

TB or not TB: Impact of an Interactive Educational Tuberculosis (TB) Module on
Occupational Health Professionals (OHP)

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Abstract

Purpose of Project: Tuberculosis (TB), both curable and preventable, remains one of the deadliest infectious diseases in the world (CDC, 2019). Occupational health professionals (OHP) can play a pivotal role in TB eradication because they work with one of the highest-risk groups for Latent Tuberculosis Infection and TB, healthcare workers (HCW), who take care of a high-risk patient or have unguarded exposure to a patient with TB before the proper precautions have been initiated (Stewart & Tsang, 2016). In May 2019, the CDC published an updated TB guideline for healthcare personnel. The purpose of this project is to ensure OHP are utilizing the most current TB clinical guidelines to identify, screen accurately, and treat employees at the highest risk of developing active TB disease.

Methodology: An interactive TB educational module to measure: 1) TB knowledge, 2) intent to change practice, 3) identification of barriers and 4) implementation of recommendations.

Results: Due to the low response rate (3%), statistical analysis of data could not be conducted. Descriptive analysis revealed: 1) 31% increase in TB knowledge, 2) 100% of participants were neutral in their intention to implement these new guidelines and strongly agreed on the use and benefit to do so, and 3) 50% did not feel confident in implementing the guidelines due to systemic barriers.

Implications for Practice: An interactive educational module can be useful in disseminating new clinical guidelines, but further studies need to be conducted to address barriers in implementing them into practice.

Keywords: Tuberculosis, Latent Tuberculosis Infection, clinical guidelines, educational module, healthcare personnel, barriers.

TB or not TB: Impact of an Interactive Educational Tuberculosis (TB) Module on Occupational Health Professionals (OHP)

Tuberculosis (TB), though preventable and curable, is one of the deadliest infectious diseases, accounting for over one billion deaths globally (Center for Disease Control and Prevention [CDC], 2019; World Health Organization [WHO], 2019). According to WHO (2019), it is the tenth global cause of morbidity and mortality worldwide. TB is transmissible through air droplets from person to person, such as a sneeze or cough, and is caused by the bacterium, *Mycobacterium tuberculosis* (*M. tuberculosis*). Infection results if the inhaled droplets reach the alveoli of the lungs (CDC, 2019). The CDC categorizes TB as either dormant (latent tuberculosis infection) or active.

An individual with latent tuberculosis infection (LTBI) is infected with the bacterium but is asymptomatic (no signs of unexplained weight loss, loss of appetite, extreme tiredness, sweating at night, fever, and coughing for more than three weeks). These individuals cannot spread TB to others; however, if left untreated, the infection can progress to active disease and lead to death.

Thirteen million people are living with LTBI in the United States (U.S.), and one in 10 will develop active TB disease (CDC, 2019). Eradicating TB will require upholding current TB control policies while increasing efforts to screen and treat LTBI in high-risk populations such as healthcare workers. (CDC, 2019). This interactive educational TB module, with the 2019 updated CDC TB guidelines for health care personnel, will attempt to aid in this effort.

Background and Significance

The national average of TB cases is 2.7 per 100,000 people, with 8,920 cases reported in 2019 alone (CDC, 2019). TB does not discriminate between age, gender, or ethnicity, however

males older than 15 years old account for more than half of all TB cases (57%), in comparison to women (32%) and children (11%), respectively (WHO, 2019a). Statistically, minorities account for most TB cases: Asians reporting 17.7 TB cases per 100,000 people, Blacks 4.7 cases, and Hispanics 4.4 cases (WHO, 2019b).

Fifty percent of all U.S. TB cases in 2018 were reported from four states: California, Texas, New York, and Florida. The CDC reports that the TB rate of New York State is significantly influenced by the high morbidity in New York City (CDC, 2019). New York City (NYC) has a TB rate of 6.8 TB cases per 100,000 people, which is higher than the national average (WHO, 2019a). The population of New York City is comprised of Blacks (24.3%), Hispanics (29.10%), and Asians (14%) (United States Census Bureau, 2019). Because New York City has a combined minority population exceeding 50%, it is plausible that New York City would be predicted to have a high TB rate. Hence, it is of vital importance to focus the efforts of this project on screening for LTBI in New York, specifically New York City.

Research shows that the current prevalence of TB is due in part to the reactivation of LTBI (Matteelli, Sulis, Capone, Migliori, & Getahun, 2017). Some risk factors associated with the activation of dormant TB to active TB disease include being immunocompromised, having certain comorbidities such as HIV or diabetes, malnutrition, and drug or alcohol abuse (CDC, 2019). Age is another risk factor to be considered when recommending LTBI treatment (Negin, Abimbola, & Marais, 2015). As we age, our immune system declines, and we become more susceptible to disease. Age-related changes in immunity have been shown to impact morbidity and mortality in general. (Pinti, Appay, Campisis, Frasca, Fulop, Sauce, & Cossariza, 2016). Treating TB at an older age can lead to poorer outcomes; hence it imperative to treat LTBI early

on before it progresses to active TB, and the person gets older (Negin, Abimbola, & Marais, 2015).

Persons considered at highest risk for LTBI and active TB disease, include foreign-born people who have been residing in the U.S. for five years or less after moving from geographic areas with a high rate of TB, and healthcare workers (HCW) who take care of a high-risk patient or have unguarded exposure to a patient with TB before the proper precautions have been initiated (Stewart & Tsang, 2016). The increased risk of TB is due in part to delay in diagnosis and increase of immigrants who come from countries with a high prevalence of TB (Casas et al., 2013). The lifetime risk of reactivation is estimated to be around 5-15% but can be averted with preventive treatment (Getahun et al., 2015). Hence, treating high-risk groups, such as HCWs, can help lower the incidence of TB cases and lead to the elimination of TB (WHO, 2019c).

The cost of treatment for one LTBI case ranges from \$400-\$600 per patient, whereas the price to treat one case of TB disease is about \$18,000 per patient (CDC, 2018). Treatment for TB disease can be from 6 months to a year and, in some cases, even longer. Most of the TB bacteria are destroyed during the first eight weeks of treatment; however, there are persistent organisms that require more prolonged treatment (CDC, 2019c). Regimens for the treatment of TB disease must contain multiple drugs to which the bacteria are susceptible, but the recommended treatment is a four-drug regimen (CDC, 2019c).

Most TB treatment take place at public health departments and facilities; however, most people receive their care from private health care providers and community health centers (Van Der Heijden, Herman, McFadden, Zu, & Patterson, 2015). Occupational health providers, such as nurse practitioners, can play a pivotal role in TB eradication. They are in a unique field to serve as representatives of change to enhance knowledge, campaign for essential resource

distributions, and execute tuberculosis infection control interventions (Nathavitharana et al., 2017).

Clinical practice guidelines are evidence-based recommendations with the potential to improve population health, yet they remain underutilized (Hoffman, Bennett, & Del Mar, 2017). In May 2019, the CDC released an updated TB guideline for healthcare professionals. These guidelines highlight the importance of screening for LTBI to decrease the incidence of TB cases. The new recommendations include: (a) an initial TB risk assessment and TB evaluation need to be conducted before being employed, (b) TB testing with a blood test (known as Interferon-Gamma Release Assays [IGRA]) or a tuberculin skin test (TST) needs to be undertaken for any health care personnel (HCP) without documented LTBI or prior TB disease, (c) no serial TST is required after baseline if there is no known TB exposure or ongoing transmission, (d) treatment for LTBI among HCP is encouraged, (e) HCP with untreated LTBI should be screened yearly for signs and symptoms of TB, and lastly, (f) annual TB education of all HCP (Sosa et al., 2019).

An interactive TB educational module with the updated CDC TB guidelines was developed to ensure accurate information was being communicated to occupational healthcare professionals to increase LTBI screening and treatment. This study aimed to impact a change in practice among occupational health professionals when screening high-risk people for TB and to encourage LTBI treatment. It hoped to aid the END TB strategy launched by WHO in 2014, which seeks to curtail the global TB epidemic. The strategy targets a decrease TB deaths by 95% and reduction in new cases by 90% between 2015 and 2035 (WHO, 2019c). Ensuring healthcare professionals are familiar with the updated guidelines, means they will deliver accurate screening and treatment of high-risk persons for TB, thus decreasing new cases of TB.

Needs Assessment

The average TB incidence rate for non-U.S. born healthcare personnel (HCP) was 10.8 cases per 100,000 population compared with 0.8 cases per 100,000 population for US-born HCP (Mongkolrattanothai, Lambert, & Winston, 2019). This rate is more than triple the national TB rate of 2.8. Thus, it is imperative to target this group of individuals and screen and treat for LTBI. Occupational health professionals (OHP) are individuals trained to assess and treat employee illnesses and injuries (Occupational Safety and Health Administration [OSHA], 2019). These OHP include physicians, physician assistants, registered nurses, including nurse practitioners, as well as licensed practical nurses (LPN), and emergency medical technicians (EMT). Some tasks performed by OHP include screening related to specific chemicals or exposures, including preplacement (post-offer) physical examinations, job placement assessments, periodic examinations, and maintenance of confidential employee health records, including individual screening results (OSHA, 2019).

OHPs are the target audience for the proposed project because they will be responsible for enforcing the updated CDC TB recommendations for healthcare personnel (HCP). The professional association used for this study has over 1,000 members, of which 69 belong to the New York Chapter. In 2018, New York State was one of the four states which accounted for 50% of all TB cases in the U.S. Focusing the efforts of this project to active members of this association would broaden the dissemination of the updated TB guidelines.

A SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of the proposed project revealed the following:

Strengths. It highlights the updated TB recommendations in a web-based design which can be accessed by multitudes of people. The DNP chair and team members are invested stakeholders in this project.

Weaknesses. A small sample pool (69 members) might lead to a low response rate. There could also be a minimal response rate for the follow-up survey. The limited two-week window to complete the survey might not be enough time to gather enough data. Limited access to technology can also be an issue.

Opportunities. One (1) contact hour was awarded after the completion of the module. The module will serve as an annual TB education requirement, which is one of the recommendations in the TB guidelines.

Threats. Healthcare professionals do not see the benefit of LTBI treatment (Katrak & Flood, 2018). Institutional policy changes will need to be implemented to adhere to the updated TB guidelines. There can be additional costs when investing in LTBI/TB testing tools for high-risk TB individuals.

Problem Statement

Timely and accurate identification of people with LTBI is vital for regulating TB (Aguste et al., 2017). Screening tests alone, such as IGRAs and TST, can provide inaccurate information (Aguste et al., 2017). Clinical practice guidelines, evidence-based recommendations with the potential to improve population health, in conjunction with screening tests, will help identify persons at high-risk for developing TB. Yet, clinical guidelines often remain underutilized (Hoffman, Bennett, & Del Mar, 2017). Lack of integration challenges the potential to sustain new practices (Brewster et al., 2015). Thus, it is imperative to ensure clinical guidelines are

being disseminated and implemented to all parties involved. Non-adherence to clinical guidelines leads to unnecessary diagnostics and inadequate treatment (Fischer et al., 2016).

Clinical Question

How will an interactive educational TB module, with the updated 2019 Centers for Disease Control and Prevention (CDC) TB guidelines for healthcare workers, impact the intent to change the practice of screening for LTBI by Occupational Health Providers (OHP)?

Aims & Objectives

This project aimed to ensure OHPs were utilizing the most current TB clinical guidelines to identify, screen accurately and treat employees at the highest risk of developing active TB disease. The knowledge objective for this project was that by the end of the educational module, OHP would have demonstrated increased TB clinical guideline knowledge, as evidenced by their post-test scores. The learning objective was that by the end of the educational module, OHP would have demonstrated an intent to change practice, as evidenced by their Continuing Professional Development (CPD) Reaction Questionnaire scores. The performance objective was that by the end of the educational module, OHP would have initiated the implementation of at least one recommendation into their current practice, as evidenced by their response in the post-4-week follow-up survey.

