HHS Public Access

Author manuscript

J Immigr Minor Health. Author manuscript; available in PMC 2016 April 21.

Published in final edited form as:

J Immigr Minor Health. 2016 April ; 18(2): 301–307. doi:10.1007/s10903-015-0169-1.

Civil Surgeon Tuberculosis Evaluations for Foreign-Born Persons Seeking Permanent U.S. Residence

Kelley Bemis,
CDC/CSTE Applied Epidemiology Fellowship Program, Atlanta, GA, USA

Tuberculosis Control Program, Connecticut Department of Public Health, Hartford, CT, USA

Andrew Thornton,
CDC/CSTE Applied Epidemiology Fellowship Program, Atlanta, GA, USA

Division of Global Migration and Quarantine, Centers for Disease Control and Prevention, Atlanta, GA, USA

County of San Diego Health and Human Services Agency, San Diego, CA, USA

Alfonso Rodriguez-Lainz,
Division of Global Migration and Quarantine, Centers for Disease Control and Prevention, Atlanta, GA, USA

Phil Lowenthal,
Tuberculosis Control Branch, California Department of Public Health, Richmond, CA, USA

Miguel Escobedo,
Division of Global Migration and Quarantine, Centers for Disease Control and Prevention, Atlanta, GA, USA

Lynn E. Sosa,
Tuberculosis Control Program, Connecticut Department of Public Health, Hartford, CT, USA

Andrew Tibbs,
Division of Tuberculosis Prevention and Control, Massachusetts Department of Public Health, Jamaica Plain, MA, USA

Sharon Sharnprapai,
Division of Tuberculosis Prevention and Control, Massachusetts Department of Public Health, Jamaica Plain, MA, USA

Kathleen S. Moser,
County of San Diego Health and Human Services Agency, San Diego, CA, USA

Jennifer Cochran, and

Correspondence to: Mark N. Lobato, `Mark.Lobato@ct.gov`.

Disclaimer The opinions and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Conflicts of interest None.

Division of Tuberculosis Prevention and Control, Massachusetts Department of Public Health, Jamaica Plain, MA, USA

Mark N. Lobato

Division of Tuberculosis Elimination, Centers for Disease Control and Prevention, 1600 Clifton Rd. Mailstop E-10, Atlanta, GA 30333, USA

Mark N. Lobato: Mark.Lobato@ct.gov

Abstract

Foreign-born persons in the United States seeking to adjust their status to permanent resident must undergo screening for tuberculosis (TB) disease. Screening is performed by civil surgeons (CS) following technical instructions by the Centers for Disease Control and Prevention. From 2011 to 2012, 1,369 practicing CS in California, Texas, and New England were surveyed to investigate adherence to the instructions. A descriptive analysis was conducted on 907 (66 %) respondents. Of 907 respondents, 739 (83 %) had read the instructions and 565 (63 %) understood that a chest radiograph is required for status adjustors with TB symptoms; however, only 326 (36 %) knew that a chest radiograph is required for immunosuppressed status adjustors. When suspecting TB disease, 105 (12 %) would neither report nor refer status adjustors to the health department; 91 (10 %) would neither start treatment nor refer for TB infection. Most CS followed aspects of the technical instructions; however, educational opportunities are warranted to ensure positive patient outcomes.

Keywords

Screening; Immigration; Public health; Surveillance; Tuberculosis

Introduction

In 2012, 9,951 cases of tuberculosis (TB) were reported in the United States, 63 % of which occurred in the foreignborn population [1]. Previous studies of *Mycobacterium tuberculosis* complex genotypes indicate that the majority of these cases are caused by reactivation of latent tuberculosis infection (LTBI), probably the result of exposure prior to arrival in the United States [2, 3]. Detecting and treating TB disease and LTBI in persons born outside of the United States has been designated as a high-priority strategy for TB control and elimination efforts [4–6].

