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HIV Status among Patients with Tuberculosis and HIV Testing Practices by Connecticut Health Care Providers

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Abstract

Knowing the human immunodeficiency virus (HIV) status of persons infected with *Mycobacterium tuberculosis* is important for individual treatment and preventing transmission. This evaluation analyzed surveillance data and surveyed health care providers who care for patients with HIV and tuberculosis (TB) to understand the factors contributing to suboptimal levels of Connecticut patients with TB having a known HIV status. During 2008 to 2010, 208 (76.2%) of 273 patients had a known HIV status; 12 (5.8%) were HIV-positive. Patients who were more likely to have a known HIV status were younger (40.5 vs 54.6 years, $P < .001$) or received care in a TB clinic (risk ratio, 1.26; 95% confidence interval, 1.12–1.42). Among 77 providers, 48 (62.3%) completed the survey, 42 (87.5%) reported routinely offering HIV testing to patients with TB, and 26 (54.2%) reported routinely offering HIV testing to patients with latent TB infection (LTBI). We conclude that interventions for improving HIV testing should focus on non-TB clinic providers and patients with LTBI.

Keywords

HIV; tuberculosis; latent tuberculosis infection; surveillance

In persons infected with human immunodeficiency virus (HIV), latent infection with *Mycobacterium tuberculosis* progresses to tuberculosis (TB) at higher rates than in persons who do not have HIV infection and coinfected persons have an elevated risk of reactivation

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Authors' Note

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at a later date,[1,2] thereby sustaining TB transmission in local populations.[3] Despite consistent annual reductions in TB incidence since 1992,[4] the US Centers for Disease Control and Prevention (CDC) goal of national TB elimination, defined as a TB case rate of no greater than 1 per million persons,[5] has not been achieved, in part because of *M tuberculosis*–HIV coinfection.[6]

Because knowing the HIV status of a patient with TB is essential for optimal treatment and management of both diseases[6,7] and for TB control strategies, CDC recommends testing all patients with TB for HIV.[8] As a component of the national TB elimination strategy,[5] a performance target of 88.7% of the patients with TB having a known HIV status was set for the year 2015.[9] Although HIV testing for persons with latent TB infection (LTBI) is not as strongly recommended as for patients with TB, the fact that TB develops at a much greater rate in HIV-infected patients and treatment of LTBI in these patients reduces the rate of TB by 62% suggests that HIV testing should be done for all persons with *M tuberculosis* infection.[10]

In 2008, only 75% of the Connecticut patients with TB had a known HIV status. In 2010, the Connecticut Department of Public Health (DPH) TB Control Program assessed HIV testing among patients with TB and LTBI to better understand why the rate of known HIV status was less than the national goal. As part of this plan, TB surveillance data were analyzed and health care providers who delivered care services for patient with TB were surveyed to assess the extent of HIV testing among patients with TB and LTBI and to identify challenges to those providing HIV testing.

Methods

A review of the study by the CDC Office of Human Subjects determined that it entailed an assessment of routine public health practice and human participants' research was not considered. Health care providers report incident TB cases in Connecticut to the DPH TB Control Program using a standardized TB surveillance case report form that includes demographic characteristics, TB clinical information, treatment, and TB medical and sociobehavioral risk factors, including HIV status. For this analysis, HIV status was defined as known (positive or negative) or unknown (refused testing and not offered testing). Patients with TB were categorized as having had at least 1 sociobehavioral risk factor for TB if reported within the year prior to TB diagnosis to have used illicit intravenous drugs, nonintravenous drugs, or excessive alcohol, to have been homeless, or at the time of TB diagnosis, to have been incarcerated. HIV data for patients with LTBI were available for contacts to persons with pulmonary or laryngeal TB, young children, HIV-infected persons, and patients who receive medication from DPH. Types of provider practice were categorized as private independent office, community health clinic, hospital-based clinic, hospitalist, and other. Some providers also saw patients at 1 of the 9 TB clinics staffed by infectious disease or pulmonary medicine specialists who deliver comprehensive TB and LTBI diagnostic and medical care in Connecticut.

