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Healthcare workers' perceptions of occupational exposure

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Letters to the Editor

Factors Associated With Tuberculin Conversion Among Staff at a University-Affiliated Hospital

To the Editor:

Early identification of tuberculosis (TB) conversion among hospital workers is the cornerstone by which the quality of TB control measures can be evaluated. Moreover, regular screening identifies newly infected individuals, who are most likely to develop the disease during the 2 years following infection,[1] allowing timely chemoprophylaxis.

The aim of this study was to determine the incidence of, and factors associated with, tuberculin conversion at a university-affiliated hospital.

A retrospective cohort was compiled from staff at the University Hospital Puerta del Mar, Cadiz, Spain, from January 1989 through July 1996. This is an 850-bed tertiary-care facility with a staff of 2,700 and 24,000 admissions per year. Workers were classified as belonging to a high-risk work area if they had been employed for at least 1 year in the infectious diseases, pulmonary, or medicine unit; emergency department; adult intensive-care unit; pathology; or hematology. All 400 staff who were skin-test negative in January 1989 or who tested negative from that date through July 1996 were included in the study.

The test was read by the presence or absence of induration, as determined by palpation, 72 hours after inoculation, and the diameter of the induration was measured. The tuberculin skin-test (TST) conversion rate was defined as representing an increase of 10 mm or more in induration, with respect to that of any test carried out in the previous 2 years. From this information, Kaplan-Meier curves were drawn for each of the independent variables. Log-rank testing was used to compare the incidence density of the conversion among the groups. Cox's proportional hazards model then was used. Data analysis was carried out with SPSS 6.0 software (SPSS Inc, Chicago, IL).

TABLE

CUMULATIVE INCIDENCE AND INCIDENCE DENSITY OF TUBERCULOSIS CONVERSION IN RELATION TO THE INDEPENDENT VARIABLES STUDIED

	onverters	Non-converters	u ulative nci ence	nci ence ensit
Age				
≤38 y	31	178	14.8	52.2
>38 y	13	178	6.8	16.9
Gender				
Male	16	100	13.8	44.9
Female	28	256	8	27.8
Job category				
Nursing	19	119	13.7	37.1
Nursing auxiliaries	8	93	7.9	20.2
Patient transports	5	20	20.0	68.8
Doctors	2	30	6.2	22.1
Residents	1	18	5.2	30.7
Kitchen staff	4	48	7.7	25.1
Technicians	4	22	15.4	53.5
Other	1	6	14.2	37.3
Work area				
High-risk	29	135	17.7	49.1
Low-risk	15	221	6.3	19.4
BCG vaccination				
Yes	23	167	14.4	33.7
No	18	141	11.3	34.5
Not known	3	48	5.8	18.9
Totals	44	356	11	32.3

Abbreviation: BCG, bacille Calmette-Guérin.
* Per 1,000 person-years.

The incidence density of TST conversions was 32.3 per 1,000 person-years. Among subjects younger than the median (38 years), conversions were 52.2 per 1,000 person-years. High rates also were found among patient transporters (68.8/1,000 person-years) and technicians (53.5/1,000 person-years). High-risk–area workers also presented a higher incidence: 49.1 per 1,000 person-years (Table). The average age of TST converters was 37.1±5.9 years and of nonconverters was 39.4±8.3 years.

Kaplan-Meier analysis found TST conversion to be significantly associated with age (P=.01), work area (P=.003), job category (P=.012), and gender (P=.07). By Cox regression, age remained a risk factor: those <38 years were at 3.0 times greater risk (95% confidence interval [CI_{95}], 1.5-5.9) than those aged >38. The relative risk was 2.1 (CI_{95}, 1.0-4.5) for patient transporters and technicians, compared to other personnel. Workers in high-risk areas were at 2.1-fold (CI_{95}, 1.1-4.0) higher risk than their colleagues in low-risk areas. No interactions between these variables were detected.

The annual rate of TB conversion among hospital employees (3.2%) was higher than generally found in other hospitals.[2,3] This may reflect the high number of TB patients attended and the lack of negative-pressure rooms, high-efficiency particulate air filters, and UV irradiation lamps. It is also necessary to take into account data incidence among the population at large: these amount to 8.7 cases per 100,000 in the United States[4] and 40 cases per 100,000 in Spain.[5]

Bacille Calmette-Guérin vaccination data did not provide significant results and were not included in the final model. This result could imply an absence of any protection against conversion or the loss of that protection over time.

