Latent Tuberculosis Infection Treatment Outcomes in an At-Risk Underserved Population in Rhode Island

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Abstract

Objectives: Within the United States (US), significant racial and ethnic disparities exist in the rates of latent TB infection (LTBI) and active TB disease. A disproportionate number of TB disease cases result from untreated LTBI among individuals born outside the US. This study evaluates LTBI treatment outcomes among an underserved, at-risk population in Rhode Island. **Methods:** A quantitative retrospective chart review of adult patients with a positive screening test assessed LTBI care cascade outcomes including referral, treatment initiation, and completion. **Results:** Seventy-four percent of patients found to have positive screening TB tests were born outside of the US; 80% identified as Hispanic or Black and 45% spoke a preferred language other than English. Twenty-one percent of potential candidates for LTBI treatment initiated treatment. **Conclusions:** Major gaps were identified in referral success and treatment initiation. Expanding LTBI treatment access into primary care settings could be a solution to improve outcomes and decrease health inequities among at-risk communities.

Introduction

Tuberculosis (TB) is one of the leading causes of death worldwide.[1] While TB incidence continues to decline in the United States (US), this progress is insufficient to achieve TB elimination within the global target of 2025. Approximately 80% of US TB disease is caused by reactivation of untreated latent tuberculosis infection (LTBI)[2] with 13 million people estimated to be infected.[3]

Within the US, there are significant racial and ethnic disparities seen in individuals with TB disease. In 2019, 71.4% of individuals diagnosed with TB were born outside the US; 19.7% of persons with TB identify as Black, 30.2% as Latinx, and 35.3% as Asian.[3] Treatment for LTBI, which significantly reduces the risk of reactivation of TB disease and has been shown to be a cost effective strategy, has been recommended by CDC TB treatment guidelines for decades; however, completion of therapy for LTBI ranges from 20% to 65%.[4] This is due to multifaceted barriers that contribute to losses along the care cascade from screening through treatment completion.[5] The LTBI care cascade can be divided into sections for evaluation of these losses:

screening those at risk, evaluation to rule out TB disease, LTBI treatment initiation and treatment completion.

The United States Preventive Services Task Force (USPSTF) endorses screening and treatment of LTBI within primary care settings.[6] However, some primary care providers (PCP) defer to specialty clinics for treatment because of gaps in provider knowledge and confidence with LTBI treatment. In Rhode Island (RI), the Department of Health sponsors one Tuberculosis clinic (RISE) which has historically cared for individuals with both active and latent TB in the state.[7] This single location site in Providence, RI, although located on a public bus line, is outside of some of the most

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at-risk underserved communities. As a result, multi-faceted challenges exist to accessing and successfully completing treatment. It has been shown that patients receiving medical care in their local community, and from clinicians who are culturally sensitive to their lived experiences receive comprehensive care resulting in better outcomes.[8] Offering LTBI treatment within primary care settings within these underserved communities might reduce barriers to achieving better health equity of outcomes.

The purpose of this study is to evaluate the losses occurring during the LTBI care cascade for individuals with a positive LTBI test seen at Blackstone Valley Community Health Care (BVCHC), a Federally Qualified Health Center (FQHC) in RI.

Methodology

Study Setting and Population

BVCHC clinics, located in Pawtucket, Providence, and Central Falls, RI serve a population of 26 000 people, with over 61 000 medical and dental patient visits per year.[9] The patient population consists of 55% identifying as Hispanic/Latinx, 23% identifying as Black/African American and 35% who speak Spanish as their primary language. Census data from 2019 demonstrate that over 25% of the Central Falls population is born outside of the US; 69.3% of individuals identify as Hispanic, 10% identify as Black; and 67.4% of residents speak a language other than English at home.[10]

A quantitative retrospective chart review (RCR) was conducted to identify patients screened for TB and those found to have a positive screening test (either tuberculin skin test (TST) or Interferon Gamma Release Assay (IGRA) blood test) at BVCHC between April 2019 and April 2020. Ethical approval was obtained from Kent Hospital Institutional Review Board [1370981-4]. Approval was obtained from BVCHC leadership.

Data Collection

An initial data query was performed from the electronic medical record, NextGen.[11] Inclusion criteria consisted of (1) BVCHC patients seen in the clinic within the data query timeframe, (2) age 18 years or older, (3) a documented TB screening test (IGRA test, and/or TST) and/or ICD-10 codes for LTBI.

