Perceptions of Latent Tuberculosis Infection Care by Providers at a Tertiary Care Center in the United States

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Abstract

Introduction: Mycobacterium tuberculosis (TB) is a leading cause of infectious disease mortality worldwide. A large reservoir of latent tuberculosis infection (LTBI) is a major public health problem worldwide and in the United States.

Methods: A 13-question survey was distributed to providers working in the infectious disease, pulmonary/critical care, and general medicine departments at an academic tertiary care center in the United States. The survey included questions about provider confidence in and knowledge about LTBI management and perceived barriers to patient completion of the LTBI care cascade.

Results: The response rate of the survey was 33% (62/186). Only 17 (30.9%) providers were able to correctly identify indication for screening in all six of the given patient scenarios. Overall, provider confidence in LTBI management decreased along the care cascade. Infectious disease providers were the most confident in management. The two most observed barriers to care were language barriers and lack of knowledge or understanding about TB.

Discussion: Surveyed providers believe the largest barriers to patient LTBI treatment completion are due to a lack of patient comprehension about their infection. Patient understanding could be improved through mandated in-person interpreters, information pamphlets in patients' preferred languages, and formation of community partnerships, to improve awareness about LTBI.

Keywords: tuberculosis; LTBI; survey; prevention control program; care cascade

List of Abbreviations: TB: tuberculosis; LTBI: latent tuberculosis infection; TMC: Tufts Medical Center; APP: advanced practice provider; USPSTF: United States Preventative Services Task Force

Introduction

Mycobacterium tuberculosis (TB) is a leading cause of infectious disease mortality worldwide [1]. In 2020 alone, over 10 million people fell ill with active tuberculosis, and 1.5 million deaths were reported [2]. It is a public health concern that more than 80% of active tuberculosis disease cases result from reactivation or progression of latent tuberculosis infection. The World Health Organization estimates that 25% of the world's population has latent tuberculosis infection (LTBI), and less than 5% of these people are treated to prevent active infection [1]. In the United States, latent TB is estimated to effect between 12-14 million people [3-5].

Additionally, tuberculosis and LTBI disproportionately affect disadvantaged populations including those with lower socioeconomic status, racial and ethnic minorities, and people who lack equitable access to healthcare, making identification and care of these individuals more difficult [6]. In Massachusetts in 2021, for example, 89% of active tuberculosis disease cases were diagnosed in patients identifying as minorities. Asian populations were the most affected, with a relative risk of being diagnosed with TB in 2021 40.9 times higher compared with white populations [7]. In the United States in 2022, 88% of tuberculosis cases were identified in racial and ethnic minority groups[6]. Other risk factors for tuberculosis infection include being born outside of the United States, experiencing homelessness, and living in correctional facilities [6]. In Massachusetts in 2021, 90% of active tuberculosis cases were identified in patients born outside the US [7]. This project focuses on LTBI care at Tufts Medical Center (TMC), an academic tertiary care hospital located in the heart of Chinatown in Boston, Massachusetts. The hospital serves large immigrant populations, with 46.1% of Chinatown residents being foreign-born and 51.8% living in limited-English speaking households [8].

The identification and management of patients with LTBI involves multiple interactions with the medical care system, with months of treatment and follow up after diagnosis, which is difficult in populations already disenfranchised by the medical system. Efforts to target the elimination of TB have historically involved emphasis on latent TB treatment completion but have failed to address the underlying problem of patients who never begin treatment [1]. One approach that has been used in prior studies to address gaps in care that lead to lack of appropriate active and latent tuberculosis infection treatment is through the creation of an LTBI specific care cascade that examines patient interactions with various stages of the healthcare system from initial screening to treatment success [1, 9-12]. In an ideal cascade of care, patients with a positive Interferon Gamma Release Assay (IGRA) screening blood test should be immediately asked about their symptoms and have imaging (chest radiograph) done to rule out active tuberculosis disease. After active TB is ruled out, patients should consider treatment options for latent tuberculosis infection through conversation with their providers, based on their risk of reactivation/progression and other factors. Prior studies have demonstrated that patients may be unable or unwilling to complete LTBI treatment for a myriad of reasons. These include, but are not limited to, financial, language, or cultural barriers, lack of transportation to appointments, stigma or mistrust towards the medical system, low perceived risk, or unwanted side effects from the treatment course [1, 13-16].