Review of Literature

Four separate comprehensive literature searches were conducted using PubMed, CINAHL, and MEDLINE. The inclusion criteria for all four searches were: abstract available, English language, published from 2014 through 2020, geography: the United States, and included all adults, aged 19 and older (See appendices A-D for Prisma Flow Diagram of Literature Searches). The exclusion criteria for all searches were: no abstract available, language

other than English, published before 2014, population younger than 19, and any study not conducted in the United States. The first search included key terms "tuberculosis or TB" and "latent tuberculosis infection or LTBI" and "screening or assessment or test or diagnosis" and "healthcare workers or nurses or medical workers or healthcare professionals," which yielded 29 articles, eight of which were included in the review.

The second search included "latent tuberculosis infection or LTBI" and "barriers," which produced 23 articles, of which three articles were hand-selected by relevance to clinical question and setting. The third search included "clinical guidelines or best practice" and "healthcare professionals or healthcare workers or healthcare providers or physician or nurse or doctor" and "tuberculosis or TB or latent tuberculosis infection or LTBI," which yielded 39 articles, of which six were selected. The fourth search included "adult learning styles" and "healthcare professionals or healthcare workers or healthcare providers or physician or nurse or doctor," which yielded 86 articles, of which four were selected. The total number of articles reviewed were 22.

All titles and abstracts that the literature search resulted were reviewed independently by the Doctor of Nursing Practice (DNP) student. Full-text studies were assessed for inclusion and exclusion criteria. All studies were appraised and graded using the John Hopkins Evidence Level and Quality Guide (Dang & Dearholt, 2017). The overall quality of evidence was rated as good to high for all outcomes (see Appendix E for Table of Evidence).

Latent Tuberculosis Infection (LTBI) Screening

There are two methods available for the detection of LTBI in the United States, the Mantoux tuberculin skin test (TST) and interferon-gamma release assays (IGRAs). The two U.S. Food and Drug Administration (FDA) approved IGRA blood tests are the QuantiFERON®-TB

Gold In-Tube test (QFT-GIT) and the T-SPOT.*TB* Both methods may be used in individuals where the risk of progression to active TB disease is high, but they are not interchangeable (Arif & Farheen, 2017).

The TST is performed by administering a protein purified derivative (PPD) antigen solution intradermally to the inner surface of the forearm with a tuberculin syringe (CDC, 2019-b). A wheal of six millimeters to 10 millimeters in diameter must be noted. If a wheal is not observed or is less than 6 millimeters in diameter, the solution has been incorrectly administered and should be re-administered immediately two inches from the original injection site (CDC, 2019-b). The site of placement should not be covered, and the person needs to return in 48-72 hours for the reading. If the patient does not return to the clinic after 72 hours, the test must be repeated (CDC, 2019-b).

The IGRAs are blood tests that must follow proper collection protocols to ensure accurate results. They detect the presence of TB infection by measuring the immune response to TB proteins in the blood (CDC, 2019-b). IGRAs cannot discern between LTBI and active TB disease. As with the TST, additional tests are needed to diagnose or rule out TB disease. IGRAs may be used for surveillance purposes or to identify people who are likely to benefit from treatment, including people who are or will be at increased risk of progression to TB disease if infected with *M. tuberculosis* (CDC, 2019-b).

Some other issues with these methods of screening for LTBI are that a false-positive and false-negative result can occur. Even though the TST and the IGRAs can detect LTBI, they are not flawless. One cause of a false-positive reaction for a TST is BCG (bacilli Calmette-Guérin), a vaccine for TB disease that is rarely used in the United States (CDC, 2019-b). People who have been vaccinated with BCG recently may have a positive reaction to the TST even if they do not

have TB infection, yet the same can be said for those who have had a BCG vaccine in the past. BCG vaccine wanes over time; most adults with a history of BCG at birth, with a positive TST can be truly infected (Whittaker, Nicol, Zar, Tena-Coki, & Kampmann, 2018). A false-positive reaction may also occur if an incorrect antigen is used or when the results are not measured or interpreted correctly.

Dorman et al. (2014) found that most conversions among HCWs in low TB incidence settings appear to be false positives, and these occurred six to nine times more frequently with IGRAs than TST, whereas King et al. (2015) suggested that the TSPOT is an accurate and reliable tool to screen healthcare workers. These conflicting studies were common in the literature search and presented a problem when deciding which tool is best to test for LTBI. The updated TB guidelines address this issue and inform healthcare providers of the preferred methods to use. The proposed project will highlight the tools that are acceptable for screening for LTBI as indicated in the updated TB guidelines.

Collins et al. (2018) suggested that annual TB screening programs be revised to eliminate automatic yearly LTBI testing for low-risk, previously negative HCWs. They should be formatted as targeted screening, which will carefully evaluate individual exposure risks and personal health history; this coincides with one of the recommendations made in the 2019 CDC TB guidelines that state all employees should be given a risk assessment survey before being hired, regardless of their prior TB history. This proposed study will ensure this point is illustrated in the module.

Barriers of Treating LTBI

Katrak and Flood (2018) identified the following obstacles to LTBI treatment: reluctance to take medication for an asymptomatic infection such as LTBI, the stigma associated with TB,

lack of knowledge on who is at high-risk for TB on the part of providers, not being comfortable with LTBI treatment guidelines, lack of perceived benefit to patient, and competing priorities of other chronic conditions. TB-related stigma plays a significant role in determining if an individual will seek treatment (Chang & Cataldo, 2014; Craig, Daftary, Engel, O'Driscoll, & Ioannaki, 2017). Some cultures view TB as a 'dirty disease' that affects only the poor, and it can also be associated with other communicable infections such as human immunodeficiency virus (HIV) (Craig et al., 2017).

Another barrier identified was that patients and providers perceive the risk of toxicity to LTBI medications to be higher than the reactivation of TB, which results in minimal LTBI treatment (Chee, Reeves, Zhang, & Belknap, 2018). Shorter, better-tolerated treatments are available that are safer and effective (Chee et al., 2018; Katrak & Flood, 2017). Another obstacle found was that LTBI is not entirely covered as a recommended preventive service without cost-sharing, which can discourage providers from screening and treating patients for LTBI (Parmer, Allen, & Walton, 2017). Another barrier discussed was the use of multiple screening tools for LTBI, which are not interchangeable (Arif & Farheen, 2017). Establishing a clear understanding of this concept will ensure reliable screening for LTBI.

Overcoming these obstacles will mean that HCWs need to be educated on the importance of screening and treating populations at risk for LTBI and TB, the medication regimens available to treat LTBI, and advocacy for including LTBI treatment as a preventative service in health insurances. This project was aimed at increasing provider TB/LTBI knowledge, TB/LTBI medication regimen knowledge, provide the new CDC TB recommendations, as well as provide resources.

Benefits of Treating LTBI

Some of the benefits of treating LTBI are that the risks outweigh the risks of converting to active TB (Getahun et al., 2015). Active TB typically affects the lungs, but it can spread to other parts of the body through the bloodstream and cause spinal pain, joint damage, meningitis, liver or kidney problems, and heart disorder (CDC, 2019a). There are shorter treatment durations that lower the risk of liver toxicity (Getahun et al., 2015). Currently, there are four regimens approved for the treatment of LTBI: 1) Isoniazid and Rifapentine, given once weekly for three months, 2) Rifampin, given daily for four months, 3) Isoniazid, given daily or twice weekly, for nine months, and 4) Isoniazid, given daily or twice weekly for six months (CDC, 2019c). The CDC (2019c) recommends prescribing the shorter regimens when possible since patients are more likely to complete them.

It is also more cost-effective to be treated for LTBI than active TB disease (Png et al., 2019). The cost of treating one case of LTBI is estimated to be four to six hundred dollars per patient, whereas the cost to treat TB disease is about \$18,000 per patient (CDC, 2018). The vast difference in prices is attributable to many factors: regimen duration, drug resistance, co-morbidity, and adverse side effects (CDC, 2019c). TB disease treatment is at least six-months in length which is further complicated if a person develops drug resistance. Drug resistance develops when a patient does not take their medicine regularly or as prescribed, or there is malabsorption of drugs, failure to improve on the drug-susceptible regimen, or when a patient develops TB disease again after having taken TB medicine in the past (CDC, 2019c). Confirmation of TB disease also involves the use of chest x-rays, sputum collection, laboratory tests, and multiple doctor visits, which can all add up.

Adherence to Clinical Practice Guidelines

Clinical practice guidelines (CPG) are statements that include recommendations intended to optimize patient care (Institute of Medicine [IOM], 2011). Clinical practice guidelines are appraised by a systematic review of evidence and an assessment of the benefits and harms of alternative care options (IOM, 2019). Non-adherence to clinical guidelines leads to unnecessary diagnostics and inadequate treatment (Fischer, Lange, Klose, Greiner, & Kraemer, 2016). Some barriers identified in the research for non-adherence to guidelines include lack of provider knowledge and awareness, the complexity of the guidelines, acceptability of recommendations, poor layout of the guidelines, and limited resources, such as time restrictions and heavy workloads (Fischer et al., 2016). The proposed project will seek to deliver the new CDC TB recommendations in a user-friendly interactive format.

Effective Educational Methods

Understanding the principles of adult learning, learning styles, and generational influences are vital components for any adult educational training to be successful (Blevins, 2014). The principles of adult learning consist of six assumptions: 1) adults need to understand the importance of the new information, 2) adults are autonomous beings and are responsible for their own lives, 3) adults use their own experiences to relate it to new information being taught, 4) adults learn what they need to use, 5) adults are problem-centered, and 6) internal pressures such as quality of life are higher motivators than external motivators (Blevins, 2014; Knowles, Holton, & Swanson, 2011). Learning styles can be visual, auditory, or kinesthetic. Mixed didactic and interactive methods increase compliance with evidence-based practice (Hoffmann, Bennett, & Del Mar, 2017). Various techniques that allow for interaction and enable learners to process and apply information are case-based learning, clinical simulations, practice, and

feedback (Bluestone et al., 2013). This proposed project aims to use clinical scenarios and vignettes to disseminate the updated CDC TB guidelines to occupational health professionals in the hopes of impacting the intent to change practice in their worksite.

Theoretical Framework

The Knowledge to Action (KTA) framework developed in Canada by Graham et al. (2006) was used to address the clinical problem: How will an interactive educational TB module, with the updated 2019 CDC TB guidelines for healthcare workers, impact the intent to change practice among occupational health providers (OHP) when screening healthcare personnel for LTBI? This framework consists of two components: knowledge creation and action cycle. Knowledge creation, represented as a funnel, includes knowledge inquiry, knowledge synthesis, and knowledge tools and products (Graham et al., 2006). As knowledge passes through these phases, it becomes more consolidated, and an end product is created to present this new knowledge. The action cycle comprises of seven activities needed for education to be applied to practice (see Appendix F).

The KTA framework identifies all the steps to be taken to implement an educational TB module for occupational health professionals. It allows for feedback at every stage and cycle of the framework and the ability to tailor activities to meet the specific needs of those who will be utilizing the knowledge (White & Dudley-Brown, 2016). This section of the paper will seek to explain how KTA was used to address the clinical problem previously stated.

Knowledge Creation

Knowledge Inquiry. In 2014, WHO introduced the END TB Strategy, which aims to reduce TB deaths by 95%, cut new cases of TB by 90% between 2015 and 2035 and ensure no family is burdened with expenditures due to TB (WHO, 2019). The WHO is demanding

governments to implement and support the strategy, primarily to serve vulnerable populations to infection and inadequate health care access (WHO, 2019). This strategy will involve multiple stakeholders in the health sector and beyond. The END TB strategy highlights the need to engage partners within the health sector and beyond. The proposed project will assist with this goal by disseminating the updated CDC TB guidelines to healthcare personnel and measuring their intent to change their practice to adhere to these recommendations.

Knowledge Synthesis. Research shows that the prevalence of TB is due in part to the reactivation of LTBI (Matteelli et al., 2017). Persons considered at highest risk for LTBI and active TB disease, include foreign-born people who have been residing in the United States for five years or less after moving from geographic areas with a high rate of TB, and healthcare workers (HCW) who take care of high-risk patient or have unguarded exposure to a patient with TB before the proper precautions have been initiated (Stewart & Tsang, 2016). The increased risk of TB is due in part to delay in diagnosis and increase of immigrants who come from countries with a high prevalence of TB (Casas et al., 2013). Hence, encouraging treatment for high-risk groups can assist in lowering the incidence of TB cases and lead to the elimination of TB.