In conclusion, the incidence of TST conversion at the Puerta del Mar Hospital is high by comparison with other centers. Age, employment in a high-risk work area, and job category all were associated with *Mycobacterium tuberculosis* infection. Our screening and risk reduction programs for hospital staff should take into consideration the risk profiles described in this study.

Dedicated to the memory of Dr. Zarzuela-Ramirez's father, Manuel Zarzuela-Boy.

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Risk of Hepatitis A Among Hospital Personnel in an Intermediate-Endemicity Area

To the Editor:

Hepatitis A virus (HAV) infection has a worldwide distribution, and, like other enterically transmitted infectious diseases, its prevalence is strongly tied to levels of socioeconomic development and standards of hygiene.[1] Results of surveys carried out in countries such as France or Belgium have suggested that healthcare workers are at higher risk of hepatitis A.[2,3] However, data from other surveys have not demonstrated an increased prevalence of HAV antibody in this group compared with control populations.[4,5] European Mediterranean countries have been considered classically as areas of moderate endemicity for HAV, where infection occurs mainly in children and young adults.[1] However, epidemiological surveys carried out in recent years in Southern European countries have shown a decrease in the prevalence of antibodies against HAV and a change in the epidemiological pattern of HAV infection.[6] In fact, the prevalence of anti-HAV antibody has dramatically decreased in Spain in the last 15 years, resulting in a growing proportion of susceptible children and young adults.[7,8] The aim of this study was to determine whether hospital healthcare workers can be considered as a group at increased risk of hepatitis A in a country with intermediate endemicity of HAV.

The study population included healthy personnel between 18 and 45 years of age at one University General Hospital in Madrid, Spain. All healthcare workers and volunteers with nonhealthcare occupations who were seen by the Preventive Medicine Department for routine health checkups during 1996 were invited to participate. Information on age, gender, type of occupation, and years of professional activity was recorded. A 10-mL blood sample was collected for anti-HAV antibody determination by an enzyme-linked immunosorbent assay (Abbott Laboratories, Chicago, IL) in the Laboratory of Microbiology of the hospital.

Mean age in years (±standard deviation [SD]), mean duration of professional activity in years (±SD), and gender distribution at enrollment were calculated for both groups and were compared by analysis of variance (one-way) and chi-square tests, respectively. The overall prevalence of anti-HAV antibody in the two study groups, as well as the prevalence stratified by age (18-24, 25-31, and >31 years) and duration of activity (1-5 and >5 years), were calculated. The association between the prevalence of anti-HAV antibody and group (healthcare and nonhealthcare), controlled for age and duration of activity, was evaluated by Mantel-Haenszel stratified analysis (two-tailed) with calculation of the odds ratios and their 95% confidence intervals (CI_{95}, Cornfield's method). All statistical analyses were carried out using Epi Info (version 6.5; Centers for Disease Control and Prevention, Atlanta, GA).

A total of 182 subjects were recruited during 1996, 6% of all hospital personnel between 18 and 45 years of age. Of these, 68 (37%) had nonhealthcare occupations (mainly food handlers, cleaning personnel, and maintenance workers) and had a mean age of 31.7 (±6) years and a mean duration of activity of 9.0 (±2) years; 36% were male. The remaining 114 (63%) were healthcare workers (physicians or nursing personnel) and had a mean age of 26.6 (±4) years, and a mean duration of activity of 6.0 (±1.5) years; 31% were male. Differences between groups in relation to age and duration of activity, but not gender distribution, were statistically significant (P<.05).

The prevalences of anti-HAV antibody of nonhealthcare personnel and healthcare workers were 54.4% (CI_{95}, 43%-66%) and 21.9% (CI_{95}, 14%-29%), respectively (P<.01). The Table shows the prevalence of anti-HAV antibody found in both groups (healthcare and nonhealthcare) when they were stratified by age and duration of professional activity.