Prior studies, including those using quantitative and qualitative survey and interview techniques, have demonstrated gaps in provider knowledge in LTBI treatment and screening guidelines, as well as low provider confidence in evaluating and treating LTBI [17-19]. For example, in a 2021 study by O'Connell et. al, providers were able to identify multiple barriers to screening and treatment of patients, including difficulty accessing LTBI testing and results and lack of clear referral pathways, through multiple choice and open ended survey questions [18]. Another qualitative study by Szkwarko et. al aimed to evaluate knowledge, attitudes, and skills of primary care providers on a LTBI care cascade to identify stepwise barriers in following United States Preventative Services Task Force (USPSTF) recommendations [17]. Results of this study demonstrated that many providers and nurses felt uncomfortable with LTBI management, and comfort decreased as the care cascade progressed.

Prior work completed at Tufts Medical Center (TMC), through a retrospective chart review of patients who had a positive IGRA screening test in 2019, demonstrated that the care cascade at TMC was sub-optimal. The overarching objectives of this study were to assess and identify gaps in physician and advanced practice provider (APP) knowledge about LTBI care and to identify barriers to care for patients with LTBI at TMC. The study relies on provider perspectives to achieve these objectives through a survey dis-

tributed to clinicians working at TMC. Through their direct engagement with patients, providers spend considerable time assessing patients' needs, discussing treatment options, and addressing patients' concerns. Therefore, the perspective of healthcare providers can offer valuable insight into the patient experience. Additionally, it is crucial that providers delivering care and counseling for latent tuberculosis infection are comfortable managing the condition and are able to provide the highest quality care. For these reasons, we can utilize provider perspectives to improve care delivery.

Methods

A web-based survey was created and sent to providers to assess knowledge about, attitudes towards, and perceptions of LTBI at an academic tertiary care center in the United States, serving a large immigrant population [8]. The targeted study participants were clinical providers (attendings, fellows, and advanced practice providers) working in the general medicine, infectious disease (ID), and pulmonary and critical care medicine departments. Informed consent was obtained from all participants. The study protocol was approved by the Tufts Health Sciences Institutional Review Board.

The survey was designed on the Qualtrics platform, containing 13 multiple choice and Likert scale questions as well as one free text question at the end. The survey was first piloted to medical providers not working at TMC, to assess clarity of questions and the survey was adjusted based on feedback. Five waves of surveys were distributed, and responses were collected between January 4th, 2023, and April 17th, 2023. It was designed in three parts. The first section was demographics questions, the second section included questions to assess provider confidence in and knowledge about managing different LTBI patient scenarios. The final section of the survey focused on provider perceptions of LTBI care. This section included questions to assess the barriers to care that providers have seen patients experience, and their perception of what potential interventions may have the most positive impact.

Results

The survey was distributed to 186 eligible medical providers and was completed by 62 participants, with a response rate of 33% (Table 1). Of the 59 respondents who answered the demographics questions, 23 (39.0%) were infectious disease specialists, 19 (32.2%) of them worked in pulmonary/critical care, and 16 (30.9%) of them worked in general medicine. When asked to specify their specialty, 42 (71.2%) respondents reported being attending physicians, 11 (18.6%) were physicians currently training in their fellowship, and 5 (8.5%) were advanced practice providers (such as nurse practitioners and physician assistants). Respondents were also asked their years of experience since graduating from their graduate degree programs, and whether they work in the inpatient or outpatient settings (Table 1). Participants were asked to rate their confidence in their ability to do tasks along the LTBI cascade of care on a scale of 1-5, with 1 indicating "not at all confident", 2 indicating "not very confident", 3 indicating "somewhat confident", 4 indicating "fairly confident", and 5 indicating "perfectly confident". The first task in which participants were asked to rate their confidence was "Identifying who should be screened for LTBI". Of the 57 who responded, 4 (7%) participants rated themselves "Not at all" or "Not very" confident, whereas 43 (75.4%) participants reported being "fairly" or "perfectly" confident in their ability to identify patients for screening. The second task providers were asked to rate their confidence in was their ability to "Initiate treatment for LTBI". Of the 57 who responded, 11 (19.3%) participants reported feeling "not at all" or "not very" confident in this task, while 35 (64.9%) reported feeling "fairly" or "perfectly" confident in this task. The final task was to "manage complications and modify treatment for LTBI". The results for this question were more mixed, with 27 (47.3%) participants reporting feeling "not at all" or "not very" confident in this task, and only 19 (33.3%) reporting feeling "fairly" or "perfectly confident" (Figure 1).