Connecticut health care providers, ascertained from surveillance records as having delivered patient care services for TB during 2008 to 2009, were surveyed during December 2010 to

January 2011. These providers were surveyed using an anonymous, self-administered questionnaire to learn about the providers' type of practice, number of patients with HIV during 2005 to 2009, and providers' current HIV testing practices of patients with TB and LTBI. To assess the frequency at which patients with TB refused HIV testing, the questionnaire defined refusal of HIV testing semiquantitatively as "never" (0% of the time), "infrequently" (1%–35% of the time), "often" (36%–69% of the time), "most of the time" (70%–99% of the time), and "always" (100% of the time).

Associations were measured using Mantel-Haenszel risk ratios (RRs) that were evaluated for statistical significance using 95% confidence intervals (CIs). Independent 2-sample *t* tests with equal or unequal group variance were used to compare group means. All tests were 2-sided and a *P* value ≤.05 was considered statistically significant. Analyses were stratified according to select TB surveillance and survey variables including patients' demographic characteristics and facility of TB care, and providers' reported medical specialty and the number of patients with HIV. Data analysis was generated using SAS software v9.3 2010 (SAS Institute Inc., Cary, NC, USA).

Results

During 2008 to 2010, 278 TB cases were reported in Connecticut, of which 5 were reported as the patient having died by the time of TB diagnosis. This analysis was done for 273 patients surviving with TB, of whom 208 (76.2%) had a known HIV status and 65 (23.8%) had an unknown HIV status. Of the 208 patients with TB, 12 (5.8%) with a known HIV status had HIV infection and 196 (94.2%) did not have HIV infection. Of the 65 patients with TB with an unknown HIV status, 51 (78.5%) were not offered HIV testing and 14 (21.5%) refused HIV testing. The HIV testing for persons with LTBI was less frequent. Among 6468 persons with LTBI during 2008 to 2010, 27.7% were not offered HIV testing and 44.6% had an otherwise unknown HIV status. Of 1681 persons with LTBI and a known HIV result, 68 (4.0%) tested positive.

The mean age of patients with TB with a known HIV status was 40.5 years, compared to 54.6 years for patients with TB with an unknown HIV status ($P < .001$). The patients with TB aged ≥65 years had the highest proportion of unknown HIV status (26 of 56, 46.4%), compared to all other age groups (39 of 217, 18%, $P < .001$). Likewise, a statistically significant younger mean age was found for patients with TB with a known HIV status compared to patients with TB with an unknown HIV status when stratified by sex, race, and foreign birth. There were no differences between patients with TB with a known HIV status and an unknown HIV status according to sex, race, ethnicity, US or foreign birth, sociobehavioral risk factors for TB, or providers' medical specialty (Table 1).

The 77 patients with TB who received care in any of the 9 TB clinics were more likely to have had a known HIV status compared to the 196 patients with TB who received care at other settings (RR, 1.26; 95% CI, 1.12–1.42). Similarly, patients who received care at a TB clinic were statistically more likely to have had a known HIV status when stratified by sex, race, and foreign birth. Among patients with TB who received care at a TB clinic, the mean age of patients with a known HIV status was 35.6 years compared to 56.1 years for patients

with an unknown HIV status ($P < .01$). The data on HIV testing for patients with LTBI did not include the information for determining factors associated with HIV testing rates.

We identified 84 health care providers who we believed delivered patient care services for persons with TB in Connecticut during 2008 to 2009. However, 6 providers were excluded from the analysis because they reported not delivering patient care services for persons with TB and 1 was excluded because the questionnaire was not completed. The questionnaire was completed by 48 (62.3%) of 77 providers, all of whom reported delivering health care services to patients with TB and LTBI during 2005 to 2009; 39 (81.3%) also reported delivering health care services to persons with HIV infection during 2005 to 2009. Half (24) of responding providers reported specializing in pulmonary medicine, 23 providers (47.9%) reported specializing in infectious diseases, and 1 was an internist.

