

Tuberculin reactivity among health care workers in nonhospital settings

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Background: We used workers' compensation data to identify health care workers at risk of tuberculosis exposure in the hospital and nonhospital environment.

Methods: We identified State Fund workers' compensation claims having a documented tuberculin skin test (TST) conversion (size ≥ 10 mm) with a previous negative skin test between 1996 and 2000 in the State of Washington.

Results: Health care workers experienced an overall accepted workers' compensation claim rate of 2.3 claims/10,000 full-time equivalent employees (FTEs) per year for tuberculin reactivity. Receptionists accounted for the largest number, with 18.4% tuberculin reactivity claims. The number of tuberculin reactivity claims was the highest for offices and clinics of doctors of medicine (3.7 per 10,000 FTEs), followed by medical laboratories (2.6 per 10,000 FTEs).

Conclusion: This study allowed characterization of employees in various nonhospital health services locations with higher number of tuberculin reactivity. (Am J Infect Control 2006;34:338-42.)

Nosocomial transmission of tuberculosis (TB) is a growing public health concern for health care workers (HCW), and this has been heightened by the emergence of multidrug resistant strains of *Mycobacterium tuberculosis*.^{1,2} To address this growing public health problem, the Centers for Disease Control and Prevention (CDC) published guidelines on how to prevent the transmission of the disease in health care settings in 1990 and revised them again in 1994.^{3,4} The Occupational Safety and Health Administration (OSHA) proposed new regulations in 1997 to protect workers in health services with an increased risk of tuberculosis exposure.⁵ The tuberculin skin test, the intradermal injection of a purified protein derivative (PPD) of

Mycobacterium to diagnose latent tuberculosis infection, has been the cornerstone of TB control for the early identification of tuberculosis conversion among HCW.⁶

Tuberculin reactivity among HCW in "hospital settings" has been the focus of current research.⁷ This study was conducted to characterize accepted workers' compensation claims for tuberculin reactivity filed by Washington State HCW in "non-hospital settings." These databases have been used successfully in several studies looking at illness and injury hazards and workplaces at risk.⁸⁻¹¹

METHODS

In Washington State, employers are required to obtain workers' compensation insurance through the Department of Labor and Industries (L & I) State Fund, unless they are able to self-insure, are self-employed, or are employed by the federal government. The L & I State Fund cover approximately two thirds of the workers in Washington State (the remainder work chiefly for the 400 largest employers in Washington State and are covered by their self-insured employers). We obtained all accepted workers' compensation claim data for HCW (employees working in Standard Industrial Code (SIC) 80-health services with date of injury between January 1, 1996, and December 31, 2000. Further details are available elsewhere.¹¹ In this study, we obtained all State Fund claims with tuberculin activity.

Definition and characterization of tuberculin reactivity claims

We screened a claim as "tuberculin reactivity" if the American National Standard Institute¹² nature code

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was "153-Tuberculosis" or the source code was "2700-infectious agent" or body part involved "850-respiratory system" or if a text word search of the workers' compensation report of the accident form for specific injury sources found the words "tuberculosis" or "TB exposure," "exposed to TB" or "TB test," "positive PPD" or "positive skin test," "TB infection" or "diagnosed with TB," or "Mantoux test." A tuberculin reactive case was defined as a State Fund claim having a documented tuberculin skin test (TST) conversion (size ≥ 10 mm) with previous negative skin test result. Employment information is reported to L & I by State Fund employers as the number of hours worked by employees for each quarter of the year. These hours are reported by the employers' account. The number of full-time equivalent employees (FTEs) was calculated by assuming that each FTE worked 2000 hours per year (40 hours per week for 50 weeks per year). SIC codes were used to differentiate hospital and non-hospital settings, eg, SIC 8011 for offices and clinics of doctors of medicine, and SIC 8021 for offices and clinics of dentists.

Statistical analysis

The analysis focused on State Fund accepted claims. Descriptive analyses included a frequency of claims by location (nonhospital and hospital) and job category. Accepted claim rates for tuberculin reactivity were calculated over the study years. Payroll data reported to the workers' compensation system were used to extract the number of hours worked. Number of hours was aggregated (to the SIC level) and reported separately by year. Claims' incidence rates were calculated by year and expressed as the number of claims per 10,000 FTEs. Test for trend of incidence rates over time was performed. We used a Poisson regression model to test for evidence of a trend in claims' rates as a function of calendar year.

RESULTS

A total of 74,758 workers' compensation claims in the health services industry (SIC 80) were filed for work-related injuries from January 1, 1996, to December 31, 2000. Of these, 1059 met the initial screening criteria, and, of those, 859 were excluded for not being tuberculin reactive cases after a detailed study of medical records. There was a total of 152 State Fund tuberculin reactivity claims in nonhospital settings. The claim for workers' compensation of a significant proportion ($n = 38$) of HCWs with tuberculin reactivity was rejected for a possible occupational exposure. The majority (82%) of the accepted claims had a documentation of chemoprophylaxis (115 isoniazid; 4 Rifampin).