Table 1: Demographics of Survey Respondents

	Number of respondentsN=59	% of Respondents
Medical Specialty		
Infectious Disease	23	39.0%
Pulmonary/Critical Care	19	32.2%
Gen Med	17	30.9%
Total	59	
Position		
Physician (attending)	42	71.2%
Physician (fellow)	11	18.6%
APP (NP, PA, etc.)	5	8.5%
Other*	1	1.7%
Years of Experience		
1 to 5	14	23.7%
6 to 10	15	25.4%
11 to 19	12	20.3%
20 to 29	8	13.6%
30+	9	15.3%
Work Setting		
Inpatient alone	9	15.3%
Outpatient alone	13	22.0%
Inpatient and outpatient	37	62.7%

APP: Advanced Practice Provider, NP: Nurse Practitioner, PA: Physician Assistant

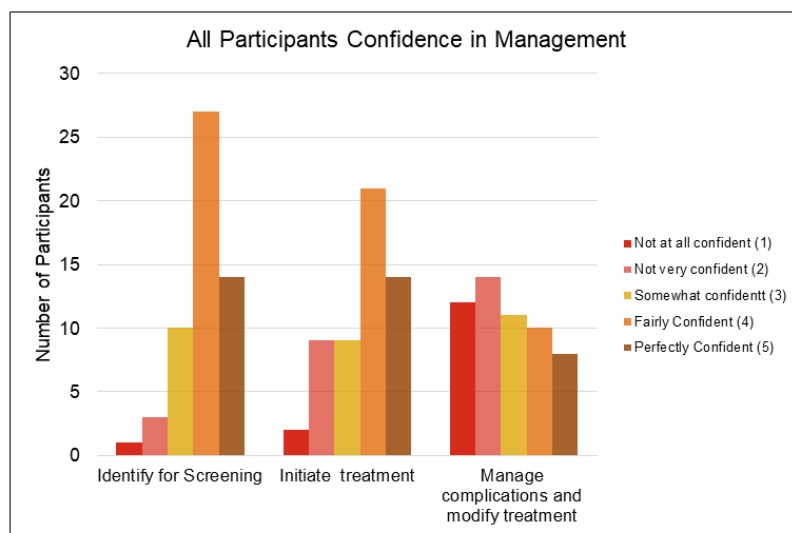*Other= clinical pharmacist, working in outpatient setting

Figure 1: All Participants Self-Reported Confidence in LTBI Management

Providers were asked "On a scale of 1-5, ("1" = not at all, and "5" = perfectly) how confident are you in your ability to do the following for the listed management tasks.

Provider confidence differed by specialty. Overall, participants working in infectious disease reported higher confidence in all tasks. 86% of infectious disease (ID) participants reported feeling confident (note "fairly" or "perfectly" confident will be referred to as "confident" for the remainder of results) in screening, 91% reported feeling confident in initiating treatment, and 69% reported feeling confident in managing complications and modifying treatments. In contrast, a lower percentage of pulmonary/critical care and general medicine providers reported confidence for each task. For pulmonary/critical care providers, 63% were confident in their ability to identify patients for screening, 42% were confident in their ability to initiate treatment, and only 16% were confident in their ability to manage complications and modify treatment. For general medicine participants, 67% were confident in their ability to identify patients for screening, 56% were confident in their ability to initiate treatment, but 0% of participants were confident in their ability manage complications and modify treatments (displayed graphically in supplemental figures).

Providers were also asked questions to evaluate their knowledge of LTBI care. First, they were asked "Who would you screen for LTBI?" and given a series of six example patient scenarios. Only 17 providers (30.9% of respondents) correctly identified whether patients were indicated for screening in all scenarios. When asked the appropriate next step when encountering a patient with a positive QuantiFERON gold, 50 (92.5%) providers correctly identified the appropriate next step, and two additional providers were partially correct, so 52 (96.3%) of participants were all or partially correct.