Sociodemographic variables captured from the electronic medical records included age, race, gender identity, preferred language, and country of birth. Type of insurance (Neighborhood Health Plan, Medicare, Medicaid, BlueCross, and no insurance) were captured. These variables were chosen based on literature regarding both topics of TB and social determinants of health in order to provide a comprehensive database on health disparities within the at-risk population.[12-18]

Data were de-identified and imported into a password protected Excel spreadsheet. A RCR standard operating procedure was developed and piloted on 20 charts prior to being finalized. Data collected on each participant included TBI evaluation via chest X-ray, referral to TB specialty clinic, treatment initiation (at the primary care site or referral site) and treatment completion. Patients with LTBI and considered candidates for treatment had to meet the following treatment criteria: a positive tuberculosis screening test and a normal chest radiograph. Data related to symptom screening were inconsistent and therefore not considered in our inclusion criteria. LTBI treatment initiation was defined as a documented medication (isoniazid, rifampin, or isoniazid and rifapentine (3HP)) prescribed by primary care provider or specialist. Treatment completion was defined as note documentation by a healthcare provider or certificate of treatment completion filed in the EMR.

Statistical Analyses

The data were de-identified and exported to Stata SE 16.1.[19] Descriptive statistics were conducted to assess proportions of patients who were or were not referred to RISE. Further statistical analysis was performed including bivariate analysis of factors associated with LTBI care cascade outcomes: referral placement, treatment initiation, and treatment completion. Independent variables included age, gender identity, country of birth, primary language spoken, and insurance status.

Results

Fifty-one patients were found to have a positive screening test and met inclusion criteria. Of the 51 patients, 37 (74%) identified as female. Median age was 41 (IQR 19-81) years. 26/51 (51%) patients identified Spanish as their preferred language; an additional 12/51 (24%) identified another primary language other than English or Spanish. 38/51 (75%) patients were born outside of the US with the highest represented countries being Guatemala 8/51 (16%), Cape Verde 7/51 (14%), and Colombia 6/51 (12%). Nine out of 51 (18%) patients reported a country of birth (Angola, Guinea, Haiti, Pakistan, and Liberia) with a TB incidence rate greater than 100/100 000 cases. 24/51 (47%) of the patients identified as Latinx/Hispanic, while 17/51 (33%) identified as Black. 38/51 (75%) of patients were insured (including public and private insurance). The remaining demographic data can be found in Table 1.

Table 1 shows there was no gender difference ($P=.89$) and no age difference ($P=.69$) in patients who attended their first consult appointment at RISE clinic versus those that did not. Country of birth did not predict attendance to first appointment. ($P=.37$). Of patients who did not attend the
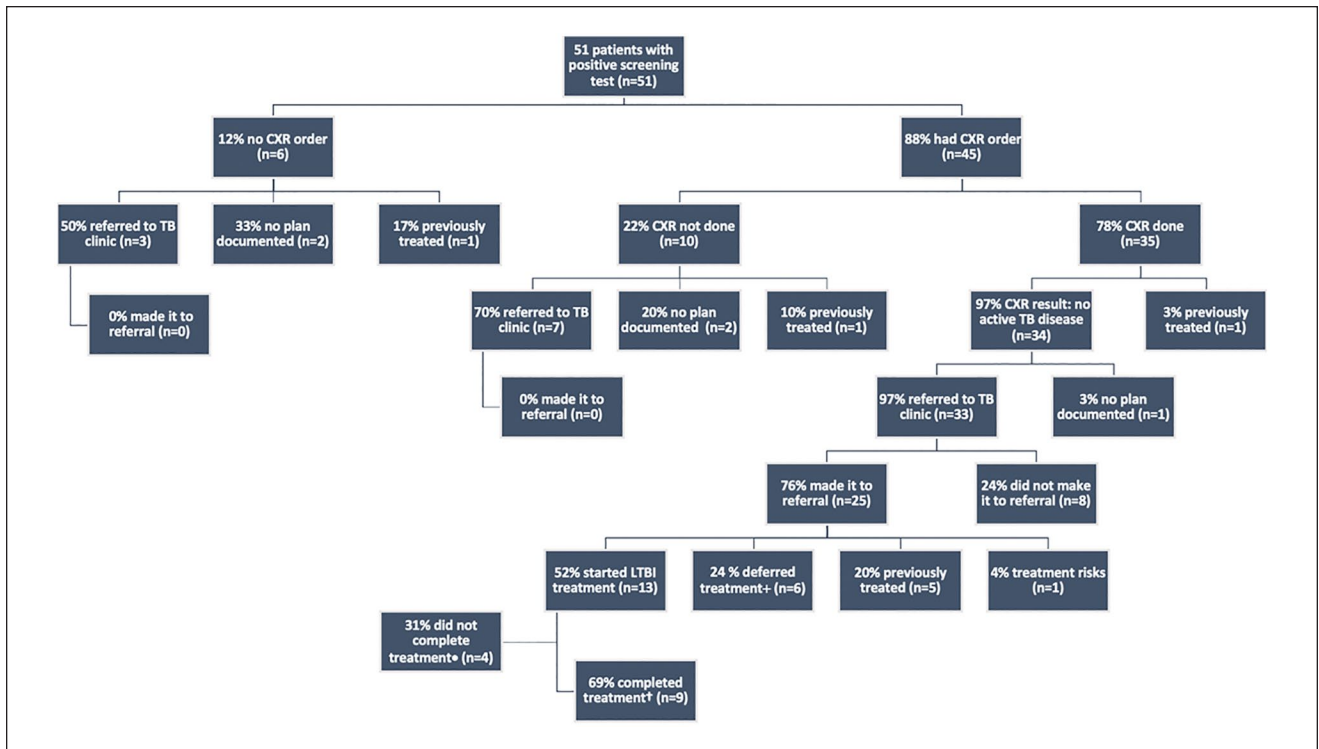
Figure 1. CXR = chest X-ray.