Of the 48 providers who delivered health care services to patients with TB and LTBI, 42 (87.5%) reported routinely offering HIV testing to patients with TB and 26 (54.2%) reported routinely offering HIV testing to patients with LTBI (RR, 1.62; 95% CI, 1.22–2.14). There were no differences in providers' reported HIV testing practices according to their reported specialty, types of provider practice, or number of patients infected with HIV. Of the 48 responding providers, 34 (70.8%) reported patients with TB infrequently refuse HIV testing. The most common reasons cited by providers for why patients with TB refuse HIV testing included stigma associated with HIV diagnosis and patients' perception of not being at risk for HIV (Table 2).

Discussion

The proportion of patients with TB reported in Connecticut during 2008 to 2010 with a known HIV status (76%) fell short of the CDC 2015 national performance target of 88.7% but exceeds the national average (65%).[9] The majority (79%) of patients with TB with an unknown HIV status were not offered HIV testing. Still, most providers who recently delivered health care services to patients with TB and LTBI in Connecticut reported routinely offering HIV testing to patients with TB, although fewer of these providers reported routinely offering HIV testing to patients with LTBI. Nonuniversal HIV testing for patients with TB persists despite recommendations that all patients with TB and their contacts should be routinely screened for HIV infection, regardless of risk factors for HIV infection,[8] and that all persons aged 13 to 64 years should be routinely tested when accessing health care settings. Knowing that a patient with LTBI has HIV infection increases the urgency of treating the *M tuberculosis* infection, and it informs the patient about the need for managing both infections.[8]

The highest rates of TB during the study period were seen among persons aged 25 to 44 years (11.7 cases per 100 000 population) followed by persons aged ≥65 years (11.1). As the population with LTBI ages, determining their HIV status will become increasingly important for prioritizing their care, and for preventing TB.[11] However, findings from a multijurisdictional study that assessed previous HIV testing among patients older than 13 years with newly diagnosed HIV infection for the period 2006 to 2009 suggest that many newly diagnosed patients older than 50 years were not previously tested for HIV infection.[12]

In Connecticut, during 2008 to 2010, patients with TB with a known HIV status were significantly younger than were patients with TB with an unknown HIV status, a finding that is consistent with a national study that assessed the HIV status of patients with TB according to patients' age using TB surveillance data for the period 1993 to 2006.[11] This national study found that a lower proportion of patients with TB aged ≥65 years had a known HIV status and were offered HIV testing compared to patients with TB aged 21 to 64 years. However, in contrast to an earlier national study that found knowing the HIV status of patients with TB varied by sex, race, and ethnicity for the period 1993 to 2005,[6] we found no differences in knowing the HIV status of patients with TB according to these characteristics, perhaps due to a smaller number of patients studied.

The finding that the patients with TB who received care at a TB clinic were more likely to have had a known HIV status might reflect TB clinics' ability to integrate HIV testing into TB case management. Since 2009, the CDC has promoted collaboration among public health programs and integration of services as a core policy in the management of HIV, TB, hepatitis, and sexually transmitted diseases to more effectively control these diseases.[13] Subsequently, the Connecticut DPH TB and HIV programs have worked closely together, which has resulted in the use of field HIV tests (eg, oral and rapid tests) by public health nurses and TB case managers, the direct provision of HIV testing materials to local health departments from DPH, and facilitation of HIV testing at the DPH Public Health Laboratory using the STD clinic courier system. This finding emphasizes that future training will need to focus on private health care providers, who treat the majority of patients with TB and LTBI in the state, to further improve HIV testing among patients with TB.

Limitations to the current study potentially include selection and information biases that resulted from the survey of providers. Although the survey response rate was adequate, the respondents were primarily infectious disease specialists or pulmonologists making generalizations limited to these specialties. In Connecticut, other types of providers treat patients with TB and LTBI, and their HIV testing practices might be different. Also, the survey instrument's validity and reliability were not measured. Given the nature of the anonymous self-reported survey data, it was not possible to link providers' actual HIV testing practices with survey responses.