Providers were also asked to identify issues/barriers that they have personally witnessed their patients experience that could be interfering with their patients' LTBI care at TMC (Table 2). The three most reported barriers were language, reported by 39 (76.5%) providers, lack of knowledge about TB, reported by 39 (76.5%) of providers, and non-adherence, reported by 37 (72.5% of providers). Patient non-adherence was defined within the survey as patients not completing testing, treatment, or follow-up. Providers were also asked to identify what they felt was the most significant barrier to patients completing LTBI care at Tufts Medical Center. The most significant barrier identified by the most providers was lack of knowledge or understanding about TB, identified by 16 (31%) of respondents. This was followed by language, non-adherence, and medication issues, all reported as the most significant issue by 9 (17%) providers. Medication issues were defined as prior authorization issues, difficulty with medication reconciliation, drug-drug interactions, adverse effects, and/or concern for adverse effects.

Table 2: Issues/Barriers Impacting LTBI Care at TMC, as Perceived by Providers

Possible Barriers	Providers who report this issue/barrier (N=52) n (%)	Providers who report this as the most significant issue/barrier(N= 52) n (%)
Language	39 (76.5)	9 (17)
Lack of knowledge or understanding about TB	39 (76.5)	16 (31)
Non-adherence*	37 (73)	9 (17)
Cultural	33 (65)	5 (10)
Medication Issues*	30 (59)	9 (17)
Transportation	22 (43)	0 (0)
Financial	12 (24)	1 (2)
Stigma	8 (16)	0
Other	4 (8)	2 (4)

*non-adherence: defined within the survey as patients not completing testing, treatment, or follow-up

**medication issues: prior authorization issues, difficulty with medication reconciliation, drug-drug interactions, adverse effects, and/or concern for adverse effects

Surveyed providers were also asked to identify interventions they thought would be useful in improving LTBI care at Tufts Medical Center (Table 3). The most selected intervention was to provide in-person language interpreters at appointments when discussing LTBI, selected by 37 (71.2%) providers. The second most selected intervention was to provide an information pamphlet in the patients' preferred languages, selected by 36 (69.2%) providers.

Table 3: Interventions to improve LTBI Care at TMC, selected by providers

Possible interventions to improve LTBI care at TMC	Number of providersN=52, n (%)
In-person language interpreter present at appointment when discussing LTBI	37 (71.2)
Information pamphlet on LTBI available in patients' preferred language	36 (69.2)
Epic prompts to order chest X-ray and do a symptom screen after positive QuantiFERON result	20 (38.5)
Assessing social determinants of health	15 (28.8)
Community outreach and collaboration regarding tuberculosis, latent and active	31(61.5)
None of the above.	0 (0)

Discussion

Understanding patient barriers to care is a crucial step in working towards tuberculosis elimination. In the United States, representative estimates of patient engagement in the LTBI cascade of care indicate that levels of engagement drop considerably during each step in the cascade, resulting in only 10% of the ~14 million people estimated to have LTBI in the US completing treatment [5,10].

Through this study, the involvement providers have in perpetuating and combatting sub-optimal care cascades at an urban tertiary care center in the United States, was examined. Although many providers reported that they were "fairly" or "perfectly" confident in screening, less than one third of providers surveyed were able to correctly identify whether patients were indicated for screening in all patient scenarios. The most common mistake was providers selecting that they would screen a nurse at their annual physical, when annual TB testing in healthcare workers is not recommended unless there is a known exposure or ongoing transmission at the hospital [20]. These findings indicate that providers may need a refresher on updated screening guidelines but otherwise feel ready and able to screen patients.

Provider confidence in managing LTBI can play a role in their ability and willingness to screen and follow through with results. Among provider groups surveyed, confidence in management decreased throughout the cascade, with fewer providers expressing confidence in managing complications and modifying treatment of LTBI. This lack of confidence throughout the cascade was especially obvious among general medicine and pulmonary/critical care providers. Discomfort in management may indirectly lead to screening hesitancy as well. Institutional provider education for general medicine and pulmonary critical/care providers could increase comfort in managing LTBI treatment. If providers remain uncomfortable and have hesitancy regarding treatment, a streamlined referral system should be implemented.