- Five patients were deferred due to pregnancy and 1 patient was deferred due to travel.

† Five patients completed Rifampin treatment, 3 patients completed INH treatment, and 1 patient completed 3HP treatment.

• One patient was still in treatment during chart review timeframe.

first appointment 11/18 (61%) identify Spanish as their primary language (*P* = .34); 10/18 (56) identify as Latinx/Hispanic (*P* = .37); and 7/18 (39%) had no insurance (*P* = .11).

Of the 51 patients, 45/51 (88%) patients had a chest X-ray ordered by the PCP; 35/51 (78%) underwent radiography and all reports found no abnormalities; 34/51 participants (97%) met our treatment criteria for LTBI; 33/34 (97%) received a referral to RISE. 25/33 (76%) attended the first appointment and 13/25 (52%) were prescribed treatment. Of the 12/25 patients (48%) not prescribed treatment: 5 were deferred due to pregnancy; 5 were previously treated for LTBI; 1 was ineligible because treatment risks outweighed the benefit, and 1 was deferred due to travel. For patients prescribed treatment, 9/13 (69%) completed treatment with 5 patients completing Rifampin treatment, 3 completing INH treatment, and 1 completing 3HP treatment. One patient was still in treatment during the chart review timeframe. No patients were initiated on medication treatment at the primary care site. The remaining cascade outcomes can be found in Figure 1.

Of the 51 patients found to have a positive TB test, 8/51 (16%) were found to be previously treated. Losses occurred throughout the LTBI care cascade: 16/51 (31%) of patients found to have a positive TB screening test never received a

CXR evaluation; 18/43 (42%) patients referred to RISE never made it to their first appointment; 6/19 (53%) of patients offered treatment deferred, and 4/13 (31%) of patients initiated on treatment did not complete. Of the patients who were found to have a positive test, excluding those who were previously treated (n = 8) or had risks of treatment (n = 1), only 9/42 (21%) completed treatment for LTBI.

Discussion

Our study is unique as it was conducted in a FQHC in RI which serves a large population born outside the US and is representative of a population at-risk for LTBI. We found that patients with a positive LTBI test were lost throughout the cascade—at evaluation, referral, treatment initiation, and treatment completion. Only 21% of patients with a positive LTBI test who were not excluded from treatment (due to previous treatment or risks) completed LTBI treatment. It is well known that screening for and treating LTBI is a cost-effective strategy, and therefore, increasing LTBI treatment completion can have positive economic and health impacts for individual patients and communities.[20] Of note, 69% of individuals who accessed the RISE clinic were retained in

Table 1. Characteristics of Patients 18 Years and Older by Referral Rates to TB Specialty Clinic.