Applicants for permanent residence in the United States, e.g. immigrants and refugees, are required to undergo pre-immigration TB screening overseas. The application process overseas includes screening by panel physicians, appointed by the United States embassy or consulate, prior to arrival. Previous studies have shown overseas TB screening to be an effective, high-yield intervention for detecting TB disease and LTBI in this population [7, 8]. “Status adjustment” is the process by which persons already living legally in the United States with temporary visas, e.g. student and temporary worker visas, can apply for permanent residence. The status adjustment process includes a medical assessment performed by a civil surgeon (CS), a physician who has applied for this designation and

been selected by the U.S. Citizenship and Immigration Services (USCIS). CS must have a minimum of 4 years of professional experience (not including internships and residencies) and maintain a current medical license. To perform status adjustment assessments, CS follow the *Technical Instructions for Medical Examination of Aliens*, requirements and recommendations published by the Centers for Disease Control and Prevention (CDC) in 1991 and revised in 2008 [9]; however, limited training has been provided. Furthermore, a 1997 assessment of CS adherence to the technical instructions revealed problems in screening practices [10].

The technical instructions require that status adjustors 2 years of age and older be tested for LTBI using a tuberculin skin test (TST) or interferon-gamma release assay (IGRA); status adjustors less than 2 years of age must be tested if there is evidence of contact with a person who has TB. Those with a TST induration ≥ 5 mm or a positive IGRA test result should have a chest radiograph (CXR). Status adjustors who are immunosuppressed or have symptoms suggestive of TB should have a CXR regardless of the TST or IGRA result. Status adjustors with abnormal CXR suggestive of active or inactive TB should be referred to their local health department for evaluation before being medically cleared for status adjustment. According to the technical instructions, status adjustors who have no evidence of TB disease, have a TST induration ≥ 10 mm (≥ 5 mm for contacts and immunosuppressed persons), and are recent arrivers (within 5 years) should be referred to the health department for possible LTBI treatment.

In fiscal year 2012, USCIS received almost 800,000 applications for adjustment of status [11]. Few studies have investigated the prevalence of TB disease and LTBI among status adjustors; however, one study in Denver in 1987 found that greater than 40 % of status adjustors had TST results indicative of LTBI [12].

The objective of this investigation was to gather information on the medical training, experience, and type of practice among CS in two states and one region of the United States and to assess whether the TB screening procedures in each state or region are consistent with those indicated in the *Technical Instructions for Medical Examination of Aliens*.

Methods

From July 2011 to July 2012, eight state TB control programs conducted a survey of CS in their states. Participating states were selected through existing collaborations; however, all had a percentage of TB cases among foreignborn persons higher than the national average. Surveys were mailed to all CS in California, Texas, and six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) using contact information obtained from the USCIS website. Approximately 4–8 weeks following the initial mailing, a second mailing was sent to non-responders. The remaining non-responders were contacted by telephone and fax. The six-page survey consisted of 25 questions, primarily multiple choice, on the characteristics of the respondent's training and practice, their TB screening and medical follow-up practices, and a scenario-based question. Two additional questions, including a second scenario-based question, were included in the surveys sent to CS in California and Texas.

Completed surveys were analyzed using SAS v. 9.3. Respondents who indicated they were no longer in practice as a CS were excluded from analysis. Completed surveys that did not include respondent identification numbers were also excluded to avoid duplication. Pearson's Chi-square and Fisher's exact tests were used to analyze categorical variables and two sample and multi-sample (Brown-Mood) median tests for difference in location were used to analyze continuous variables. A significance level of $P<0.05$ was used in analyses.

As the purpose of this survey was to gather information with the intent of informing and evaluating public health practice, the CDC Human Research Protections Office determined that this project was routine public health evaluation and not human subjects research.

Results

From July 2011 to July 2012, surveys were mailed to 918 practicing CS in California, 308 in Texas, and 143 in the New England region. A total of 907 CS responded for an overall response rate of 66 %: 584 (64 %) CS in California returned surveys, 203 (66 %) CS in Texas, and 120 (84 %) CS in the New England region. Table 1 shows demographic characteristics of respondents by region. The majority were in private, independent practice, ranging from 59 % in New England to 98 % in Texas. The median number of years in practice as CS was 10 with an interquartile range of 4–19 years.