Products/tools. In June 2019, the CDC released an updated TB guideline for healthcare personnel. These guidelines highlight the importance of screening for LTBI in healthcare personnel to decrease the incidence of TB cases. Developing a comprehensive, easy to use interactive TB educational module for occupational health professionals will ensure the right information is being communicated, and the proper tests and actions are being performed consistently. The CDC currently has self-study modules on TB (9 in total) that are divided into two sections. The CDC and other organizations have also released multiple memos with these recommendations. Medscape, a website providing access to medical information for healthcare

providers, created a 0.5 CEU course geared towards these updated TB recommendations and ask two questions at the end. It does not delve deeper into how healthcare providers will incorporate these recommendations into practice.

The Action Cycle

Step one: Identify the problem. Clinical practice guidelines are evidence-based recommendations with the potential to improve population health, yet they remain underutilized (Hoffman et al., 2017). Lack of integration challenges the potential to sustain new practices (Brewster et al., 2015). The new updated TB clinical guidelines for healthcare personnel need to be circulated to ensure it is being put into practice.

Step two: Adapt knowledge. The target audience for this DNP project were healthcare professionals, specifically OHP. Healthcare professionals play a crucial role in TB eradication. They will advocate for necessary resources and implement TB infection control policies in their current work location (Nathavitharana et al., 2017).

Step three: Assess barriers. Some barriers to be addressed are the implication of amending and creating new institutional policies at the healthcare professionals' workplace to include these new CDC TB recommendations at the workplace and the time required to complete the educational module. Members from the professional association were tasked to take the educational module and act as an expert panel to evaluate the module and its feasibility and limitation and whether it will change their practice. The CDC encourages the treatment of LTBI but does not mandate it.

Step four: Develop and implement intervention. With the aid of Dr. Bhavaraju, the Director of The Global TB Institute and Dr. Manchester, Associate Professor and Clinical

Assistant Dean at Rutgers University, an educational TB module was created via Canvas and distributed electronically to the members of this professional association.

Step five: Monitor knowledge use. A post-test determined if the OHP had attained the materials presented, as well as sought their expert opinion and feedback on the module itself and whether it will impact a change in practice.

Step six: Evaluate the impact of knowledge use. The Continuing Professional Development (CPD) Reaction Questionnaire measured and determined if the educational TB module had any influence on the intent to change practice among the OHP who participated in the module. Content analysis was also used to evaluate the responses from the Activity Evaluation form and the post-4-week survey.

Step seven: sustain the use of knowledge over time. This interactive educational module will be archived at a Rutgers University, School of Nursing, via the Canvas learning management system, for two years. It will be available to nursing students. The module will also provide OHP with resources to ensure the updated CDC TB guidelines are being applied in their workplace.

The KTA framework guided this project via a step by step process and hopefully influence a positive change in practice by OHP by properly screening healthcare personnel for LTBI and offering them treatment.

Methodology

Design of Project

The project used a pre- and post-quasi-experimental design.

Setting

An online, interactive platform, Canvas, provided by Rutgers University School of Nursing was used.

Subject Population

This project included a purposeful sample of 69 men and women from a professional association who affiliated themselves from one of the following states: New York, New Jersey, Connecticut, Massachusetts, New Haven, Rhode Island, Vermont, Central Pennsylvania, Eastern Pennsylvania, Southwest Pennsylvania, Maine, Delaware, District of Columbia, and Maryland. Inclusion criteria includes being an English-speaking, active member of said professional association. Exclusion criteria were men and women who were inactive members and did not identify themselves from one of the following states: New York, New Jersey, Connecticut, Massachusetts, New Haven, Rhode Island, Vermont, Central Pennsylvania, Eastern Pennsylvania, Southwest Pennsylvania, Maine, Delaware, District of Columbia, and Maryland. Using Raosoft, Inc. (2004) for an a priori power analysis to calculate sample size, having a 5% margin of error and 95% confidence level, the necessary sample size needed was 55 participants.

Subject Recruitment

Information about the interactive TB module was shared via an online flyer. An administrator of the professional association-controlled access to the participants and sent all emails. At the request of the administrator and the current COVID-19 pandemic, the total number of reminders were reduced from four to two. These two email reminders to complete the module were sent: the initial invite and an email reminder one week after the first initial invite. Participants were provided with a handout, via an email attachment, that summarized the project and provided contact information. Participants were informed that participation in the module

was voluntary, and one continuing education unit (CEU) was provided after the completion of the module. Copies of the recruitment email fliers and email reminder notifications can be found in Appendices G-I.

Consent

Consent was included as a task in the module. Participants were not able to proceed to the rest of the module without the consent/procedure completed. (See Appendix J).

Risks/Harms/Ethics

Participation in this project posed a minimal risk. There was a possibility of risk of anxiety after completing the module due to changes that would need to take place to be compliant with CDC recommendations. Still, solutions to barriers were presented in the module. The data was securely stored in a password-protected computer in the Rutgers Biomedical Health Sciences building located at 65 Bergen Street, Room 1126, Newark, NJ 07107. All data was locked, following the RU encryption process. The data collected was tracked using Microsoft Excel for analysis. A secure Qualtrics server collected and stored the data in the password-protected electronic format. This server ensured that all responses remained anonymous, as it did not collect information such as name, email, or IP address. No names or identifying information were included in any publications or presentations, and all responses to the questionnaire remained confidential. Subject confidentiality was maintained, and only the PI had access to the information from the pre and post-tests.

Subject Costs and Compensation

There was no cost to participate in this project. Subjects did not receive monetary compensation for their participation in the project; however, contact hours, at a cost of \$600, were provided "in kind" by the Rutgers School of nursing.

Study Intervention

The interactive educational module was developed based on the updated 2019 CDC TB guidelines (Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC), and the CDC Self-Study Modules on Tuberculosis, 1-5 (see Appendices K-L for Module Outline and Course Instructions). The pre- and post-TB test questions were created by the DNP student and given to a team of experts in the field of tuberculosis for face validity. This process resulted in a 11-item questionnaire that was given at the beginning and end of the module to test TB content presented. Participants were also given the Continuing Professional Development (CPD) reaction questionnaire post module to measure their intent to change practice after participating in the module.

The CPD questionnaire is a twelve-item instrument, with a Cronbach's coefficients varying from 0.77 to 0.85, which combines social cognitive theories for justifying health professionals' clinical performance (Legare et al., 2017). The CPD tool proposes that three categories of variables predict the behavior of health professionals: 1) their intention to adopt a particular behavior or not; 2) their beliefs about their capabilities; and 3) their past behavior and habits (Legare et al., 2017). Each response uses a Likert-scale ranging from 1 to 7. The DNP student obtained permission to use the CPD tool.

The interactive educational TB module had eleven parts: 1) Consent, 2) Pre-test on TB Knowledge, 3) TB 101, Part One, 4) Video, 5) TB 101, Part Two 6) Highlights of the 2019 Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC guidelines, 7) Video, 8) Three POWTOON case studies, 9) Post-test on TB knowledge, 10) CPD

questionnaire, and 11) TB Resources (See Appendices M-Y). A follow-up survey was sent via email four weeks after completion of the module to self-report any changes made in their current practice to implement the CDC TB recommendations (See Appendix Z).

Outcomes to be Measured

The planned outcomes to be measured were TB knowledge, intent to change practice, implementation of one recommendation from the TB guidelines, and barriers to implementation of guidelines. An increase in TB knowledge among OHP would have been evidenced by the pre/post-test TB test scores. The CPD reaction questionnaire measures the intent to change practice, which would have been evidenced by the post-module Likert scale scores. The post-4-week survey and activity evaluation form would have evaluated the implementation of one recommendation and the identification of any barriers. However, due to COVID-19, these outcomes were not able to be measured as planned.

Project Timeline

The complete DNP project took ten months to complete: November 2019 to October 2020. These months were divided into five seasons: Fall 2019, Winter, 2020 Spring 2020 Summer 2020, and Fall 2020 (See Appendix AA). During the Fall of 2019, meetings with the DNP Chair and team members took place to finalize the clinical question. The first proposal draft was submitted to all team members at the end of December for review. The creation of the interactive educational module, along with the TB knowledge pre and post-test questions, and post-4-week survey, was created during January of 2020. During that time, an expert panel reviewed and finalized the "TB 101" PowerPoints and the knowledge pre and post-test.

The final proposal was submitted to the IRB in May 2020. IRB approval was given, and the educational module was set up on the canvas platform by the second week of May 2020 (see

Appendix AC). The two email notifications (separated by one week) were sent between May 20 to May 27 to active members of the professional association. The analysis of the data occurred during July 2020. The post-4-week survey was sent between July 1 and July 15. Final review of the pre/post TB knowledge test scores and responses from the post-4-week survey took place during July 2020. Draft analysis of final findings and team member discussions also took place at this time as well. The final proposal and poster presentation will be completed between July and August of 2020. The final exhibition will take place on August 30, 2020.

Project Budget

The costs associated for this project was the sole responsibility of the DNP student. Costs included recruitment materials, educational handouts, and materials for the online educational program. Research expenses were also included in the budget for this project. (See Appendix AB for the anticipated budget).

Evaluation Plan

The results of the post-test for TB knowledge would have been analyzed using a paired t-test. Descriptive statistics, such as mean and standard deviation, would have also been performed on these test scores. However, due to the current COVID-19 pandemic and the low response rate, these tests could not be performed. The Rutgers Activity Evaluation Form was given to participants at the end of the educational module to get CEU credits and to provide feedback on whether the participants felt the objectives were met. The results of the CPD Reaction Questionnaire would have also been analyzed. Qualitative content analysis would have been used to analyze the responses to the follow-up email four weeks post module, but no response was received from the participants.

Data Analysis Plan

Descriptive statistics were used to describe the sample of participants. Analytical statistics would have been used to determine the efficacy of the project interventions. Ordinal data (pre-and post-intervention scores) was collected for participants' tuberculosis knowledge and comparison was made to see if there was a change in score. A t-test would have demonstrated if TB knowledge increased after participating in the module. The statistical software package SPSS would have also been used for the completion of data analysis.

Data Maintenance/Security

The data was securely stored in a password-protected computers in Rutgers University following the RU encryption process. The data collected was tracked using Microsoft Excel for analysis. A secure Qualtrics server collected and stored the data in the password-protected electronic format. This server ensured that all responses remain anonymous, as it did not collect information such as name, email, or IP address. No names or identifying information were included in any publications or presentations, and all responses to the questionnaire remained confidential. Subject confidentiality was maintained, and only the PI had access to the information from the pre and post-tests.

Results

Due to the low response rate (3%), statistical analysis of data could not be conducted. Out of the 69 participants recruited, 22 attempted the module, but only 2 completed it. Both participants did show an average 31% increase in TB knowledge, as evidenced by their pre and post TB test scores. While they were both neutral in their intention to change their practice, they strongly agreed that implementing these new guidelines would be useful and beneficial. Systemic barriers were identified by one of the participants in the activity evaluation form. None

of the participants completed the post-4-week survey, hence the implementation of at least one recommendation could not be assessed.

Had the response rate been higher, the study hoped to show a correlation between the module and an increase in TB knowledge. The participants' Likert Scores from the CPD Questionnaire would have been analyzed to see if participants showed an intent to change their practice, then follow-up with them four weeks later to see if any changes had been implemented in their practice. The identification of barriers would have been analyzed by the post-4-week responses and activity evaluation forms.

Discussion

This study, using quantitative and qualitative methods, sought to disseminate updated TB clinical guidelines and influence healthcare professionals in making the necessary changes in their practice to reflect them. Unfortunately, the low response rate amidst the current global pandemic of the coronavirus disease 2019 (COVID-19) undermined this attempt. That being said, TB must continue to be monitored, and healthcare professionals will still need to abide by the new guidelines set forth by the CDC. This educational module did highlight the changes that need to take place and offered valuable resources that would make compliance with these new regulations more attainable.