	Total population (n = 51), % (n)	Made it to referral (n = 25), % (n)	Did not make it to referral (n = 18), % (n)	No referral (n = 8), % (n)
Gender identity				
Female	73.6 (37)	72.0 (18)	72.2 (13)	75.0 (6)
Male†	27.4 (14)	28.0 (7)	27.8 (5)	25.0 (2)
Age (years)◊				
19-41	51.0 (26)	52.0 (13)	55.6 (10)	37.5 (3)
42-81	49.0 (25)	48.0 (12)	44.4 (8)	62.5 (5)
Country of origin (Tb incidence)				
Angola (351/100 000)	2.0 (1)	4.0 (1)	0.0 (0)	0.0 (0)
Brazil (46/100 000)	2.0 (1)	4.0 (1)	0.0 (0)	0.0 (0)
Cape Verde (46/100 000)	13.7 (7)	16.0 (4)	11.1 (2)	12.5 (1)
Colombia (35/100 000)	11.8 (6)	12.0 (3)	16.7 (3)	0.0 (0)
Dominican Republic (42/100 000)	2.0 (1)	0.0 (0)	0.0 (0)	12.5 (1)
El Salvador (58/100 000)	5.9 (5)	12.0 (3)	0.0 (0)	0.0 (0)
Guatemala (26/100 000)	15.7 (8)	16.0 (4)	22.2 (4)	0.0 (0)
Guinea (176/100 000)	3.9 (2)	4.0 (1)	5.6 (1)	0.0 (0)
Honduras (31/100 000)	2.0 (1)	4.0 (1)	0.0 (0)	0.0 (0)
Mexico (23/100 000)	2.0 (1)	4.0 (1)	0.0 (0)	0.0 (0)
Puerto Rico (1.4/100 000)	2.0 (1)	0.0 (0)	5.6 (1)	0.0 (0)
USA (3/100 000)	9.8 (5)	8.0 (2)	5.6 (1)	25.0 (2)
Haiti (170/100 000)	3.9 (2)	4.0 (1)	5.6 (1)	0.0 (0)
Pakistan (263/100 000)	2.0 (1)	4.0 (1)	0.0 (0)	0.0 (0)
Liberia (308/100 000)	5.0 (3)	8.0 (2)	0.0 (0)	12.5 (1)
Unknown/mi	15.7 (8)	0.0 (0)	27.8 (5)	37.5 (3)
Race				
Latinx/Hispanic	47.1 (24)	36.0 (9)	55.6 (10)	62.5 (5)
Black	33.3 (17)	40.0 (10)	22.2 (4)	37.5 (3)
Otherr°	19.6 (10)	24.0 (6)	22.2 (4)	0.0 (0)
Language				
Spanish	51.0 (26)	48.0 (12)	61.1 (11)	37.5 (3)
English	25.5 (13)	20.0 (5)	22.2 (4)	50.0 (4)
OtherÒ	23.5 (12)	32.0 (8)	16.7 (3)	12.5 (1)
Insurance type				
No insurance	25.5 (13)	24.0 (6)	38.6 (7)	0.0 (0)
Insurance-	74.5 (38)	76.0 (19)	61.1 (11)	100 (8)

*Chi square test analysis was performed on made it to referral compared to the did not make it to referral groups.

†One patient identified as transmale.

◊Age was categorized by median age = 41.

°Race Included: White, Asian, Multiracial, Not specified.

ÒLanguages included: Portuguese Creole, Portuguese, Haitian Creole, ASL, French, Mandarin, Urdu.

-Includes private and public insurance options.

care; we interpret this as an implication that patients do value completing treatment for LTBI.

The largest losses occurred at the points of transfer between primary care services and the RISE Clinic in what has been traditionally characterized as provider related and patient related barriers. No patients were treated at the primary care level. A recent qualitative study regarding PCPs' knowledge and attitudes regarding LTBI care in RI confirmed that PCPs' lack confidence with all steps of the LTBI care cascade and this confidence decreases with later steps—particularly treatment initiation and completion.[21] Further formal qualitative work is needed at our clinic to confirm these findings and identify strategies to improve PCPs' knowledge and confidence. Educational efforts such as the Regional Latent TB Infection ECHO (Extension for Community Healthcare Outcomes)[22] is one existing strategy that could potentially improve LTBI management by PCPs within primary care facilities.

Forty-two percent of patients referred to RISE never attended the first appointment. Although we did not conduct

patient interviews to identify the causes for non-attendance, literature supports loss at transfer steps and suggests causes, extrapolated from our patient demographics. It is well described that transportation costs contribute globally to the financial burden placed on patients with TB.[4] There is an association for patients who are non-English speaking or of racial and ethnic minorities to have less access to personal transportation[23,24]; public transportation in our patient population would require at least a 2 transfer route to move from community to RISE Clinic[25]—an investment not only in cost but even more critically in time taken from other life tasks such as work or child care. Twenty-five percent of identified patients with LTBI in our study were uninsured; it is unknown, but likely this contributed to losses in the care cascade—either in obtaining a CXR, transportation costs, or unclear understanding that TB services are free at RISE.