Ninety-five percent of respondents received at least some training as residents or fellows in a primary care field. Approximately half of respondents from California and Texas received their medical education outside of the United States (54 and 50 %, respectively), compared to 28 % in New England. Although a majority of CS in each region reported reading the 2008 technical instructions, 149 out of 888 respondents (17 %) did not or could not remember reading them. In the 3 years prior to survey completion, 135 (15 %) respondents recalled diagnosing a total of 236 cases of TB disease among status adjustors, with the greatest percentage diagnosed in New England.

Almost all CS respondents used TST or IGRA to initially screen status adjustors for TB; CXR was used as the sole screening test among 8 of 904 CS (1 %), overall (Table 2). However, 14 % of respondents in California and Texas used CXR as the sole screening test when status adjustors were vaccinated with Bacille Calmette-Guerin (BCG). When asked about the TST cutoff for the purposes of the status adjustment examination, only 64 % of CS in California and Texas chose the correct cut-off of ≥ 5 mm (New England respondents were not asked this question). Despite this, when respondents were asked about a TST with 7 mm induration in a case scenario (a healthy, BCG-vaccinated 19-year old status adjustor), 80 % correctly responded that this TST result should prompt having a CXR done.

The vast majority of respondents would obtain a CXR for all status adjustors with a positive TST or IGRA result as required by the technical instructions. However, just 565 (63 %) of respondents would obtain a CXR, per the technical instructions, for status adjustors with symptoms suggestive of TB who should be evaluated regardless of the TST or IGRA result, and only 326 (36 %) would obtain one for status adjustors who are immunosuppressed.

Table 3 details CS responses about LTBI and possible TB disease. Overall, 801 (90 %) respondents would start treatment or refer for treatment upon diagnosing LTBI. If TB disease were suspected, a similar number, 775 (88 %), would report or refer status adjustors to the health department. Respondents in California and Texas were also presented with a case scenario regarding a status adjustor with a positive TST result and an abnormal CXR consistent with healed TB. Just under half, 359 respondents (46 %), selected the correct next step (per the technical instructions) of referral to the health department.

Differences between CS characteristics and their TB screening and medical follow-up practices were assessed in Table 4. Differences by region were observed. In the 30 days preceding the survey, CS respondents in Texas and New England performed more status adjustor evaluations than respondents in California (median 9 and 8 respectively, vs. 5; $P < .01$; Brown Mood median test). Respondents in California and Texas more frequently referred status adjustors with suspected TB disease to the health department (90 % in California, 87 % in Texas, and 79 % in New England, $P < .01$, Pearson's Chi square).

Differences among CS were also found by practice type and volume of status adjustors examined (Table 4). CS respondents in private, independent practice evaluated more status adjustors in the 30 days preceding the survey than respondents who practiced in community health centers (CHCs) (6 vs. 1, $P < .01$). Private practitioners were also more likely to read the technical instructions (85 vs. 73 %, $P < .01$) and to respond correctly in the TST case scenario (84 vs. 57 %, $P < .01$). However, respondents who practice in CHCs were more likely to either start treatment for LTBI or refer status adjustors to other providers for LTBI treatment (95 vs. 89 %, $P = .04$, Fisher's exact). Independent of practice type, CS who evaluated more than the median number of status adjustors in the past 30 days were more likely to read the technical instructions (88 vs. 81 %, $P < .01$) and to respond correctly to the TST case scenario (88 vs. 77 %, $P < .01$).

Finally, CS respondents were evaluated for associations between training and experience and TB screening and medical follow up practices (Table 5). Respondents who had been in practice as a CS for more than 9 years evaluated more status adjustors in the 30 days preceding the survey than those with fewer years in practice (6 vs. 5, $P < .01$) but were less likely to read the technical instructions (81 vs. 87 %, $P = .02$). Respondents were also compared by the country in which they attended medical school. CS who attended medical school in the United States were less likely to respond correctly in the TST case scenario (77 vs. 84 %, $P = .01$) and less likely to report or refer status adjustors with suspected TB disease to the health department (86 vs. 91 %, $P = .01$). No significant differences were found between CS who received training in a primary care field and those who did not (data not shown).