Limitation of Findings

The outcomes did not allow for statistical analysis to determine what impact, if any, the module had on the participants' TB knowledge, their intent to change practice, the identification of any barriers to implementing these changes, and if any changes were made. Some contributing factors that might have influenced the results were: 1) small sample size, 2) lack of control of the association's listserv, 3) number of email reminders sent to participants to take the survey, 4) the

two-week window to participate in the study, and 5) allowing for only four weeks to see if a change took place in practice. An administrator of the association was responsible for recruiting its members for this study, and they set limitations on the number of reminders that could be sent. Instead of four reminders, only two were allowed: the initial invite, and one a week later.

Not having control of the participants' emails to send out the invites and reminders might have influenced the low response rate as well. A reminder had to be sent to the administrator to send the emails to the participants. The emails were noticed to be sent later in the day when maybe the healthcare professionals would have been too busy to check their inboxes. The study was open for two weeks only, and because of the current COVID-19 pandemic, it might not have allowed participants sufficient time to take the one-hour long module. Twenty-two participants attempted the module but did not complete it, so maybe shortening it might serve to be more beneficial. The communication lag with participants from when they were completing the module to when the post-4-week survey was sent, presented another barrier in getting a higher response rate. It also could be too short a window to implement any changes into practice. Extending this post-4-week survey time frame might prove to be more conducive to yielding results.

Facilitating/Prohibiting Factors

The current climate and environment of the COVID-19 pandemic influenced the outcome of this study. The targeted audience was healthcare professionals, who are now on the front lines of this pandemic, and their priorities are not on tuberculosis. The lack of control over the participants' emails and sending reminders contributed to the results.

Implications

This project demonstrates that tuberculosis guideline dissemination via an interactive educational module can be a sustainable means of increasing provider TB knowledge, and reinforcing updated TB guidelines. While further studies will be needed to identify and address barriers to implementation of said guidelines, it can serve as an educational tool for healthcare workers and be a valuable resource for screening, prevention, and treating LTBI.

Policy Implications

The release of the updated TB guidelines will require institutions to revise their current TB policies and procedures to reflect these recommendations. All health care workers will be required to complete an individual baseline TB risk assessment, which is a form all institutions will need to have in place (CDC, 2018). This module provides a template that can be customized for each institution. This document is listed under "TB Resources" in the module. Annual TB education is another requirement that must be implemented in institutions. It should include information about TB, TB risk factors, signs and symptoms of TB, and TB infection control and policies. Mandating all healthcare workers to take this educational TB module annually as a work requirement, will comply with these regulations and will be one less thing an institution will need to do.

Additional policies that need to take effect are those for treating LTBI. Institutions will need to look at how they can offer LTBI treatment, whether it is providing those services themselves or referring them another facility. Institutions will also need to change their policies regarding the frequency that healthcare workers are screened for TB. The new recommendations state that only healthcare workers who have an occupational risk or ongoing exposure should be

screened annually (CDC, 2018), which will require informing all healthcare workers of such changes.

Economic/Cost Benefit of Project

Treating LTBI is more cost-effective than treating TB disease. Treating TB disease requires multiple doctor visits, laboratory tests, chest x-rays, and costly medications. This online interactive educational module requires a minimal cost to implement, yet can reach a multitude of healthcare providers at the same time. It will increase provider TB knowledge, inform providers on the new TB guidelines, and discuss how to address potential barriers of implementing the new guidelines. Resources will need to be allocated for any additional tests and supplies (such as IGRAs, PPD solution, needles, syringes, etc.) to conduct LTBI screening. Money should also be allocated for the treatment of LTBI if institutions choose to offer this service to their employees.

Health Care Quality and Safety

Proper screening and treatment for LTBI should be completed on all high-risk healthcare personnel, which will reduce the reactivation of active TB disease. TB disease is a contagious and fatal disease, but following the updated TB guidelines will aid in decreasing the morbidity and mortality of the disease. The importance of screening of LTBI couldn't be more critical in this COVID-19 pandemic. TB and COVID-19 are known to be transmitted via close respiratory contact and have similar signs and symptoms: dry cough, fever, and shortness of breath (Dara, Sotgiu, Reichler, Chiang, Chee, & Migliori, 2020). Frontline healthcare workers need to be well-informed on triage, cough etiquette, contact tracing and infection control policies for both diseases (Dara et al., 2020). TB screening should not be overlooked and should be a priority for both healthcare workers and the general public safe.

Health Policy

Advocating for LTBI screening to be included as a preventative service will encourage healthcare providers to screen routinely for LTBI on all patients. Healthcare providers can play a vital role in pushing for legislature to support this measure, which is necessary to aid in the elimination of a highly contagious and fatal disease.

Education

The interactive educational module will remain as an actively listed available course at Rutgers University for two years, which allows nursing students and licensed nurses can access to it for two years. This module can also serve as an annual TB educational training for healthcare providers, primarily since contact hours will be provided.

Plans for Sustainability

Rutgers University will post the interactive educational module for two years on the Center for Professional Development's website. Participants can register and take the course to obtain contact hours. This project will serve as a foundation for future DNP students interested in tuberculosis, to continue to update with any future TB recommendations made by the CDC. A modification of the study can be conducted that expands the sample pool to other health care providers besides occupational health professionals, lengthens the duration the study is available, increases the number of email reminders and prolongs the post module survey to assess for implementation of changes. Plans are also underway with the Deputy Director of the Global TB Institute to discuss this module with their training staff and market it to other health professionals since it will be accessible online and provide contact hours.

Plans for Dissemination and Future Scholarship

Results of this project will be presented at Rutgers School of Nursing, as part of the requirements for the doctorate nursing practice degree as well as at AOHP's 2021 National Conference.

Summary

TB is an infectious disease that should no longer be a burden in the United States. Proper screening and treatment can eliminate this disease in its entirety. Educating healthcare providers on the most updated TB guidelines will ensure that LTBI screening is accurately performed on all who are considered high-risk, policies and procedures are revised and implemented in institutions, and continuous screening is done annually for all healthcare personnel.

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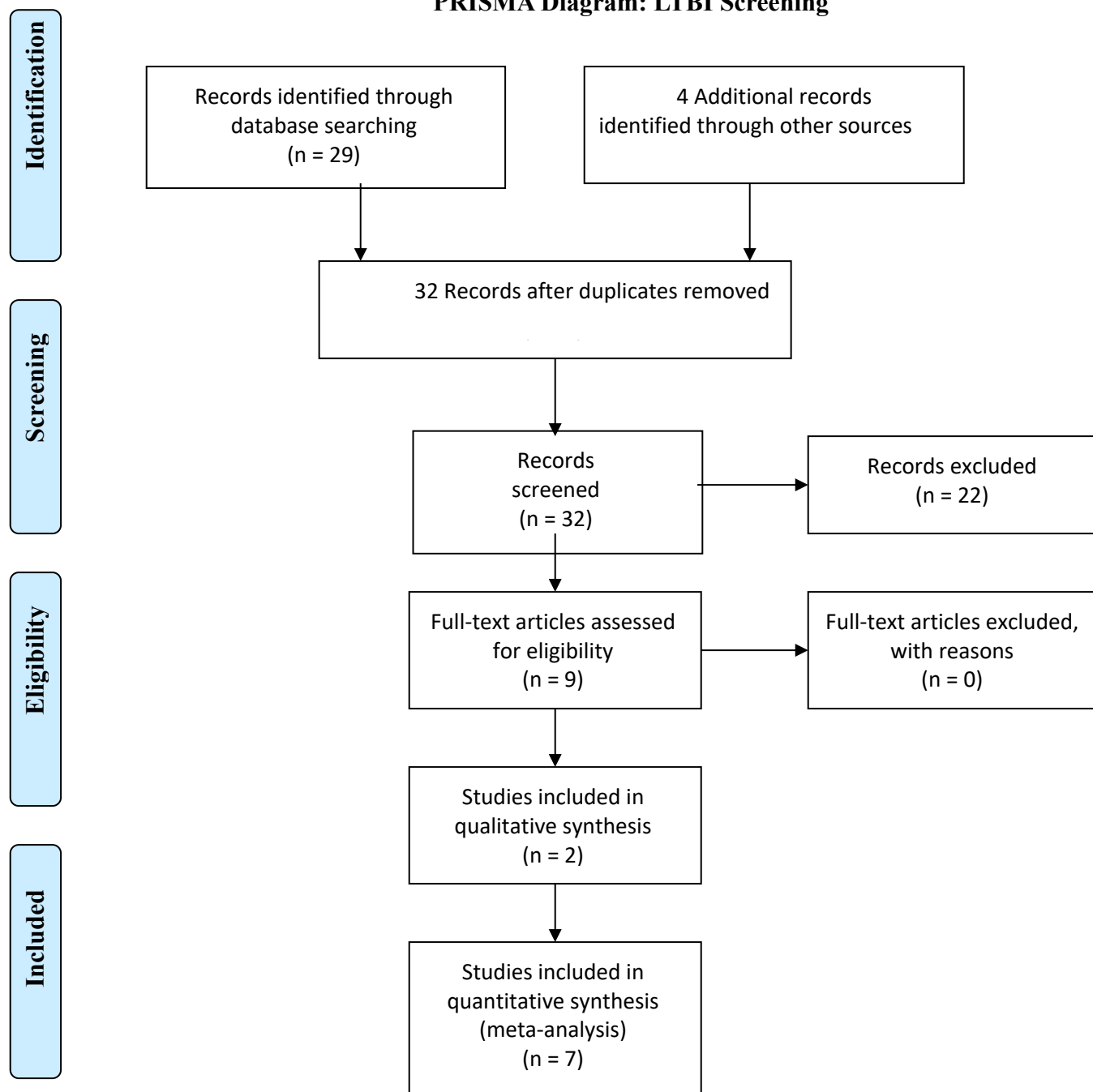
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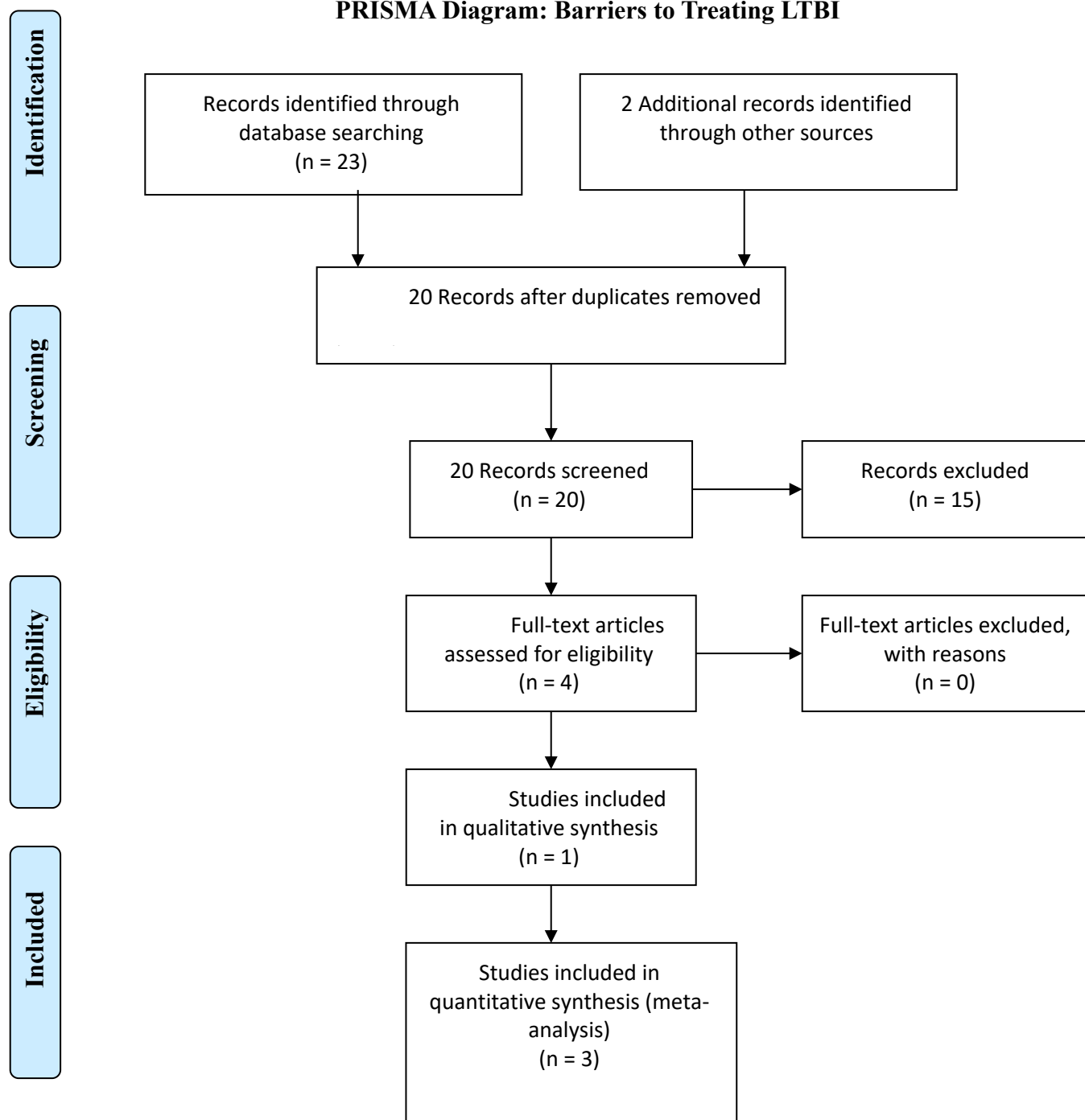
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Appendix A