These results show a lower level of anti-HAV prevalence among healthcare workers than among a control group of nonhealthcare personnel, even when age and duration of activity were controlled. The prevalence of anti-HAV antibody in relation to age in this group of physicians and nursing personnel was also lower than that found in samples of the Spanish population of similar age.[7,8] These results suggest that, in areas where hepatitis A is still moderately endemic, healthcare activity is not a risk factor for HAV infection and that presence of anti-HAV antibody is more likely to be associated with other factors, such as socioeconomic level or standards of hygiene. A relatively low level of HAV seropositivity was found among the group of physicians and nursing personnel younger than 31 years of age (10% and 23% for the groups of age of 18-24 and 25-31 years, respectively). Moreover, the prevalence of anti-HAV antibody has been falling over the last 2 decades, so it is likely that future healthcare personnel increasingly will be susceptible to HAV infection.[7,8] In addition, physicians and nursing personnel are more likely than the general population to have contact with contagious patients, and outbreaks of hepatitis A among healthcare personnel have been described.[9,10]

Studies to determine the incidence of hepatitis A in this population, as well as clinical studies to show the effectiveness of HAV vaccine in postexposure prophylaxis and cost-effectiveness studies for different strategies, will be needed to formulate specific recommendations for the appropriate use of hepatitis A vaccines in healthcare personnel.

TABLE

ASSOCIATION BETWEEN HEPATITIS A PREVALENCE AND PROFESSIONAL ACTIVITY, CONTROLLING FOR AGE AND DURATION OF ACTIVITY

	Prevalence of Anti-HAV			
	Healthcare Worker		Nonhealthcare Worker	
	N	Prevalence	N	Prevalence
Age (y)*				
18-24	72	10%	17	29%
25-31	22	23%	20	35%
>31	20	65%	31	81%
Duration of activity (y)†				
1-5	84	11%	34	26%
>5	30	45%	34	82%

Abbreviations: CI_{95}, 95% confidence interval; HAV, hepatitis A virus; OR, odds ratio.
* Healthcare versus nonhealthcare: OR, 2.5; CI_{95}, 1.1-5.9; P=.02.
† Healthcare versus nonhealthcare: OR, 4.1; CI_{95}, 1.8-9.2; P=.0004.

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Hepatitis B Morbidity in Municipal and Hospital Waste Collection Workers in the City of Rio de Janeiro

To the Editor:

Occupational exposure of municipal and hospital waste collection workers has been the subject of some studies in recent years, mainly because of the growing public concern about environmental and worker health issues.

Stratton et al[1] identify hepatitis B virus (HBV) as an occupational risk for healthcare and related occupation workers. We studied occupational exposure of municipal and hospital waste collection workers to HBV with the aim to compare both populations and to evaluate their HBV morbidity and mortality and the necessity of occupational prevention.

A cross-sectional morbidity study of hepatitis B was conducted between May and July of 1996 among hospital collection workers and in a sample of municipal waste collection workers of Municipal Urban Cleaning Company of Rio de Janeiro (COMLURB).

The "exposed group" consisted of all workers serving specific hospital waste collection routes. As identified by COMLURB, 32 workers served those routes.

The "non-exposed group" consisted of a sample of the municipal waste collection worker population. As the hospital waste collection is carried out during the day, in the study, only the municipal waste collection workers who work daylight hours were considered, totaling 503 individuals. A sample of 156 workers was sought based on an estimated hepatitis B prevalence of 16% for this population.[2]

From each worker a blood sample of 10 mL was collected by vacutainer. The samples were taken to the Virology Laboratory of the Pathology Clinic at Clementino Fraga Filho Hospital of the Federal University of Rio de Janeiro, where the serum was preserved in a cool chamber. The enzyme-linked immunosorbent assay tests AUSAB (anti-hepatitis B surface antigen [HBs]) and CORZYME (anti-hepatitis B core antigen [HBc]) were used (Abbott Laboratories, North Chicago, IL).

Workers were considered to have previous exposure if either anti-HBc or anti-HBs (without previous vaccination) were presented.

Two nonexposed workers did not agree to have their blood drawn. The blood collected from one of the exposed workers was insufficient to accomplish the tests. As shown in the Table, the prevalences of HBV markers among the remaining municipal and hospital waste collection workers were 14.2% and 12.9%, respectively, and did not statistically differ.

There are no prevalence data of hepatitis B for the Rio de Janeiro pop-

TABLE
PREVALENCE OF HEPATITIS B INFECTION IN 155 MUNICIPAL AND 31 HOSPITAL WASTE COLLECTERS, RIO DE JANEIRO

	unicipal		Hospital	
Anti o	**N**		**N**	
Anti-HBc + anti-HBs	18	11.6	4	12.9
Anti-HBc	1	0.6	—	—
Anti-HBs	3	1.9	—	—
Total	22	14.2	4	12.9

Abbreviations: anti-HBc, anti-hepatitis B core antigen; anti-HBs, anti-hepatitis B surface antigen; CI_{95}, 95% confidence interval; OR, odds ratio.
OR, 0.9; CI_{95}, 0.24-3.05; *P*=.9246.

ulation to compare with the results of the present study, and thus it is not possible to know if the prevalence of hepatitis B in these workers is higher than in the general population. However, there is no doubt that these values can be considered high. The high level of accidents with sharp materials among these workers and the risks of infectious disease transmission[3] argue that they should be vaccinated against hepatitis B.