Discussion

In this evaluation of self-reported TB medical examination procedures, CS in New England, Texas, and California were found to follow CDC's technical instructions in important areas; however, there are several areas where additional training or monitoring might improve adherence.

The vast majority of survey respondents used appropriate TB screening tests. However, when asked specifically about screening BCG-vaccinated status adjustors, 18 % of California CS and 20 % of Texas CS did not follow the technical instructions' requirement to screen these adjustors with a TST or IGRA. In addition, over a third of CS in these regions did not select the correct TST cut-off for obtaining a CXR for a status adjustment examination. On the other hand, after interpreting a test result as positive, almost all CS obtained a CXR as required. In 2008, the CDC issued a new version of the technical instructions (replacing the 1991 version). Although the updated instructions also require a CXR for status adjustors who have symptoms suggestive of TB or are immunosuppressed, more than half of respondents did not obtain CXRs for immunosuppressed status adjustors and more than a third did not obtain them for status adjustors with symptoms suggestive of TB, regardless of TST or IGRA result.

If a CXR indicates abnormal findings indicative of either TB disease or old healed TB, the technical instructions require CS to refer status adjustors to the health department for further evaluation. Health departments and their consulting physicians may have experience with the potential complications inherent in TB treatment, drug-resistant TB, and the need for directly observed therapy, therefore increasing the likelihood of a successful treatment course [13]. Approximately 90 % of CS in California and Texas and 80 % of CS in New England adhere to this requirement and either report or refer status adjustors with suspected TB disease to their local or state health department. Similar percentages of CS also follow the technical instructions' recommendation to refer status adjustors diagnosed with LTBI to be evaluated for treatment. Additional training to reach those CS that do not refer could improve the usefulness of TB screening by increasing the proportion of patients initiating early treatment, thereby possibly preventing progression to TB disease and future TB transmission.

Few studies have previously investigated CS performance or practices. An analysis of TB screening outcomes for status adjustment medical exams, as reported on USCIS forms, performed in 1997 and 1998 in San Diego, San Francisco, New York, and Massachusetts also found moderate adherence among CS to the CDC's technical instructions: 74 % (4,121 of 5,570) of adjustors were appropriately screened [10]. Of those who were not evaluated appropriately, 1,172 (21 %, range 8–52 %) were referred for a CXR with no prior administration of a TST. This percentage is considerably higher than the 1 % of our survey respondents who reported screening in this manner. It is possible that this difference could reflect a self-reporting bias in our results: CS may have indicated their ideal rather than their actual practices when completing the survey. Similar to the results reported here, that study also showed regional variation in CS adherence, suggesting that future training and assessments should be tailored to meet region- or state-specific needs.

Another study of CS screening in Denver in 1987 and 1988 investigated the yield of TB screening among status adjustors for both TB and LTBI. Of the 6,520 patients reviewed, four new TB cases were found and 42 % had TST results indicative of LTBI [12]. Our evaluation did not quantify the number of LTBI diagnoses made; however, the respondents estimated that in the past 3 years they had diagnosed more than 200 cases of TB disease. This estimate suggests that CS screening may be an effective intervention for reducing the burden of TB

among foreign-born persons. Mathematical models of future TB trends underscore the importance of increased TB screening and treatment among foreign-born persons in order to achieve TB elimination [14, 15]. Current domestic recommendations advocate for testing for LTBI infection among immigrants from high prevalence countries who have arrived in the last 5 years [16]; however, foreign-born persons infected with TB continue to be at increased risk for progression to disease, even after several years of living in the United States [6, 17–19]. CS screening presents an important opportunity to prevent these cases by finding and treating LTBI that might otherwise be missed. Seventy-six percent of our respondents said they referred status adjustors for LTBI treatment; however, the number of adjustors referred as well as the rates of treatment initiation and completion are unknown. Improving communication between CS and the providers and health departments that are working to ensure completion of LTBI treatment, could capitalize on this opportunity.