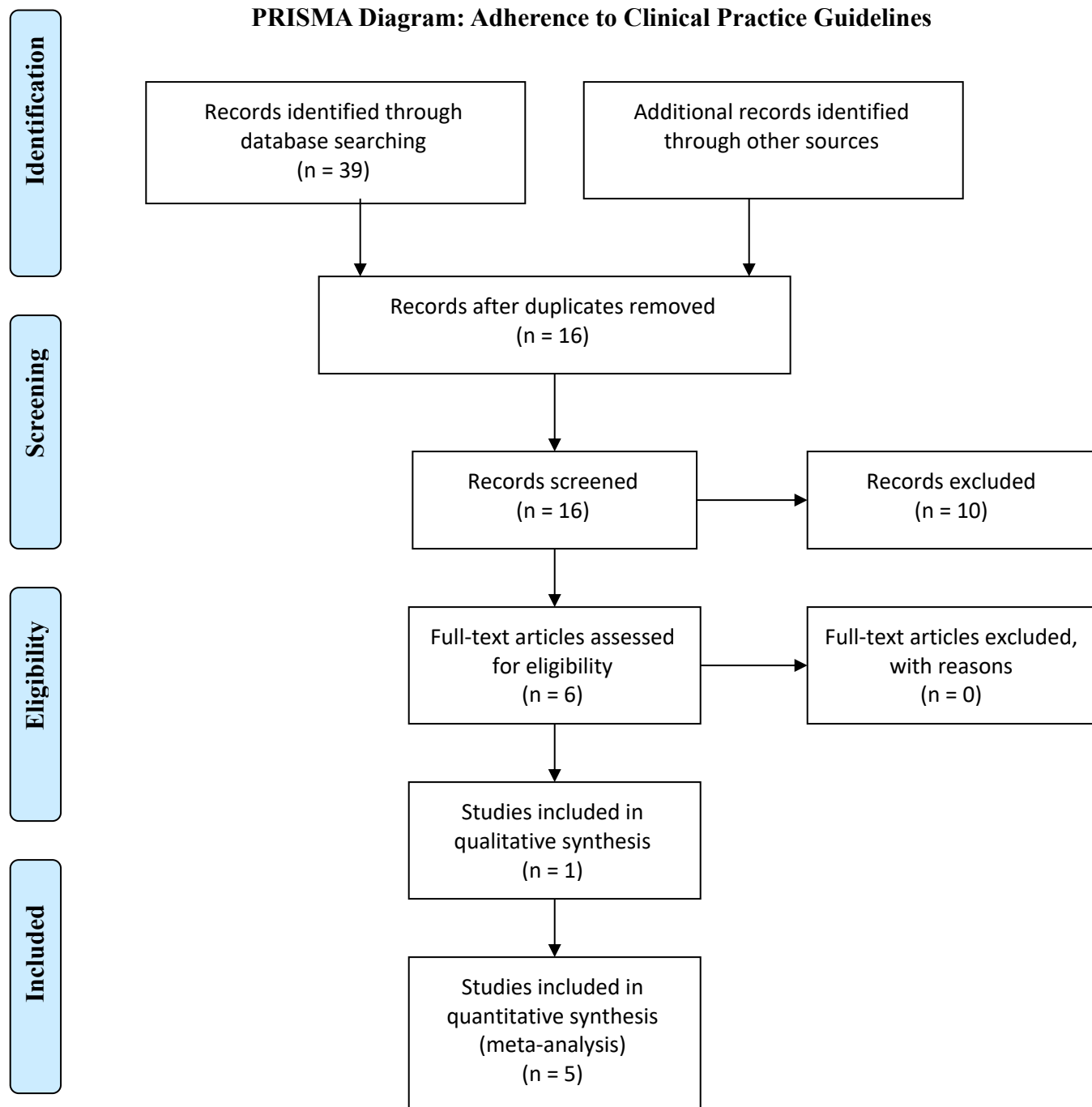
PRISMA Diagram: LTBI Screening



Appendix B**PRISMA Diagram: Barriers to Treating LTBI**

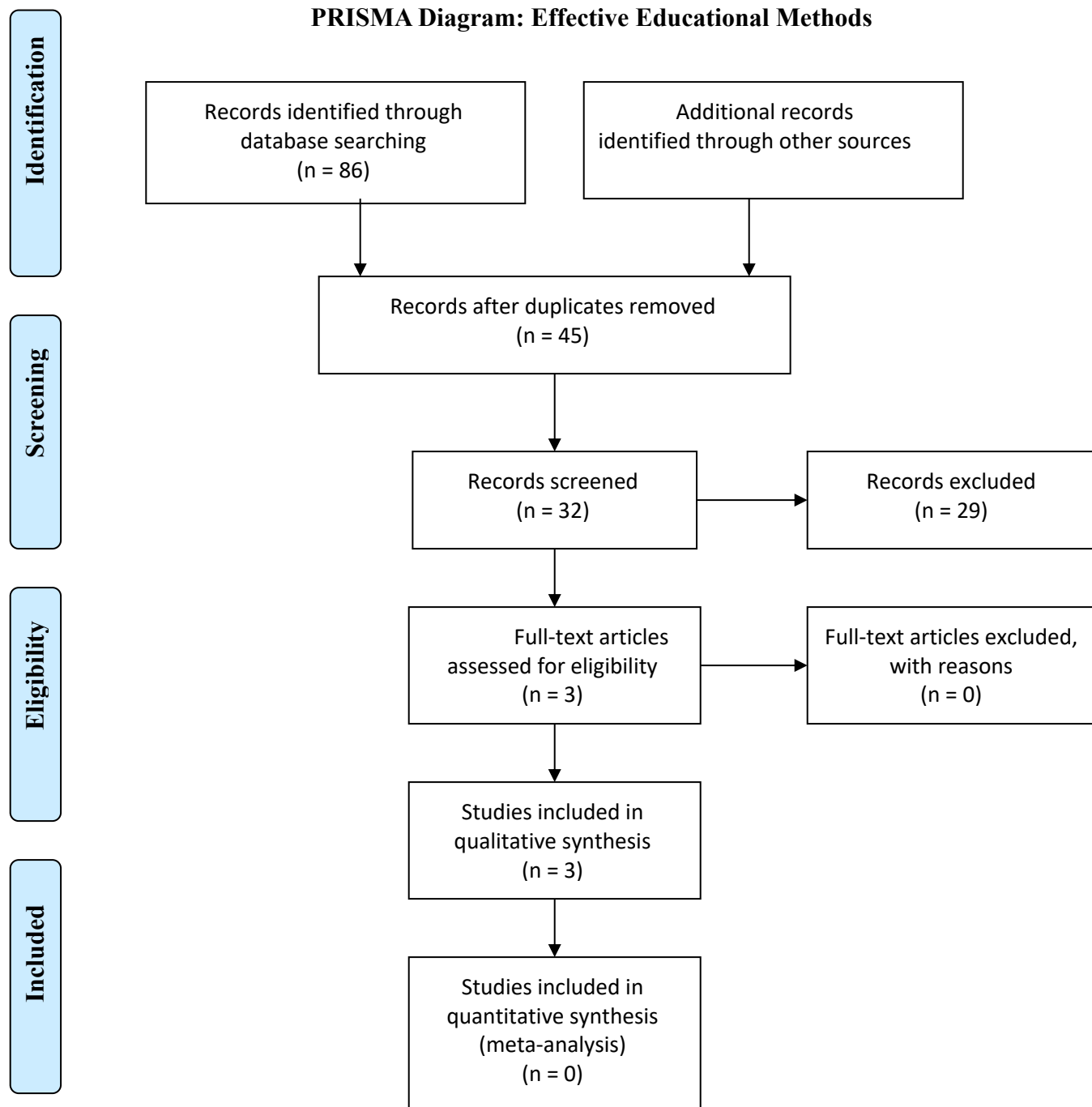
Appendix C

PRISMA Diagram: Adherence to Clinical Practice Guidelines



Appendix D

PRISMA Diagram: Effective Educational Methods



Appendix E

Table of Evidence

EBP Question: How will an interactive educational Tuberculosis (TB) module, with the updated 2019 Centers for Disease Control and Prevention (CDC) TB guidelines for healthcare workers, impact the intent to change practice among occupational health providers (OHP) when screening healthcare personnel for Latent Tuberculosis Infection (LTBI)?

Date: November 17, 2019

Article	Author, Date	Evidence Type	Sample, Sample Size, Setting	Study Findings that help answer EBP question	Limitations	Evidence Level & Quality
#1	Blevin et al. (2014)	Review	Multiple sample/setting	Six assumptions of Adult learning: 1) adults need to understand the importance of the new information, 2) adults are autonomous beings and are responsible for their own lives, 3) adults use their own experiences to relate it to new information being taught, 4) adults learn what they need to use, 5) adults are problem-centered, and 6) Internal pressures such as quality of life are higher motivators than external motivators	Article was from 2014, which means anything after 2014 was not studied or included.	Research Level V, B, Good Quality
#2	Bluestone et al. (2013)	Literature Review	Multiple sample/setting	Multiple techniques allow for interaction and enable learners to process and apply information	Data collected was from 2000 to 2011.	Research Level V/B, Good Quality