Table 1. Characteristic of the State Fund health care workers with tuberculin reactivity,* Washington State, 1996-2000

Characteristic	Nonhospital N	%
Sex		
Female	120	78.9
Male	32	21.1
Marital status		
Married	89	58.6
Unmarried	63	41.4
Age, yr		
<26	28	18.4
26-35	54	35.6
36-45	40	26.3
46-55	24	15.8
>55	6	3.9
Occupation		
Receptionist	28	18.4
Nurse	22	14.6
Nursing assistant	15	9.9
Physician (MD)	13	8.5
Medical assistant	18	11.8
Lab assistant	16	10.5
Support staff	7	4.7
Home health aide	9	5.9
Technician	3	1.9
Therapist	3	1.9
Housekeeping staff	7	4.7
Counselor	4	2.6
Food handler	4	2.6
Dental assistant	2	1.3
Occupation not reported	1	0.7
Total	152	100.0

*Purified protein derivative positive.

HCWs experienced an overall accepted workers' compensation claim rate of 2.3 claims/10,000 FTEs per year for tuberculin reactivity, with the rate increasing from 1.3 claims/10,000 FTEs in 1996 to 2.4 claims/10,000 FTEs in 2000. The reported rate of tuberculin reactivity did not increase significantly (P value = .95) over the study period.

Table 1 shows demographic characteristics of the study population and the number and percentage of tuberculin reactivity by job category and location. Receptionists accounted for the largest number of HCW involved in the "non-hospital" setting, with 28 (18.4%) tuberculin reactivity claims, followed by nursing assistants, with 22 (14.6%), and medical assistants, with 22 (11.8%). Figure 1 shows the median TST diameters for 111 claims for tuberculin reactivity in "non-hospital settings," and the median PPD size was 15 mm.

The number of tuberculin reactivity claims and the corresponding claims' rate in each of the health industry groups are presented in Table 2. The number of tuberculin reactivity claims was the highest for offices

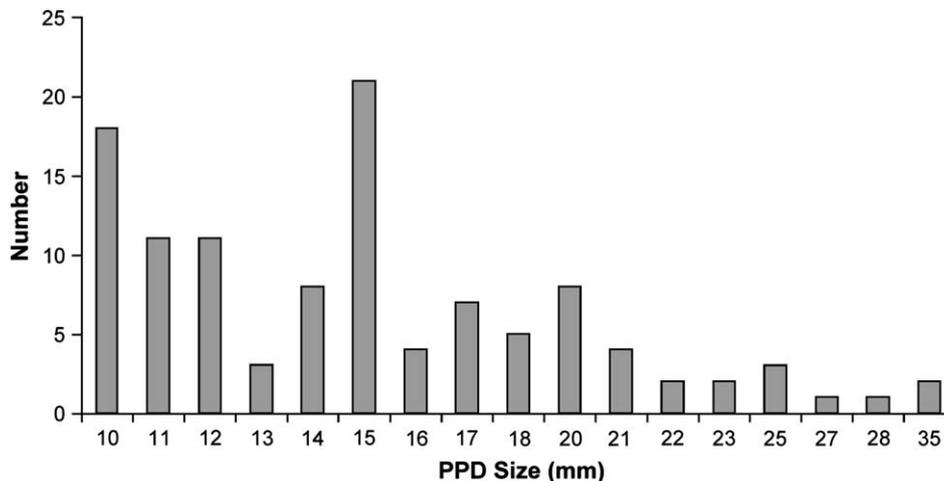


Fig 1. State Fund claims with documented tuberculin skin test conversion size in nonhospital settings, Washington State, 1996-2000.

Table 2. Washington State Fund claims incidence rate for tuberculin reactivity among health care workers by health facility location, 1996-2000

SIC Description	FTEs	Count	Rate per 10,000 FTEs
8011 Offices and clinics of doctors of medicine	219,801	103	4.7
8071 Medical laboratories	35,236	9	2.6
8051 Skilled nursing care facilities	135,221	20	1.5
8082 Home health care services	31,619	4	1.3
8093 Specialty outpatient facilities	34,036	8	2.4
8049 Offices and clinics of health practitioners	28,848	5	1.7
8059 Nursing and personal care facilities, NEC	12,766	3	2.3

FTEs, full-time equivalent employees.

and clinics of doctors of medicine (3.7 per 10,000 FTEs), followed by medical laboratories (2.6 per 10,000 FTEs) among State Fund accepted claims.