Additional training and resources for CS TB screening offered by state health departments, USCIS, and CDC may help reduce the TB burden in the United States. Because gaps in CS knowledge and adherence appear to vary by region, practice type, volume of status adjustors seen, location of medical training, and years as a CS, trainings tailored to specific sub-groups of practitioners might be beneficial. Areas of focus should include proper interpretation of TSTs for the purpose of status adjustment and referral of high risk status adjustors (i.e., immunosuppressed and symptomatic) for CXRs, regardless of the TB test result. Emphasis should continue to be placed on reporting and linkages to care between the CS diagnosing status adjustors with TB disease or infection and the state or local health departments who have the expertise in TB treatment and case management. Changes to the technical instructions should be clearly communicated to CS to ensure they are aware of updates and are implementing them in their practice.

Additionally, periodic assessments of adherence to and results of CS screening could allow for more consistent recognition of training gaps and improved resource allocation. Assessments may indicate the need for additional incentives or disincentives to improve CS adherence. Increased communication and data sharing between USCIS and state and local health departments to track TB outcomes might assist in highlighting important areas for improvement in CS screening.

The major limitation of this evaluation is its reliance on self-reported survey data. CS responses may be biased to reflect desired practices or unreliable because of poor recall. If so, the results described might be an overestimation of how well the technical instructions are followed. Additionally, moderate response rates may have resulted in biased results. For example, CS who were more likely to read and follow the instructions for status adjustment examinations might also be more likely to complete and return the survey. If present, this pattern would also tend to overestimate how well the technical instructions are followed. Finally, surveys administered in the six New England states were pooled and analyzed in aggregate which might have masked differences within this region.

These data reflect the first investigation in the past decade of CS characteristics and their TB screening of status adjustors. Responses indicate areas for training that could improve the ability of CS screening to diagnose LTBI and TB disease, ensure referral to public health

programs for appropriate treatment and case management, and possibly prevent future transmission of disease.

Acknowledgments

The authors are grateful to the New England Tuberculosis Consortium for contributions to the design and implementation of the survey, the Massachusetts Department of Health for efforts in survey follow-up, and the Texas Department of State Health Services. We would also like to acknowledge Jennifer Flood for input throughout the design of this evaluation as well as Melissa Lin, Tracy Renaud, and Jeffrey Lawliss, U.S. Citizenship and Immigration Services for their assistance. Finally, we thank the Division of Global Migration and Quarantine, CDC for their generous contribution of time and thoughts. This evaluation was supported in part by an appointment to the Applied Epidemiology Fellowship Program administered by the Council of State and Territorial Epidemiologists (CSTE) and funded by the Centers for Disease Control and Prevention (CDC) Cooperative Agreement Number 5U38HM000414.