				<p>Case-based learning, clinical simulations, practice and feedback are effective educational techniques.</p> <p>Computer-based learning is more effective than live instruction and more cost efficient</p>		
#3	Chang & Cataldo (2014)	Systematic Review	<p>Multiple studies/settings</p> <p>Eighty-three studies from 35 countries</p>	<p>Cultural variations should be considered in the development of interventions aimed at reducing stigma and improving treatment adherence.</p>	<p>The study looked at research before 2014 and left out data after 2014.</p>	<p>Research</p> <p>Level III/B</p> <p>Good Quality</p>
#4	Chee, C. et al. (2018)	Review	N/A	<p>LTBI treatment is less in countries with high resources and low burden of disease.</p> <p>Current Diagnostic test have low predictive value</p>	<p>This study provided an overview of the literature available for LTBI testing but did not support one method or the other.</p>	<p>Non-Research</p> <p>Level IV/A,</p> <p>Good Quality</p>
#5	Craig, G.M. et al. (2017)	Systematic Review	Multiple studies/settings	<p>In low TB burden settings (incidence of less than 100 per 100,000 people per year), TB stigma plays a role in whether an individual will seek or start TB treatment.</p> <p>Interventions</p>	<p>The study looked at research from the last ten years (2006 to 2016), which leaves out data from before 2006 and after 2016.</p> <p>The study didn't list any actual interventions to reduce TB stigma.</p>	<p>Research</p> <p>Level III/B,</p> <p>Good Quality</p>

				addressing TB stigma should implement cultural differences of the targeted population.		
#6	Doan et al. (2017)	Systematic Review	Multiple Studies/Settings used (157 articles included in the analysis)	<p>This article discussed the importance of using the best performing test to diagnose LTBI. It compared the use of the Tuberculin Skin Test with Interferon-Gamma release assays for LTBI diagnosis.</p> <p>OHP can use either test to diagnose LTBI.</p> <p>Results from this study show that IGRAs is a better diagnostic tool for individuals with a history of BCG vaccine, whereas TSTs are better for immune-competent individuals. IGRAs should be incorporated in settings where the population has a history of BCG vaccine. This information needs to be included in the educational module.</p>	This review looked at many studies that had different populations other than healthcare workers and different countries with varying rates of prevalence of TB.	Research Level III/A, High Quality

#7	Gao, Cook, & Mayhew (2018)	Mixed Methods	<p>Total of 1,598 patients</p> <p>Patients were 18 years or older and were patients of two TB clinics in Greater Vancouver, Canada</p> <p>45-minute health promotional video on latent tuberculosis infection (LTBI).</p>	<p>A culturally tailored, multi-lingual educational video on LTBI increased knowledge and facilitated behavior change among patients.</p>	<p>This study focused on patients and LTBI education and not healthcare providers.</p> <p>The study setting was conducted in Vancouver, Canada, which is different from where the proposed study will take place.</p>	<p>Research ,</p> <p>Level III/A, High Quality</p>
#8	Getahun, H. et al. (2015)	Systematic Review	Multiple studies/settings	<p>Benefits to treat Latent Tuberculosis Infection (LTBI) outweighs the risk.</p> <p>Shorter treatment duration is preferred to treat LTBI.</p> <p>National Data collection should be created to track and monitor people with LTBI.</p> <p>Guidelines were developed by the World Health Organization (WHO) to provide clear policy guidance on the</p>	<p>The study looked at research from 2003 to 2014, which leaves out any new recommendations that might have come after 2014.</p>	<p>Research</p> <p>Level IV/A High Quality</p>

				management of LTBI.		
#9	Hannah et al. (2017)	Non-experimental	Data obtained from the National Tuberculosis Surveillance system and included 52,175 patients who were alive or dead and diagnosed with TB between 2009 and 2013.	TB patients with certain risk factors have an elevated risk of TB mortality. These patients should be monitored before, during, and after treatment.	Choosing only patients diagnosed with TB between 2009 and 2013 leaves out individuals before 2009 and after 2013, which might yield different data since new medication regimens have been recommended.	Research Level III/A High Quality
#10	Haas et al. (2016)	Systematic Review	Multiple studies/settings	Diagnostic tests aren't sufficient to diagnose active TB. Other factors need to be included. Other tests/screenings are needed to diagnose and treat tuberculosis	Review was done in 2016 and any new findings after that date may not be included and will not reflect the new 2019 guidelines.	Research Level IV/A High Quality
#11	Katrak et al. (2018)	Non-experimental	N/A	This article discusses barriers to the elimination of TB and makes suggestions on where efforts should be: 1) Finding and engaging high-risk patients and the providers who serve them, 2) Enabling health	The solutions suggested to overcome TB elimination are not specific and only generalizes what should be done	Non-Research Level IV/B, Good Quality

				care systems to adopt recommended strategies for testing and treatment through improved dissemination of policy, 4) tracking and measuring LTBI outcomes and 4) reducing financial barriers to LTBI treatment.		
#12	Knowles et al. (2011)	Book	Multiple studies/settings	Introduction of adult learning style: Andragogy and its six assumptions (the learners' self-concept, the role of experience, readiness to learn, orientation to learning, motivation, and the need to know	Data presented is from 2011, new findings after that date would not be present in book.	Research Level V/A High Quality
#13	Matteelli, A. et al. (2017)	Medical Review	N/A	Testing and treatment of LTBI require an effective monitoring and evaluation system and political commitment. In high income and low incidence settings, testing of high-risk populations should be targeted.	Study and ideas are from six expertise and can have some bias based on their specialties. Their interpretation of the WHO guidelines could have been misinterpreted.	Non-Research Level V/B, Good Quality

#14	Miller et al. (2019)	Systematic Review	<p><u>Study 1:</u> Colorado (2002-2003)</p> <p><u>Study 2:</u> Georgia (2009-2010)</p> <p><u>Study 3:</u> Colorado (2016-2017)</p> <p><u>Study 4:</u> Florida (2015-2017)</p> <p><u>Study 5:</u> California (1992)</p> <p><u>Study 6:</u> California (no year reported)</p> <p><u>Study 7:</u> New York (2003-2005)</p>	<p>The effectiveness of strategies by healthcare facilities to improve targeted TB infection testing and linkage to care is unclear among non-United States (US) born persons in the US.</p> <p>Multifaceted strategies targeting providers may improve targeted TB infection testing.</p>	<p>This systematic review focused on only seven studies that were identified as low-quality evidence. Additional high-quality studies are needed to infer what methods work best to improve LTBI testing and treatment among non-US born individuals in the US.</p>	<p>Research</p> <p>Level III/A</p> <p>High Quality</p>
#15	Morano et al. (2014)	Quasi-experimental	<p>A total of 8,322 individuals visited the</p> 	<p>Screening for Tuberculin Skin Tests using a mobile medical clinic identified high-risk TB foreign-born Hispanic, working, and uninsured populations for LTBI in an urban setting.</p> <p>Providing an outreach interactive interventional strategy approach</p>	<p>This study was effective for LTBI screening in foreign-born Hispanics, which is the population in New Haven, Connecticut, but there is no evidence that it will work for other ethnic groups.</p> <p>Selection Bias noted for sampling method because the individuals that</p>	<p>Research</p> <p>Level II/B</p> <p>Good Quality</p>

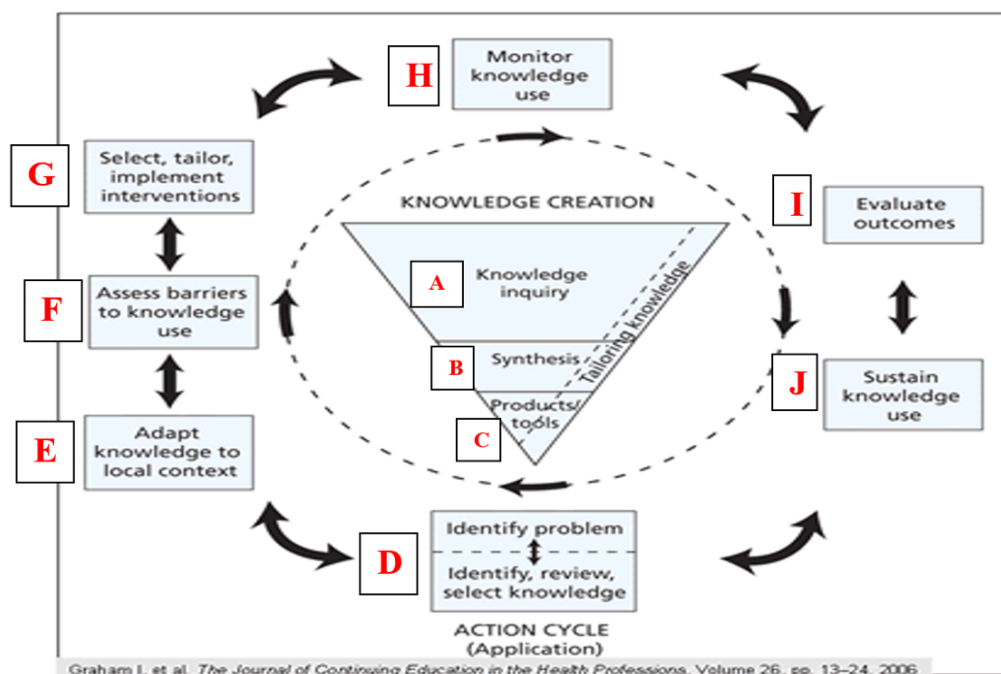
				to screen for LTBI can be offered as an option for OHP when screening employees.	utilized the mobile van were because they precisely needed a TST, for example, employment purposes.)	
#16	Narayanaan et al. (2019)	Non-experimental Cross-sectional Study	At least 18 years of age, self-identifying as South Asian, verbal consent for participation, and birth in a high TB endemic country	Understanding the beliefs among non-US born South Asians in New Jersey can provide insight on developing a multicultural educational approach to promote LTBI screening and testing for this population.	<p>Focused only on Non-US Born South Asians in New Jersey.</p> <p>Selection Bias for the sampling method</p> <p>Gender was not taken into consideration when data was collected.</p> <p>Data collected was from self-reported surveys; hence the accuracy of the survey is not known.</p>	Research Level III/A High Quality
#17	Negin et al. (2015)	Meta-Analysis	Multiple studies/settings	Treating TB at an older age can lead to poorer outcomes; hence it imperative to treat LTBI early on before it progresses to active TB, and the person gets older.	Multiple populations and settings were studies so generalization cannot be done.	Research Level III/A, High Quality
#18	Parmer et al. (2017)	N/A	Child: 6-12 years; Adolescent: 13-18 years	Provides a general overview of tuberculosis transmission, pathogenesis, and	Population was limited to children and adolescents.	Non-Research Level IV/B

				epidemiology; presents preventive care recommendations for targeted testing among high-risk groups. It discusses the USPSTF recommendation's applicability to public health and primary care practice in the United States.		Good Quality
#19	Pinti et al. (2016)	Review	Multiple studies/settings Mice and Human subjects	Age-related changes in immunity have been shown to impact morbidity and mortality in general.	Research was done from 2016 and prior. Any new developments in aging will not be reflected after 2016.	Research Level V/B Good Quality
#20	Png et al. (2019)	Quasi-experimental	Tertiary-care hospital in Singapore 30-year-old, newly hired healthcare worker	Targeted LTBI screening for healthcare workers can be highly cost-effective for hospitals in settings like Singapore.	This study was a simulation based on assumptions made from published literature or expert opinion. The setting took place in Singapore, a high incidence TB country.	Research , Level II/B Good Quality
#21	Sosa et al. (2019)	Clinical Practice Guidelines	N/A	Provides the recommendations for the Tuberculosis screening, testing, and treatment of healthcare personnel. It will	They might not apply to all healthcare workers. Recommendations might not screen for LTBI in individuals who	Non-Research Level IV/A, High Quality

				serve as the vital information to be implemented into the educational module.	should be screened but might not be based on the new guidelines.	
#22	Whittaker et al., (2018)	Cross-sectional	<p>The study was conducted at the [REDACTED]</p> <p>78 children in 4 age groups.</p>	BCG immunity wanes over time, recommended booster for children in high TB endemic areas.	<p>Setting took place in South Africa</p> <p>TB Testing was limited to IGRA, and TST were not taken into consideration</p> <p>Limited to children, not adults.</p>	Research Level II/B Good Quality

Appendix F

Theoretical Framework: Knowledge to Action



Adapted from Graham, I., Logan, J., Harrison, M., Strauss, S., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map?. *The Journal of Continuing Education in the Health Professions*, 26.