When examining issues/barriers that providers have witnessed patients at TMC experience, "language" and "lack of knowledge or understanding about latent tuberculosis" were tied for the two most chosen barriers by providers in this survey. Language is expect-

ed, given the large number of immigrant and limited-English proficient patients who are at risk for LTBI. Misinterpretation can contribute to misunderstanding of tuberculosis infection, especially given that it is a symptomless disease, and patients may be hesitant to treat it and invite possible side effects from medications. Medical interpreters are vital for non-English speaking patients in the United States. In-person interpreters have been shown to be associated with the most positive outcomes and quality of care for patients.[21], [22] Indeed, when asked what interventions could improve LTBI care, in-person language interpreter was the most reported among all survey respondents. Another highly selected intervention to improve LTBI care was an information pamphlet available in the patient's preferred language. These give patients the opportunity to take the information home and digest it in their own time, or with the help of their families.

A "lack of knowledge or understanding of latent tuberculosis" was chosen as the most significant barrier that patients face by the greatest number of surveyed providers. This barrier is likely linked closely to language and cultural barriers that complicate understanding between patient and provider. To further address lack of understanding of LTBI, it is likely important to take a multifaceted approach, extending beyond the patient-provider relationship and mobilizing partnerships with local community or religious groups. Large medical centers often have partnerships with various groups in their local community, and these connections could be utilized to disseminate information about LTBI.

Limitations

There were multiple notable limitations of this study. First, a response rate of 33% limits the conclusions that can be drawn from the responses. However, surveys targeting healthcare workers tend to have low response rates, and it is not uncommon for response rates to be 20% or less [23, 24]. Additionally, the respondents of this survey were biased towards attendings and providers from the infectious disease specialty, which may give a skewed perspective lacking other provider perspectives. General medicine had the lowest response rate of all three specialties and are likely responsible for most screenings. Given that general medicine and pulmonary/critical care participants expressed more discomfort with management, it would be beneficial to have increased participation from these groups. Additionally, although physicians and advanced practice providers (APPs) have intimate relationships with their patients and a good ability to assess patient barriers to care, there is some inference involved in assessment of these barriers, and this research is limited in that it does not study the patient's perspective. More focused investigation on patients' experienced barriers to care could be a direction of future research.

Conclusions

Addressing and improving patient knowledge and understanding of tuberculosis infection is a crucial step in improving care. Survey results suggest some possible interventions to improve the latent tuberculosis infection care cascade would be to implement in-person interpreters at all visits, to provide patients with pamphlets with information in their preferred language, and to collaborate with community groups to increase general understanding. Finally, providers should be given the tools they need to remain updated on screening and management, with referral resources as needed.

Supplemental Materials
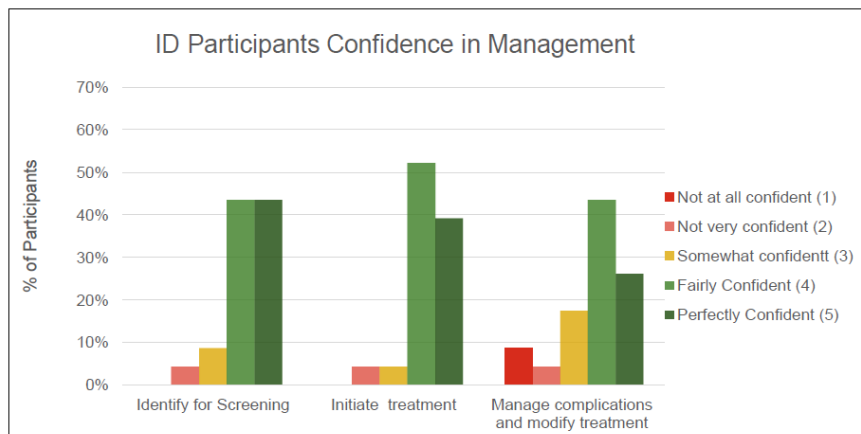
Supplemental Figure 1: ID Providers Self-Reported Confidence in Management

Providers were asked "On a scale of 1-5, ("1" = not at all, and "5"= perfectly) how confident are you in your ability to do the following 5 for the listed management tasks

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