References

1. CDC. Reported tuberculosis in the United States, 2012. Available at http://www.cdc.gov/tb/statistics/reports/2012/default.htm.
2. Ricks PM, Cain KP, Oeltmann JE, Kammerer JS, Moonan PK. Estimating the burden of tuberculosis among foreign-born persons acquired prior to entering the U.S., 2005–2009. PLoS One. 2011; 6(11):e27405. [PubMed: 22140439]
3. Chin DP, DeRiemer K, Small PM, Ponce de Leon AP, Steinhart R, Schecter GF, Daley CL, Moss AR, Paz EA, Jasmer RM, Agasino CB, Hopewll PC. Differences in contributing factors to tuberculosis incidence in U.S.-born and foreign-born persons. Am J Respir Crit Care Med. 1998; 158(6):1797–1803. [PubMed: 9847270]
4. Centers for Disease Control and Prevention. Recommendations for prevention and control of tuberculosis among foreign-born persons: report of the Working Group on Tuberculosis Among Foreign-born Persons. Morbidity and Mortality Weekly Report. 1998; 47(RR-16):1–25. [PubMed: 9450721]
5. Talbot EA, Moore M. Tuberculosis among foreign-born persons in the United States, 1993–1998. JAMA. 2000; 284(22):2894–2900. [PubMed: 11147986]
6. Cain KP, Haley CA, Armstrong LR, Garman KN, Wells CD, Iademarco MF, Castro KG, Laserson KF. Tuberculosis among foreign-born persons in the United States: achieving tuberculosis elimination. Am J Respir Crit Care Med. 2007; 175(1):75–79. [PubMed: 17038659]
7. Liu Y, Weinberg M, Ortega L, Painter J, Maloney S. Overseas screening for tuberculosis in U.S.-bound immigrants and refugees. N Engl J Med. 2009; 360:2406–2415. [PubMed: 19494216]
8. LoBue PA, Moser KS. Screening of immigrants and refugees for pulmonary tuberculosis in San Diego County, California. Chest. 2004; 126(6):1777–1782. [PubMed: 15596673]
9. CDC. Technical instructions formedical examination of aliens in the United States. 2008. http://www.cdc.gov/immigrantrefugeehealth/exams/ti/civil/tuberculosis-civil-technical-instructions.html
10. Saraiya M, Cookson ST, Tribble P, Silk B, Cass R, Poonja S, Walting M, Howland N, Paz EA, Cochran J, Moser KS, Oxtoby MJ, Binkin NJ. Tuberculosis screening among foreign-born persons applying for permanent US residence. Am J Public Health. 2002; 92(5):826–829. [PubMed: 11988454]
11. U.S. Citizenship and Immigration Services. USCIS Adjustment of Status Form I-485 Performance Data. http://www.uscis.gov/portal/site/uscis/menuitem.eb1d4c2a3e5b9ac89243c6a7543f6d1a/?vgnextoid=e093211f28ff0310VgnVCM100000082ca60aRCRD&vgnextchannel=e093211f28ff0310VgnVCM100000082ca60aRCRD
12. Blum RN, Polish LB, Tapy JM, Catlin BJ, Cohn DL. Results of screening for tuberculosis in foreign-born persons applying for adjustment of immigration status. Chest. 1993; 103(6):1670–1674. [PubMed: 8404083]
13. Golub JE, Bur S, Cronin WA, Gange S, Baruch N, Comstock GW, Chaisson RE. Patient and health care system delays in pulmonary tuberculosis diagnosis in a low-incidence state. Int J Tuberc Lung Dis. 2005; 9(9):992–998. [PubMed: 16158891]

14. Dye C, Williams BG. Eliminating human tuberculosis in the twenty-first century. J R Soc Interface. 2008; 5:653–662. [PubMed: 17690054]
15. Hill AN, Becerra JE, Castro KG. Modeling tuberculosis trends in the USA. Epidemiol Infect. 2012; 140(10):1862–1872. [PubMed: 22233605]
16. Centers for Disease Control and Prevention. Targeted tuberculin testing and treatment of latent tuberculosis infection. Morbidity and Mortality Weekly Report. 2000; 49(RR-6):1–54. [PubMed: 10993565]
17. Lobato MN, Mohamed MH, Hadler JL. Tuberculosis in a low-incidence US area: local consequences of global disruptions. Int J Tuberc Lung Dis. 2008; 12(5):506–512. [PubMed: 18419885]
18. Walter ND, Painter J, Parker M, Lowenthal P, Flood J, Fu Y, Asis R, Reves R. Persistent latent tuberculosis reactivation risk in United States immigrants. Am J Respir Crit Care Med. 2014; 189(1):88–95. [PubMed: 24308495]
19. Walter ND, Jasmer RM, Grinsdale J, Kawamura LM, Hopewell PC, Nahid P. Reaching the limits of tuberculosis prevention among foreign-born individuals: a tuberculosis-control program perspective. Clin Infect Dis. 2008; 46(1):103–106. [PubMed: 18171222]

Table 1

Characteristics of civil surgeons in California, Texas, and New England, 2011–2012