LEGEND

- A. Risks of TB among HCP; Are HCP being screened and treated for LTBI?
- B. Literature Review on LTBI, HCP and TB Policies
- C. Educational TB Module
- D. Identification/Treatment of LTBI will lower TB incidences
- E. Members from the NY Chapter of the Association of Occupational Health Providers (AOHP)
- F. Barriers are time (how long should the educational module take), creation of new protocols and policies for OCP and their worksite
- G. Educational Module will be sent electronically to members from the NY Chapter of the Association of Occupational Health Providers
- H. Pre and Post survey will evaluate whether OCP have retained knowledge and will put it to use
- I. Descriptive and Content Analysis will determine if Educational Module will impact OHP's intent to change practice for screening HCP for LTBI
- J. Rutgers University archives all education materials created via Canvas and makes it available to Rutgers for two years

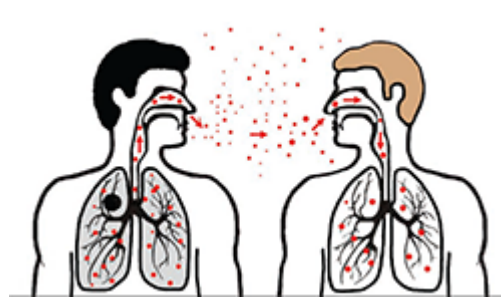
Appendix G

Recruitment Email Flier



RUTGERS
School of Nursing

**PARTICIPANTS NEEDED
FOR AN INTERACTIVE TUBERCULOSIS (TB)
MODULE**



CEU will be awarded

**Are you aware of the New Recommendations in the 2019 CDC
Updated Tuberculosis (TB) Guidelines for Health Care
Personnel?**

If not, this educational module is just for you. It will provide you with these new recommendations and how your current practice will need to change to reflect these changes.

Who: Active, Region 4, Members of the Association of Occupational Health Professionals (AOHP)

What: Impact of an Interactive Educational Tuberculosis Module on Occupational Health Providers (OHP)

Where: Online Educational Module

Time: 45-60 minutes

This study involves a post-test to measure TB knowledge. It will also evaluate your intent to change practice four weeks after completing the module via an online survey.

Contact:

Principle Investigator: Dr. J. Manchester

Email: [REDACTED]

Co-Investigator: Marleni Estrella

Email: [REDACTED]

Appendix H

Initial Email Invite

Dear AOHP Member,

You have been selected to participate in an interactive educational module developed by a DNP candidate of the Rutgers School of Nursing Executive Leadership program.

May 20, 2020 – June 3, 2020

The module will focus on occupational health providers (OCP), such as you, and your current knowledge of the updated 2019 CDC Tuberculosis (TB) recommendations for healthcare personnel. The intervention will be an interactive educational module delivered through an audio PowerPoint on Canvas geared towards OCP. Information presented will include tuberculosis knowledge, the 2019 CDC updated tuberculosis recommendations for healthcare personnel, and the use of a Continuing Professional Development (CPD) tool to measure intent to change practice after completing the module. You will be asked to complete a pre-survey and post-survey to assess your intention to change behavior/practice.

The module will take about 45 minutes for you to complete. Completion of the module and the surveys will provide you with continuing education units.

Participation in the module is completely voluntary and all information will remain confidential.

Link to module: <https://rutgersnursing.wufoo.com/forms/tb-or-not-tb/>

Thank you for your time,

Marleni Estrella, DNP Candidate



Appendix I**Second Email Reminder****REMINDER EMAIL FOR PARTICIPATION IN THE INTERACTIVE EDUCATIONAL TUBERCULOSIS
MODULE ON CANVAS!**

Dear AOHP Member,

You have been selected to participate in an interactive educational module developed by a DNP candidate of the Rutgers School of Nursing Executive Leadership program.

May 20, 2020 – June 3, 2020

The module will focus on occupational health providers (OCP), such as you, and your current knowledge of the updated 2019 CDC Tuberculosis (TB) recommendations for healthcare personnel. The intervention will be an interactive educational module delivered through an audio PowerPoint on Canvas geared towards OCP. Information presented will include tuberculosis knowledge, the 2019 CDC updated tuberculosis recommendations for healthcare personnel, and the use of a Continuing Professional Development (CPD) tool to measure intent to change practice after completing the module. You will be asked to complete a pre-survey and post-survey to assess your intention to change behavior/practice.

The module will take about 45 minutes for you to complete. Completion of the module and the surveys will provide you with continuing education units.

Participation in the module is completely voluntary and all information will remain confidential.

Link to module: <https://rutgersnursing.wufoo.com/forms/tb-or-not-tb/>

Thank you for your time,

Marleni Estrella, DNP Candidate



Appendix J

TB Module Consent Form



School of Nursing
Rutgers University–Newark
65 Bergen Street
Newark, NJ 07107



CONSENT TO TAKE PART IN A RESEARCH STUDY

TITLE OF STUDY: TB or not TB? Impact of an Educational Tuberculosis (TB) Module on Occupational Health Professionals (OHP)

Principal Investigator: Jeanette Manchester, DNP, RN

This consent form is part of an informed consent process for a research study, and it will provide information that will help you decide whether you want to take part in this study. It is your choice to take part or not. After all of your questions have been answered and you wish to take part in the research study, you will be asked to sign this consent form. You will be given a copy of the signed form to keep. Your alternative to taking part in the research is not to take part in it.

Who is conducting this research study, and what is it about?

You are being asked to take part in a research study conducted by Jeanette Manchester, DNP, RN, who is a Rutgers faculty member in the School of Nursing. The purpose of this study is to ensure occupational health professionals are utilizing the most current tuberculosis clinical guidelines to accurately screen, identify, and treat employees at the highest risk of developing active tuberculosis (TB) disease.

What will I be asked to do if I take part?

If you agree to take part in this research, you will be asked to review a Canvas educational module and take part in a post-survey that will test your knowledge on what you have learned and your intent to change your current practice. You will also be asked to complete a second three-item survey four weeks after completing the module to see if you have implemented a change in your practice. Your participation in this study will take a total of 60 minutes. We anticipate 50 subjects will take part in the study.

What are the risks and/or discomforts I might experience if I take part in the study?

Participation in this project poses minimal risk. A secure Qualtrics server will collect and store the data in the password-protected electronic format. This server ensures that all responses remain anonymous, as it does not collect information such as name, e-mail, or IP address. There is a risk of anxiety after completing the module due to changes that will need to take place in your current practice to be compliant with CDC recommendations. Solutions to implementation barriers will be presented in the module to mitigate this risk. If you decide to quit at any time before you have finished the study, your answers will NOT be recorded.

Are there any benefits to me if I choose to take part in this study?

Yes, you will be provided with the most current tuberculosis clinical guidelines to accurately screen, identify, and treat employees at the highest risk of developing active TB disease at no cost. You will also be given tools to facilitate the implementation of these new guidelines into your practice.

Will I be paid to take part in this study?

You will not be paid to take part in this study. Participants will receive one hour of continuing education units for entire module completion.

How will information about me be kept private or confidential?

The data will be securely stored in a password-protected computer in the Rutgers Biomedical Health Sciences building located at 65 Bergen Street, Newark NJ 07103. All data will be locked, following the RU encryption process. The data collected will be tracked using Microsoft Excel for analysis. A secure Qualtrics server will collect and store the data in the password protected electronic format. This server ensures that all responses remain anonymous, as it does not collect information such as name, e-mail, or

TB Module Consent Form

School of Nursing
Rutgers University–Newark
65 Bergen Street
Newark, NJ 07107

Jeannette.Manchester@sn.rutgers.edu.
Phone: 973-972-0645

IP address. No names or identifying information will be included in any publications or presentations, and all responses to the questionnaire will remain confidential. Subject confidentiality will be maintained and only the PI will have access to the information from the pre and post-tests.

What will happen to information I provide in the research after the study is over?

The information collected about you for this research will not be used by or distributed to investigators for other research.

What will happen if I do not want to take part or decide later not to stay in the study?

Your participation is voluntary. If you choose to take part now, you may change your mind and withdraw later. If you do not click on the 'submit' button after completing the form, your responses will not be recorded. You may also choose to skip any questions that you do not wish to answer. However, once you click the 'submit' button at the end of the form, your responses cannot be withdrawn, as we will not know which ones are yours.

Who can I call if I have questions?

If you have questions about taking part in this study, you can contact the Principal Investigator: Dr. Jeanette Manchester at [REDACTED]. You can also contact the study coordinator: Marleni Estrella, Rutgers DNP candidate by email: [REDACTED].

If you have questions about your rights as a research subject, you can call the IRB Director at: Newark HealthSci (973)-972-3608.

Please print out this consent form if you would like a copy of it for your files.

If you do not wish to take part in the research, close this website address. If you wish take part in the research, follow the directions below:

By beginning this research, I acknowledge that I am 18 years of age or older and have read and understand the information. I agree to take part in the research, with the knowledge that I am free to withdraw my participation in the research without penalty. Click on the link that will take you to the educational module.

Appendix K**Interactive Educational Module**

Outline

- I. Course Instructions
 - a) Instructions
 - b) TB Module Consent Form
 - c) Consent
- II. Module 1
 - a) TB Knowledge (Pre-Test) → 11 Questions
 - b) TB 101, Part One
 - c) Video: Five Things to Know about TB
 - d) TB 101, Part Two
- III. Module 2
 - a) Highlights of Updated CDC TB Recommendations
 - b) Video: TB Testing and Treatment of Health Care Personnel
- IV. Module 3
 - a) Three TB Case Studies (POWTOON)
 - b) TB Knowledge (Post Test) → 11 Questions
- V. TB Resources
 - a) 2005 Guidelines for Preventing the transmission of *Mycobacterium tuberculosis* in Healthcare Settings
 - b) 2019 CDC TB Recommendations for Health Care Personnel
 - c) Latent Tuberculosis Infection: A Guide for Primary Health Care Providers

- d) LTBI Treatment Guidelines
- e) Global Tuberculosis Report 2019
- f) Adult TB Risk Assessment Form
- g) TB Screening Surveillance Form
- h) CDC Self-Study TB Modules
- i) Tools for Health Care Providers

VI. Successful Completion of Course

- a) Intent to Change Practice (CPD Reaction Questionnaire) → 12 Questions
- b) Instructions for Continuing Education Credits and Course Completion

Appendix L

Course Instructions

Instructions

Instructions

Welcome! Thank you for your interest in learning about the latest CDC TB Recommendations for Health Care Personnel and your role as an Occupational Health Professional (OHP).

Please follow the directions below to ensure the successful completion of the course.

1. Click on "Modules" on the left side of your screen. Complete Consent Quiz to participate in the study and take the TB Knowledge Pre-Test
2. Review Modules 1, 2, and 3.
3. Refer to "TB Resources" for links and form templates to utilize for your practice.
4. Complete the Post-Test "Test Your Tuberculosis Knowledge"
5. Complete the Continuing Professional Development (CPD) Reaction Questionnaire
6. After the CPD survey, complete course evaluation to successfully receive one hour of continuing education unit (CEU).

By beginning this course, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty. We ask your permission to use your survey results for professional presentations and potential publications. Please refer to the next section titled "Consent form" for more information.

Thank you again for your participation.

[Next ▶](#)

Appendix M
Module Consent

Consent

⚠ This is a preview of the published version of the quiz

Started: Mar 29 at 1:32pm

Quiz Instructions

After carefully reading the previous consent, please answer the following question:



Question 1

1 pts

Do you agree to participate in the educational module "TB or not TB: Impact of an Educational Tuberculosis Module on Occupational Health Providers"?

