 10 individuals), and general surgery (14.0 events per 10 individuals) (Table).

Among house staff, the greatest number of injuries occurred in October (75 of 715 events [10.5%]), with an overall downward trend thereafter. June to July demonstrated the largest month-to-month increase, from 44 reported injuries (6.2%) to 67 reported injuries (9.4%). This month-to-month change was not observed among the non-house staff cohort (Figure). The proportion of injuries by calendar quarter among non-house staff remained relatively stable throughout the year (first quarter, 1199 [25.6%]; second quarter, 1171 [25.0%]; third quarter, 1153 [24.6%]; fourth quarter, 1157 [24.7%]; total, 4680 injuries). In comparison, the distribution of injuries among house staff was significantly different, with a notable increase between the second and

Table. Needlestick or Sharps Injury (NSI) Incidence Rate by Specialty, 2000 to 2020

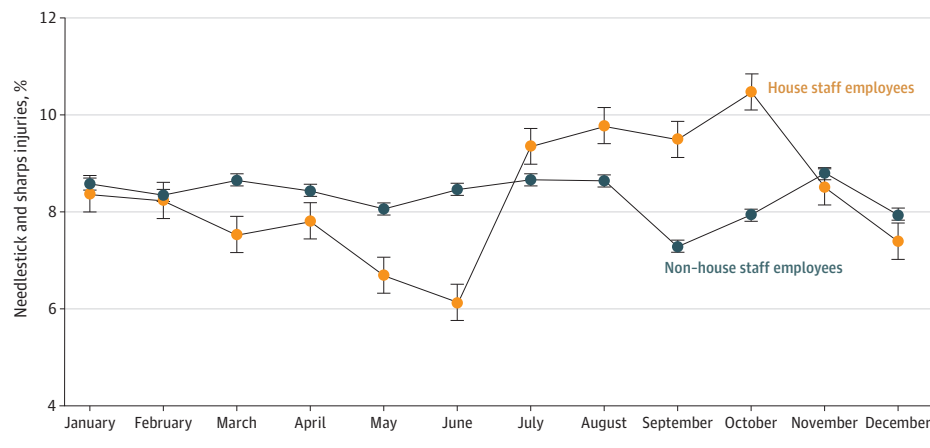
Specialty	Incident NSIs, No.	Annual house staff population, No. ^a	Incidence rate per 10 house staff ^b
Surgical			
Urology	27	17	16.0
Orthopedic surgery	115	82	14.1
Surgery	102	73	14.0
Obstetrics and gynecology	43	43	10.1
Otolaryngology	21	23	9.0
Cardiothoracic surgery	4	6	6.5
Neurosurgery	9	16	5.5
Ophthalmology	11	21	5.3
Plastic surgery	16	36	4.4
Total	348	317	NA
Mean	NA	NA	9.4
Medical/nonsurgical			
Pathology	39	34	11.5
Dermatology	32	28	11.3
Anesthesiology	79	76	10.4
Internal medicine	85	192	4.4
Radiology	28	66	4.3
Physical medicine and rehabilitation	15	41	3.7
Pediatrics	26	92	2.8
Medical subspecialties	32	128	2.5
Emergency medicine	16	66	2.4
Neurology	12	50	2.4
Radiation oncology	1	9	1.1
Psychiatry	2	75	0.3
Total	367	858	NA
Mean	NA	NA	4.8

Abbreviation: NA, not applicable.

^a Reported mean number of house staff from July 2012 through July 2019.

^b The mean value is rounded to the closest integer value; however, the nonrounded value was used to calculate the incidence rate.

Figure. Needlestick and Sharps Injury by Month



Needlestick and sharps injuries as a percentage of total injuries incurred by house staff and non-house staff employees, shown by month of injury.

third quarter (first quarter, 173 [24.2%]; second quarter, 148 [20.7%]; third quarter, 205 [28.7%]; fourth quarter, 189 [26.4%]; total, 715 injuries; $P = .02$). The third quarter corresponds to the first 3 months of residency training, from July to September. The annual NSI incidence rate did not significantly change among house staff from July 2012 to July 2019.

Discussion | We report what is, to our knowledge, the largest non-survey-based study of NSI events among house staff. We build on prior studies, which suggest that NSIs occur most often during the first 6 months of training,⁴ and further characterize this risk to be highest in the first 3 months of the academic year, with the transition from June to July representing a pivotal point for intervention. Our data suggest that there is a learning curve over which house staff acquire procedural skills, since July coincides with the onboarding of new resident physicians. This trend is unique to house staff in training, in that NSI frequency among non-house staff remained stable during the same period.

Postgraduate year information was not captured in our data set. Attributing the NSI risk to first-year residents may not explain the entirety of the observed increase, in that non-first-year residents may have new responsibilities resulting in increased fatigue, anxiety, or longer hours, leading to more injuries.⁶ Our findings suggest that preventive and educational strategies should target residents during onboarding and potentially be repeated annually between postgraduate years.

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1. National Institute for Occupational Safety and Health. NIOSH alert: preventing needlestick injuries in health care setting, NIOSH publication No. 2000-108. Published 1999. Accessed April 2, 2020. <https://www.cdc.gov/niosh/2000-108.html>.

2. United States General Accounting Office. Occupational safety: selected cost and benefit implications of needlestick prevention devices for hospitals, GAO-01-60R. Published November 17, 2000. Accessed October 1, 2020. <https://www.gao.gov/new.items/d0160r.pdf>

3. Makary MA, Al-Attar A, Holzmueller CG, et al. Needlestick injuries among surgeons in training. *N Engl J Med*. 2007;356(26):2693-2699. doi:10.1056/NEJMoa070378

4. Marnejon T, Gemmel D, Mulhern K. Patterns of needlestick and sharps injuries among training residents. *JAMA Intern Med*. 2016;176(2):251-252. doi:10.1001/jamainternmed.2015.6828

5. American College of Surgeons. What are the surgical specialties? Accessed April 2, 2020. <https://www.facs.org/education/resources/medical-students/faq/specialties>

6. Wicker S, Stirn AV, Rabenau HF, von Gierke L, Wutzler S, Stephan C. Needlestick injuries: causes, preventability and psychological impact. *Infection*. 2014;42(3):549-552. doi:10.1007/s15010-014-0598-0