Characteristic[a]	California	Texas	New England	Total
Practice location				
Private, independent practice	489 (86.7)	194 (98.0)	70 (58.8)	753 (85.5)
Community health center	66 (11.7)	3 (1.5)	36 (30.3)	105 (11.9)
Hospital-based clinic	9 (1.6)	1 (0.5)	13 (10.9)	23 (2.6)
Years in practice as a civil surgeon[b]	10 [4–18]	12 [5–20]	9 [4–12]	10 [4–19]
SA evaluations in past 30 days[b]	5 [2–10]	9 [4–15]	8 [1–10]	5 [2–10]
Attended medical school in the U. S.	265 (46.5)	100 (49.8)	83 (71.6)	448 (50.5)
Received training in a primary care field[c]	554 (95.5)	191 (94.6)	112 (93.3)	857 (95.0)
Read technical instructions	484 (84.5)	156 (78.8)	99 (84.6)	739 (83.2)

Missing responses were excluded for all rows
SA status adjustors

[a] Values expressed n (%) unless otherwise specified

[b] Median [Interquartile range]

[c] Internal medicine, family medicine, general medicine, pediatrics, and obstetrics or gynecology

Table 2

Screening and follow-up practices of civil surgeons in California, Texas, and New England, 2011–2012

Characteristic[a]	California	Texas	New England	Total
Screening test used[b]				
Tuberculin skin test	554 (96.2)	197 (98.5)	116 (98.3)	867 (97.0)
Interferon-gamma release assay	25 (4.3)	1 (0.5)	3 (2.5)	29 (3.2)
Chest radiograph	6 (1.0)	2 (1.0)	0 (0.0)	8 (0.9)
Testing practice for BCG vaccinated[b]				
TST	370 (64.7)	137 (68.8)	88 (74.6)	595 (66.9)
IGRA	36 (6.3)	9 (4.5)	7 (5.9)	52 (5.9)
TST or IGRA[c]	64 (11.2)	14 (7.0)	19 (16.1)	97 (10.9)
CXR	82 (14.3)	28 (14.1)	3 (2.5)	113 (12.7)
CXR and TST or IGRA	13 (2.3)	6 (3.0)	1 (0.9)	20 (2.3)
Do not test	7 (1.2)	5 (2.5)	0 (0.0)	12 (1.4)
CXR required for TST result on exam[d]				
≥5 mm for all SA	346 (63.7)	130 (65.3)	–	476 (64.2)
≥5 mm for immunosuppressed; ≥10 mm for all others	159 (29.2)	46 (23.1)	–	205 (27.6)
≥10 mm for everyone	38 (7.0)	23 (11.6)	–	61 (8.2)
Responded correctly to a case scenario	458 (78.7)	167 (83.9)	98 (83.1)	723 (80.4)
SA referred for CXR[e]				
Positive TST or IGRA result	575 (99.3)	194 (97.0)	120 (100)	889 (98.9)
Symptoms suggestive of TB	351 (60.6)	130 (65.0)	84 (70.0)	565 (62.9)
Immunosuppressed	193 (33.3)	82 (41.0)	51 (42.5)	326 (36.3)

BCG Bacille Calmette-Guerin, *CXR* chest radiograph, *HIV* human immunodeficiency virus, *IGRA* interferon-gamma release assay, *SA* status adjustor, *TST* tuberculin skin test, *TB* tuberculosis

[a] Values expressed as n (%)

[b] Correct response: either TST or IGRA; IGRA preferred in persons who had BCG vaccination

[c] Includes CS who use both TST and IGRA for each patient and CS who use TST or IGRA on patient-by-patient basis

[d] Correct response: ≥5 mm for all SA. Question was not asked of New England respondents

[e] Correct response: all answers (positive test result, symptomatic, immunosuppressed)

Table 3

Civil surgeons' responses to suspected TB disease or LTBI, California, Texas, and New England, 2011–2012