In conclusion, this report indicates which populations might be undertested for HIV infection, areas for improvement in provider HIV testing practices, and perceptions of why patients with TB refuse HIV testing. Knowledge of a patient's HIV status is essential for implementing effective LTBI screening and treatment strategies aimed at preventing TB.[14] In HIV-coinfected patients with TB, it has also been demonstrated that prompt initiation of antiretroviral therapy significantly improves survival.[7] Provider-initiated HIV testing of patients with TB and LTBI is an indispensable first step, as is testing for TB among persons known to have HIV infection,[15] for improving HIV-related TB health outcomes.

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Table 1

The HIV Status of Patients with TB by Demographic Characteristics, TB Risk Factors, and Provider Specialty Training, Connecticut 2008 to 2010 (N = 273)

Variable	Characteristic	Known HIV Status[a]		Unknown HIV Status[b]		RR (95% CI)
		n	%	n	%	
Sex	Male	115	78.8	31	21.2	1.08 (0.94–1.23)
	Female	93	73.2	34	26.8	
Race	White	101	77.7	29	22.3	1.04 (0.91–1.19)
	Nonwhite	107	74.8	36	25.2	
	Asian	63	70.0	27	30.0	0.88 (0.76–1.03)
	Non-Asian	145	79.2	38	20.8	
	Black	43	82.7	9	17.3	1.11 (0.96–1.28)
	Non-black	165	74.7	56	25.3	
Ethnicity	Hispanic	65	83.3	13	16.7	1.14 (1.00–1.29)
	Non-Hispanic	143	73.3	52	26.7	
Country of origin	United States	44	77.2	13	22.8	1.02 (0.87–1.19)
	Other	164	75.9	52	24.1	
TB risk factors[c]	At least 1	18	85.7	3	14.3	1.14 (0.94–1.37)
	None	190	75.4	62	24.6	
Providers' specialty[d]	Infectious disease	77	77.0	23	23.0	1.03 (0.89–1.19)
	Other	112	74.7	38	25.3	
	Pulmonary	84	72.4	32	27.6	0.92 (0.80–1.07)
	Other	105	78.4	29	21.6	
	Medicine	23	82.1	5	17.9	1.10 (0.91–1.33)
	Other	166	74.8	56	25.2	

Abbreviations: TB, tuberculosis; HIV, human immunodeficiency virus; RR, risk ratio; CI, confidence interval.

[a] Known HIV status was HIV-positive and HIV-negative.

[b] Unknown HIV status was tested with indeterminate results, tested but results unknown, refused testing, and not offered testing.

[c] TB risk factors included: intravenous drug use, nonintravenous drug use, excessive alcohol consumption, homelessness within 1 year of TB diagnosis, and incarceration at the time of TB diagnosis.

[d] Of the 273 TB cases, 23 (8.4%) were reported by health care providers with unknown specialty (N = 250).

Table 2

Rate of and Reasons for the Refusal of HIV Testing by Patients with TB as Cited by Health Care Providers, Connecticut December 2010 to January 2011 (N = 48)

	Health Care Provider Citations	
	n	**%**
Refusal rate of HIV testing in patients with TB		
Never (0% of the time)	11	22.9
Infrequently (1%–35% of the time)	34	70.8
Often (36%–69% of the time)	3	6.3
Most of the time (70%–99% of the time)	0	0.0
Always (100% of the time)	0	0.0
Reasons why patients with TB refuse HIV testing[a]		
Stigma associated with HIV diagnosis	29	72.5
Perception of not being at risk for HIV	27	67.5
Lack of understanding about HIV	21	52.5
Inability to mentally deal with HIV diagnosis	17	42.5
Financial difficulties	1	2.5

Abbreviations: TB, tuberculosis; HIV, human immunodeficiency virus.

[a]Of 48 health care providers, 40 (83.3%) responded to this question; multiple reasons for why patients with TB refuse HIV testing could be cited (N = 40).