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Healthcare Workers' Perceptions of Occupational Exposure

To the Editor:

Healthcare workers (HCWs) are at risk for occupational exposure to bloodborne pathogens.[1-3] Despite documentation of this risk and the establishment of mandatory national standards for preventive practice, HCWs have low adherence to Universal Precautions.[4,5] To understand this phenomenon, we conducted focus-group interviews with participants from high-risk occupational groups: students, residents, operating room (OR) staff and surgeons, and emergency department (ED) staff and physicians. Forty-eight individuals participated in 10 focus groups between February and March 1996. Each group was asked to describe factors that affected their risk of exposure, and how they responded to occupational risk. Discussions were transcribed and thematically analyzed, and the results were assessed for trustworthiness using accepted methods.[6]

The participants included 27 women and 21 men. Three of the focus groups were comprised of surgeons, four of nurses (OR and ED), and one each of medical residents, emergency physicians, and medical students. Participants' clinical experience ranged from less than 1 year to more than 10 years, and less than 10% reported a personal history of occupational exposure. The Table summarizes the categories of risk factors identified by participants. In this report, we highlight unexpected findings, using representative quotations, regarding risk factors for exposure and efforts to decrease occupational risk.

Only medical students and residents identified intimidation as a factor that led to increased risk of exposure. Intimidation by other residents and attending physicians led them to feel hurried or forced into actions that increased the risk of injury. A student reported, "I think there is a lot of pressure not to say, 'Excuse me, I don't feel comfortable'." Despite a decade of educational and preventive efforts, surgeons and some residents still described exposure as an unavoidable job hazard. One participant said, "If your number's up, your number's up."

Surprisingly, some participants in all groups felt their risk was influenced by the behavior of other workers, not their own behavior. A surgeon reported, "Most of the sticks I've had were not sticks I inflicted on myself." An OR nurse echoed, "It's usually somebody else's fault that you got stuck; it's not your own fault that you got stuck." And a resident said, "I got stuck with a needle, and it wasn't even something I did; I thought it was someone else's carelessness."

Only surgeons and trainees indicated that one method they used to reduce occupational risk was to avoid invasive procedures and high-risk patients. They also indicated that they modeled preventive practices of senior staff. One reported, "Surgeons are inherently hero worshippers who focus on individuals and pattern themselves after individuals." Only nurses identified organizational strategies, such as safety guidelines and policies, as mechanisms for reducing exposure. They often cited that mandatory policies were the reason they used personal protective equipment. They noted, however, that policies were not uniformly applied or reinforced. "The big thing with policies is that they have to be enforced, and they have to be enforced 100% of the time for 100% of the people. And they're not." Another nurse noted, "Policies around here are like rain; you hear them, and then they're gone."

Our purpose was to use qualitative methods to identify factors that would help us to create effective intervention programs for decreasing occupational exposure. This study corroborated findings of earlier studies, underscoring the trustworthiness of the data, but also identified risk factors that had not previously been detailed or included in studies of occupational risk. The most noteworthy of these factors were intimidation and the attribution of occupational risk to others. The perception that one's risk of occupational exposure depended on someone else's carelessness, not on one's own behavior, was shared by different