Characteristic[a]	California	Texas	New England	Total
Next step for suspected TB disease[b]				
Report case or refer SA to health dept.	513 (90.3)	167 (87.0)	95 (79.2)	775 (88.1)
Refer the patient to a specialist	239 (42.1)	78 (40.6)	77 (64.2)	394 (44.8)
Send sputum for AFB smear and culture	207 (36.4)	39 (20.3)	37 (30.8)	283 (32.2)
Start treatment immediately	118 (20.8)	17 (8.9)	8 (6.7)	143 (16.3)
Correct response to a case scenario about a positive TST and abnormal CXR[c]	260 (45.2)	99 (49.3)	–	359 (46.3)
Next step after diagnosis of LTBI				
Do not start or refer for treatment	60 (10.5)	21 (10.5)	10 (8.3)	91 (10.2)
Refer for treatment only	251 (44.0)	145 (72.1)	83 (69.2)	479 (53.7)
Start treatment or refer for treatment	159 (27.9)	26 (12.9)	9 (7.5)	194 (21.8)
Start treatment only	101 (17.7)	9 (4.5)	18 (15.0)	128 (14.4)

AFB acid fast bacilli, *CXR* chest radiograph, *LTBI* latent tuberculosis infection, *SA* status adjustor, *TST* tuberculin skin test, *TB* tuberculosis

[a] Values expressed as n (%)

[b] Respondents could select more than one answer

[c] Question was not asked of New England respondents

Table 4

Associations between civil surgeons' characteristics and their TB screening and medical follow-up practices, California, Texas, and New England, 2011–2012

Practices[a]	Region, n (%)				Practice type, n (%)			Status adjustors seen in the last 30 Days, n (%)		
	California	Texas	New England	*P*	Private	CHC	*P*	≤5	>5	*P*
Median status adjustor evaluations in past 30 days	5	9	8	<.01	6	1	<.01	–	–	–
Read technical instructions	484 (78.7)	156 (78.8)	99 (84.6)	.17	623 (84.5)	74 (72.6)	<.01	470 (80.6)	269 (88.2)	<.01
Responded correctly to a TST case scenario	458 (78.7)	167 (83.9)	98 (83.1)	.21	626 (83.9)	59 (56.7)	<.01	451 (76.6)	272 (87.7)	<.01
Report or refer TB suspect to the health department	513 (90.3)	167 (87.0)	95 (79.2)	<.01	649 (89.2)	86 (82.7)	.06	506 (88.3)	269 (87.6)	.77
Start or refer treatment for fLTBI diagnosis	511 (89.5)	180 (89.6)	110 (91.7)	.77	656 (88.8)	100 (95.2)	.04	530 (90.9)	271 (87.7)	.13

CHC community health center, *LTBI* latent tuberculosis infection, *TST* tuberculin skin test, *TB* tuberculosis

[a]Continuous variables were reported as medians and tested with the medians test; categorical variables were tested with either Chi square or Fisher's exact test; missing responses were excluded from analysis

J Immigr Minor Health. Author manuscript; available in PMC 2016 April 21.

Table 5

Associations between civil surgeons' training and experience and their TB screening and medical follow-up practices, California, Texas, and New England, 2011–2012

Characteristic[a]	Years in practice as a CS; n (%)			Attended medical school in the U.S.; n (%)		
	≤9	>9	*P*	No	Yes	*P*
Median status adjustor evaluations in past 30 days	5	6	<.01	5	5	.18
Read technical instructions	337 (86.6)	381 (80.9)	.02	359 (83.7)	370 (83.7)	.99
Responded correctly to a TST case scenario	321 (81.5)	379 (79.5)	.46	368 (84.0)	342 (77.4)	.01
Report or refer TB suspect to the health department	341 (88.3)	410 (87.6)	.74	391 (91.1)	372 (85.5)	.01
Start or refer treatment for LTBI diagnosis	351 (90.0)	424 (89.5)	.79	382 (88.4)	404 (91.2)	.18

CS civil surgeon, *LTBI* latent tuberculosis infection, *TST* tuberculin skin test, *TB* tuberculosis

[a]Continuous variables were reported as medians and tested with the medians test; categorical variables were tested with either Chi square or Fisher's exact test