The issues of provider and patient barriers are not new in the TB literature and our findings may not be surprising to many in the field. It is important to expand on the present view of provider and patient barriers and consider how structural racism contributes to the continued inequities within LTBI care particularly among at-risk communities. Considering the definition of structural racism by Lett et al[26] which states structural racism refers to the compounding impacts of the cultural norms, policies, laws, and practices that produce racial inequity, provider level, patient level, and institutional level barriers are in many situations linked to structural racism. Let's consider the gaps in TB knowledge, attitude, and skills.[21] Diseases such as TB that disproportionately impact racial and ethnic minorities are often taught in a manner that does not include how racial social inequity influences pathology. Additionally, historical and sociopolitical factors that worsen health outcomes among patients are often missing in medical curricula. As proposed by Green et al[27] curriculum reform that incorporate equity competencies and embed structural practices to dismantle racism in medicine could be a potential strategy to enhance medical education and positively impact care for racial and ethnic minorities. A strong comprehension of why racial and ethnic minorities are disproportionately impacted by TB in addition to understanding TB infection and disease could build a foundation for mastering LTBI testing and treatment.

Provider and patient level barriers represent greater systemic barriers that ultimately impact LTBI care in our setting. Eighty percentage of patients in our community identify as Black or Hispanic, and 39% of patients in our study did not have insurance. Racial and ethnic minorities—who are disproportionately at higher risk for LTBI—are more likely to be uninsured in the United States, highlighting structural discrimination that impacts access to LTBI care.[5,24,28-30] Although the World Health Organization states that achieving Universal Health Coverage is a key target for nations to achieve the sustainable development goals, US dialog around the Affordable Care Act and extension of its reach to cover the uninsured has slowed progress toward increasing patient access to care such as that for LTBI. The goal of Zero Catastrophic costs placed forward by the WHO End TB could include mitigation strategies for health inequities by engaging primary care providers already in the community of patients to decrease cost related to untreated LTBI progressing to TB disease that requires specialized care. Primary care clinics are often the only source of healthcare for many individuals within this community. Therefore, investments in primary care not only prevents disease, but reduces costs resultant due to disease, morbidity and mortality—benefits for both patient and society.

The strengths of our study include it being one of the first, published retrospective chart reviews of the LTBI care cascade outcomes in a primary care clinic serving an at-risk community for tuberculosis infection to our knowledge. Our study confirmed gaps along the cascade in evaluation, referral success, and treatment initiation and completion, particularly noted when the patient needs to access a different site or health care provider. Our treatment completion outcome of 21% is similar to the outcomes found in a large systematic review by Alsdurf et al[4] where 18.8% of individuals who were eligible for treatment completed treatment. Our study has several limitations. Most importantly, we were unable to collect several important variables given the inconsistencies in electronic medical record documentation. For example, we were unable to obtain information on symptom screening because there was no standardized procedure at the clinic and provider documentation varied. Therefore, we were unable to consider symptom screening as a criterion for establishing if an individual was a potential candidate for TB infection treatment. Missing documentation included co-morbidities (such as diabetes, HIV, and other immunosuppressive diseases, which would contribute to a patient's increased risk for progression to TB disease), homelessness, documentation status, and demographic data, specifically county of birth, and specialist notes. Second, the data obtained in the initial query were found to be inconsistent with the data in the EMR. This highlights data query challenges within primary care EMR systems; as well as represents a possible information bias given there may have been patients with a positive LTBI test who were not pulled by the initial query. Additionally, the small sample size may have led to a type 1 error as we did not identify any factors that predicted successful referral attendance.

As LTBI identification and management continues to become a major focus in our national TB elimination strategy and screening remains an important USPSTF Grade B recommendation,[6,31] successful task shifting of LTBI testing and treatment for at-risk communities into primary care is critical. FQHCs are perfectly poised to provide these

services when given the appropriate training and support. Our study provides a real-world glimpse into the realities of LTBI care within a busy, underserved Federally Qualified Health Center in Rhode Island, and the gaps identified throughout the cascade suggest provider, patient, and system level barriers that perpetuate inequitable LTBI care. Further qualitative research is needed with patients and community members to further understand the complexities of barriers impacting LTBI care and to design additional patient-centered strategies to LTBI primary care management.

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