The cost incurred on these claims was also estimated. The mean cost per accepted claim for tuberculin reactivity was US \$290 (median, \$162). The mean cost per rejected claim with tuberculin reactivity was \$113 (median, \$79). The mean cost for a compensable claim (≥ 4 days of lost time from work) was \$1756 (median, \$1580).

DISCUSSION

Mycobacterium tuberculosis is carried through the air in infectious droplets nuclei, and these droplet nuclei may be generated when a person with infectious tuberculosis diseases coughs, speaks, sings, or spits. In an

occupational setting, workers in close contact with persons with infectious tuberculosis diseases are at increased risk of infection with tuberculosis. The increased risk among receptionists is apparent, given the nature of disease transmission and frequent close patient contact. Managers and support and housekeeping staff who did not provide direct medical care, but shared a common environment, have had tuberculin reactivity. These results are in agreement with other studies.^{13,14} Rates by occupation could not be calculated because denominator data were not available by occupation.

Lower tuberculin reactivity rates were found in this study when compared with other studies of this nature.^{15,16} Our findings may reflect an underestimate of the actual burden of disease because of under-reporting of occupational injury and illness to workers in compensation systems.^{17,18}

The TST remains the only validated method to diagnose tuberculosis at an early stage (latent tuberculosis). The ongoing monitoring of tuberculin conversion among HCWs, and use of chemoprophylaxis in case of a positive test, is important for the success of TB infection control programs.¹⁹ In this study, a substantial number of skin test converters were prescribed chemoprophylaxis. Data were limited on how many of those actually completed 6-month treatment regimes. Camins et al found that slightly more than half (55%) of HCWs completed a 6-month course of isoniazid therapy; others discontinued because of adverse drug effects or simple noncompliance.²⁰

The claim for workers' compensation of a significant proportion (n = 33) of HCWs with tuberculin reactivity was rejected for a possible occupational exposure. An ill or injured employee has to prove that the injury or illness is related to a work activity

to benefit workers' compensation such as reimbursement of lost wages and complete payment of all medical bills related to the injury. In many cases of physical injury such as a cut or a fall, work-related injury is not difficult to prove because there is physical evidence, but, for a TB exposure, identification of the source client is difficult because of the airborne nature of disease transmission. This remains one of the legal issues in workers' compensation.²¹

In this study, we were able to document tuberculin reactivity among HCWs in a number of nonhospital health care facilities. HCWs who work in offices and clinics of physicians assumed the highest priority places for intervention. This study clearly demonstrates the need to address TB transmission in small health care facilities such as offices of physicians.

We estimated direct average cost incurred on tuberculin reactivity claims. The mean cost was particularly high for compensable claims (≥ 4 days of lost time from work). A single indicator such as direct cost does not capture all the dimensions of disease burden. Burden also includes indirect costs (often borne by the workers and their families as well as the employer and community) such as lost productivity, increased absenteeism, higher employee turnover, and recruitment of replacement workers.

There are several potential limitations in using workers' compensation data to describe injury and illness rates. Workers' compensation data may underreport the true number of events because both a worker and a physician must recognize his or her condition as work related and file a claim with L & I. The worker must also satisfy the state criteria for eligibility to have an injury or illness accepted by the Washington State workers' compensation system. We describe the tuberculin reactivity rate as a measure of incidence, with claims as the numerator and hours of work as the denominator. If significant numbers of work-related injuries or illness were not reported to the workers' compensation system (eg, on-site medical care, failure to report), the injury rate presented here would be underestimated. Because rates are based on employer-reported hours, potential bias in rate estimates could occur if employers overreport or underreport the number of hours worked by their employees. The case definition of tuberculin reactivity is sensitive to the American National Standard Institute z16.2 coding for type, source, and nature of claims. Some of the tuberculin incidents may not have been identified because of coding inconsistencies, leading to an underestimation of the number of identified incidents.

In summary, the TB burden we identified in this study may represent only a fraction of the actual burden of disease. Proper documentation of worker PPD conversions and TB disease on OSHA 200-log by

employers, as required under the OSHA standards in health care facilities, might help us to clarify further the extent of the problem. This study allowed identification of characteristics of employees with higher number of PPD conversions in nonhospital health services locations. Further studies are needed to evaluate whether health care personnel working as receptionists and in doctors' offices may be at higher risk of exposure. This would help to understand better this problem and guide intervention strategies to target such facilities. Although the overall TB rates among nonhospital workers were lower, they still represent a substantial occupational and public health threat because this is a group that is more fragmented and may often be working in smaller places with limited resources for safety and infection control. Promoting appropriate TB prevention strategies in nonhospital health care settings would not only prevent illness but also decrease the number of compensation claims in the state.

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