TABLE
RISK FACTORS FOR OCCUPATIONAL EXPOSURE IDENTIFIED BY HEALTHCARE WORKERS

Risk Factor	Representative Quotations
Mechanism of injury	"Hollow-bore needles pose the greatest risk." (surgeon)
	"I know two people who have been stuck, both with suture needles, not hollow-bore needles. It's better [to get stuck with a suture needle]." (student)
Intimidation	"Sometimes you're forced into doing things you really don't want to do [that put you at risk] because you don't want to look weak." (resident)
	"The intern was hurrying me up, basically telling me how weak I was, not going fast enough. He ordered me to change needles on a blood culture, and in the process, I got stuck." (resident recalling exposure while a student)
Professional risk	"I don't think there's any way for a cardiac surgeon to modify the way he or she does the procedure to increase the distance between them and the blood." (surgeon)
	"It's sort of the risk I'm taking as a healthcare worker." (resident)
Patient factors	"If I'm working with a gang leader or an IV drug user, I am definitely more aware that that person is giving me a risk." (nurse)
	"That little old lady could have raging hepatitis C, but it's still harder to get gowned up for that little old lady." (emergency room physician)
Procedural experience	"I think it is people who are inexperienced [who get exposed]." (resident)
	"People that have never done it [a procedure] are more likely to make mistakes [that lead to exposure]." (resident)
Situational factors	"It [concern about exposure] isn't because I don't use Universal Precautions; it's when I'm tired. Most people are usually tired when it happens." (resident)
	"The reason for an exposure is you're moving too fast." (nurse)
Lack of personal protective equipment	"If you have two layers of rubber [gloves] on, it does protect you as opposed to one." (surgeon)
	"I got squirted in the face once. I hadn't put on my glasses yet." (student)

groups of HCWs. This phenomenon of attributing blame to others has been desorbed previously in psychology literature.[7] Although successful outcomes often are attributed to one's own behavior, failures are more likely attributed to "outside" causes. For example, an injury such as a needlestick is attributed to the situation or other people, circumstances outside of the individual's control. A worrisome finding is that, despite substantial educational and public message efforts, some medical trainees still perceive that occupational risk is unavoidable.

Our findings suggest that risk factors for occupational exposure and responses to risk can be unique to specific groups of health professionals. Thus, tailoring training programs to the target group may help to design programs that are more effective in reducing occupational exposure to bloodborne pathogens. For example, knowing that intimidation is a perceived risk factor and that role modeling is a cultural norm for learning preventive precautions among trainees suggests that this factor and teaching technique be specifically included in an intervention program. In contrast, nursing professionals are less likely to find these to be pertinent issues. Intervention programs that emphasize organizational strategies are more likely to be effective for them.

Qualitative research methods can provide information about perceptions and practices that otherwise can be difficult to obtain.[8] They cannot answer questions of magnitude or prevalence of risk factors, nor do they readily allow generalization of findings to other settings. This study suggests factors that, with additional research, may provide important insights in efforts to design interventions for specific groups of at-risk health professionals. Attention to these factors may allow training programs to be tailored appropriately to the target group and may result in effective programs for reducing occupational exposure to bloodborne pathogens.

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Tea as a Source of *Acinetobacter baumannii* Ventilator-Associated Pneumonia?

To the Editor:

Acinetobacter baumannii increasingly has been involved as an agent of hospital outbreaks worldwide. The most common site of nosocomial infections is the respiratory tract, especially in ventilated patients, followed by bloodstream infections.[1] The incidence of *Acinetobacter* species as a cause of nosocomial pneumonia has increased despite advances in the management of ventilated patients and the use of better disinfection procedures for ventilatory equipment. Spread of *Acinetobacter* via hands of staff members was found to be important in many studies.[2] Outbreaks due to contaminated medical equipment and materials, including mattresses and pillows, also have been reported,[3] but tea or other fluids used for mouth hygiene have not previously been reported as a source of infections caused by *Acinetobacter* species.

Between October 1997 and October 1998, *A baumannii* (identified by API 20 NE, bioMérieux, Nürtingen, Germany) was isolated in our neurological intensive-care unit from tracheal secretions (39 patients), a cerebrospinal fluid specimen, and a skin swab. All isolates but one were sensitive to cotrimoxazole. Ventilator-associated pneumonia caused by *A baumannii,* alone or in combination with other pathogens, was diagnosed in 18 patients. There was one case of relapsing *Acinetobacter* ventriculoperitoneal shunt infection.

Genotyping by randomly amplified polymorphic DNA-polymerase chain reaction revealed 10 genetically different strains, 6 of which were involved in small clusters of colonized or infected patients.[4]

Sampling of 288 environmental sites (including hands of personnel) revealed three strains isolated from tapwater and from anti-splash nozzles that were identical to those found in three patients. Contaminated respiratory equipment or contamination of the patients' inanimate environment could not be identified. One of the outbreak strains also was isolated from tea used for mouth care. Native tea was found to be heavily contaminated with a wide range of gram-negative bacteria, but not with *A baumannii.*

Contamination of the brewed tea may have occurred due to mixing the hot tea with tap water to cool it or to brewing with tap water insufficiently heated in an automatic water heater.

Our findings raise the possibility of the acquisition of *A baumannii* from tea used for mouth hygiene.

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