☐ I Agree

☐ I Do Not Agree

Appendix N

Pre-Test TB Knowledge

- 1) Tuberculosis (TB) is the _____ global cause of morbidity and mortality world-wide.
 - a) 1st
 - b) 5th
 - c) 10th
 - d) 3rd
- 2) How is TB spread?
 - a) TB spreads person to person through blood
 - b) TB spreads person to person through the air
 - c) TB spreads person to person through touch
 - d) All of the above
- 3) How is LTBI detected?
 - a) Mantoux tuberculin skin test (TST)
 - b) Interferon-gamma release assay (IGRA)
 - c) All of the above
- 4) Fifty percent of all TB cases in the United States were reported from which four states?
 - a) New York, New Jersey, California, Florida
 - b) Hawaii, New York, Arkansas, Connecticut
 - c) New York, Texas, California, Florida
 - d) Idaho, Illinois, Kansas, Texas
- 5) Which group of people are more likely to develop TB disease once infected? Select all that apply.
 - ☐ People living with HIV
 - ☐ Children younger than 5 years of age
 - ☐ People recently infected with M. Tuberculosis (within the past 2 years)
 - ☐ Persons with silicosis, diabetes mellitus, chronic renal failure, leukemia, or cancer of the head, neck or lung
 - ☐ Persons receiving immunosuppressive therapy
 - ☐ Cigarette smokers and persons who abuse drugs or alcohol
 - ☐ Overweight/obese people
 - ☐ Persons who have had a gastrectomy or jejunioileal bypass
- 6) Five or more millimeters of induration is considered a positive reaction for which of the following groups? Select all that apply.
 - ☐ People living with HIV
 - ☐ People with organ transplants
 - ☐ Persons receiving immunosuppressive therapy

- ☐ People with chest x-ray findings suggestive of previous TB disease

- 7) What is target testing?
- a) TB control strategy to identify and treat persons with latent TB infection who are at high risk for developing TB disease once infected with *M. tuberculosis*
 - b) TB control strategy to identify and treat persons with latent TB infection who are at low risk for developing TB disease once infected with *M. tuberculosis*
 - c) Both a and b
- 8) How many treatment regimens are approved for the treatment of LTBI?
- a) 2
 - b) 6
 - c) 4
 - d) 3

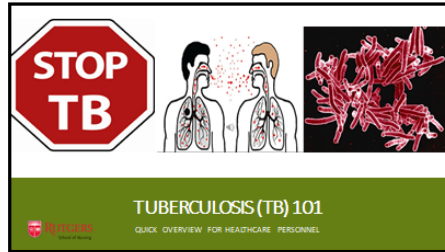
The following statements are either True or False

- 9) Routing testing using both an IGRA and a TST is recommended.
- 10) IGRAs are the preferred method of testing for groups of people who have poor rates of return for TST reading and interpretation and for people who have received the BCG vaccine.
- 11) Which of the following are the 2019 CDC TB recommendations for healthcare personnel? Select all that apply.
- ☐ All U.S. health care personnel should have baseline TB screening, including an individual risk assessment upon pre-placement/pre-hire.
 - ☐ Annual TB testing is not recommended for health care personnel unless they have been exposed to TB or there is ongoing TB transmission.
 - ☐ All health care personnel with a known exposure to TB disease should receive a TB symptom screen and timely testing.
 - ☐ Annual TB education should include information about TB risk factors, signs and symptoms of TB disease, and TB infection control policies

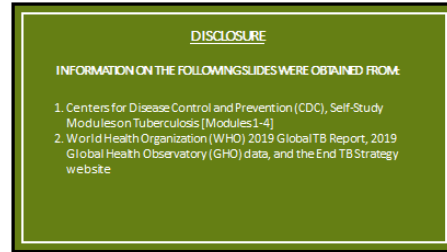
Appendix O

TB 101, Part One

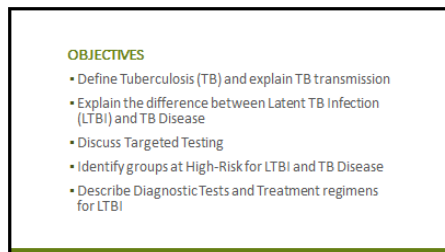
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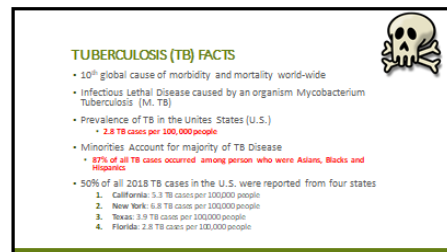
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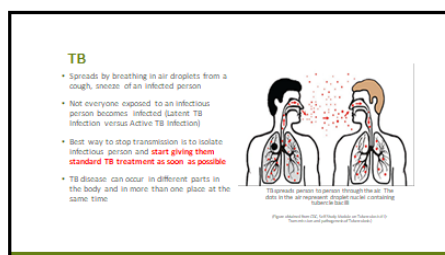
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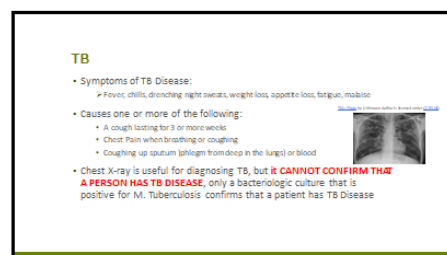
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4



5



6

1

TB 101, Part One

3/29/2020

TB DISEASE

- Develops when immune system cannot keep the tubercle bacilli under control, and they begin to multiply rapidly
- Can develop very soon after infection or many years after infection
- 10% of all people with normal immune systems who have LTBI will develop TB disease at some point in their lives
- Risk of developing TB disease is **highest in the first 2 years after infection**
- Some conditions increase the risk that LTBI will progress to disease
 - **Co-factors:** HIV (weakened or badly weakened immune system), recent TB infection, diabetes mellitus, chronic renal failure, certain types of cancer, certain medicinal conditions, and low body weight

7

LATENT TUBERCULOSIS INFECTION (LTBI)

- Infected with M. TB but are asymptomatic and cannot spread TB to others
- 13 million people living with LTBI in the United States
 - **1 in 10 of these people be diagnosed with TB in their lifetime**
- Without treatment, 5 to 10% will develop active TB disease (CDC, 2019).
- If not treated appropriately, LTBI can convert to TB disease and be lethal

8

LATENT TB INFECTION VERSUS TB DISEASE

PERSON WITH LTBI	PERSON WITH TB DISEASE (in the lungs)
Usually has a skin test or blood test result indicating TB infection	Usually has a skin test or blood test result indicating TB infection
Normal chest x-ray and negative sputum test	Abnormal chest x-ray, positive sputum smear or culture
Has TB bacteria in his/her body that are alive, but inactive	Has active TB bacteria in his/her body
Does not feel sick	Usually feels sick and may have symptoms such as coughing, fever, and weight loss
Cannot spread TB bacteria to others	May spread TB bacteria to others
Needs treatment for latent TB infection to prevent TB disease	Needs treatment to treat TB disease
Does not require respiratory isolation	May require respiratory isolation

9

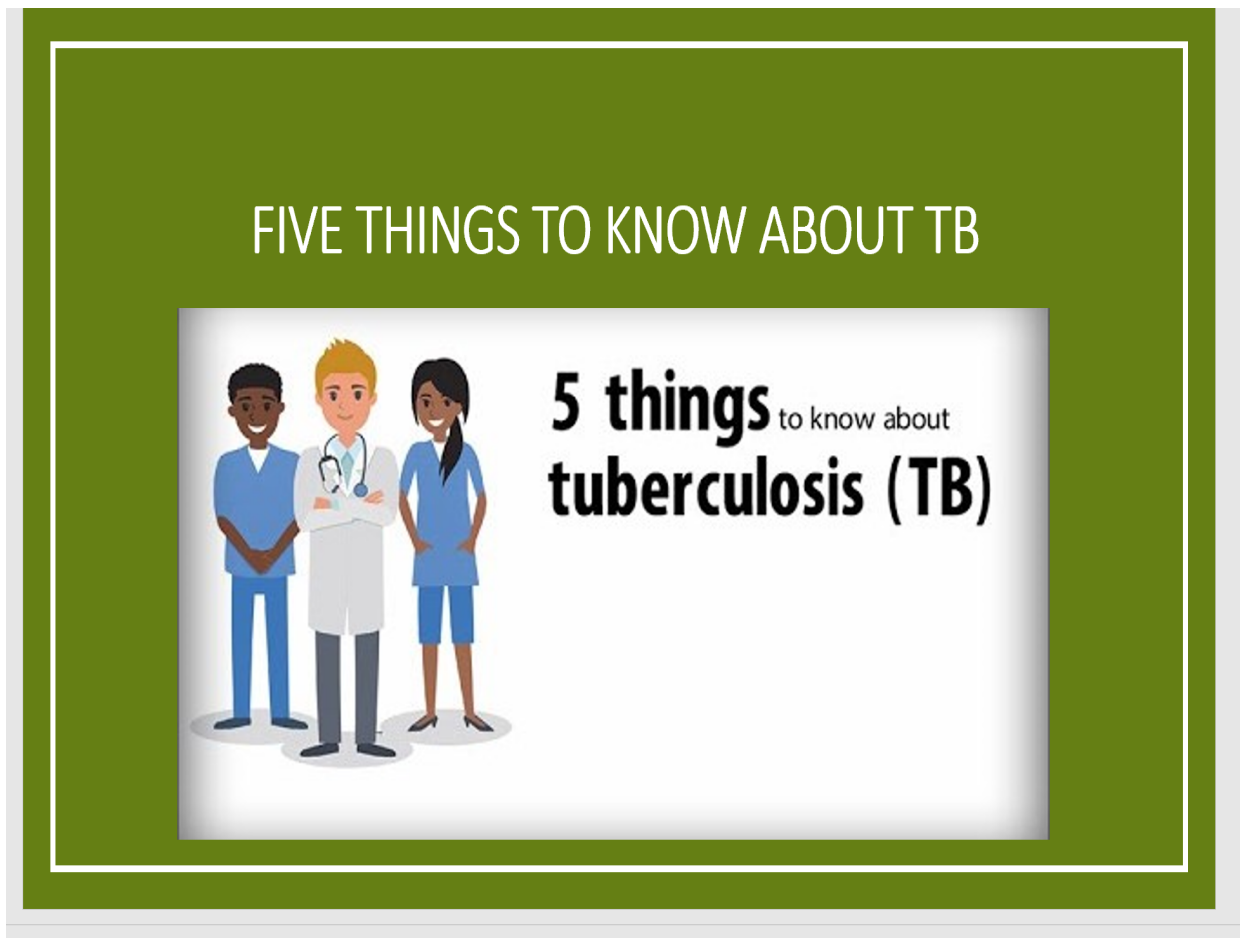
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10

Appendix P

Video: Five Things to Know about TB



URL: <https://www.youtube.com/watch?v=x803ELzggKI>

Appendix Q

TB 101, Part Two

3/29/2020

TARGETED TESTING



- TB Control Strategy
- Identifies and treat persons with LTBI who are at high-risk for developing TB disease once infected with M. Tuberculosis
- LTBI treatment can prevent these persons from developing TB disease and stop the further spread of TB to others

1

HIGH-RISK GROUPS FOR TB TESTING

- Divided into two categories
 1. People who are at high risk for exposure to or infection with M. Tuberculosis
 2. People who are at high risk for developing TB disease once infected with M. Tuberculosis
- Flexibility should be used in defining high-risk groups for testing

Definitions of high risk should be made at the local (city, county, or state) level according to local demographics and TB epidemiology

2

PEOPLE AT HIGH-RISK FOR EXPOSURE TO OR INFECTION WITH M. TUBERCULOSIS

- Contacts of people known or suspected to have TB disease
- People born in or who travel frequently to countries where TB is common
- People who live in or have lived in high-risk congregate settings (i.e., homeless shelters, correctional facilities)
- Employees of high-risk congregate settings
- Healthcare workers who serve patients with TB
- Populations defined locally as having increased incidence of LTBI or TB disease
- Infants, children, and adolescents exposed to adults who are at increased risk for LTBI or TB disease

3

PEOPLE AT HIGH-RISK FOR DEVELOPING TB DISEASE AFTER INFECTION WITH M. TUBERCULOSIS

- Children younger than 5 years of age
- People recently infected with M. tuberculosis (within past 2 years)
- People with history of untreated or inadequately treated TB
- Persons on immunosuppressive therapy
- Persons with HIV, silicosis, diabetes mellitus, chronic renal failure, leukemia, or cancer of the head, neck, or lung
- Person who had gastrectomy or jejunoileal bypass
- Low body weight
- Cigarette smokers and person who abuse alcohol or drugs
- Populations defined locally as having increased incidence of LTBI or TB disease

4

DIAGNOSTIC TESTS OF LTBI

- Two methods currently available:
 1. Interferon-gamma release assays (IGRAs) such as the QuantiFERON TB Gold Plus (WFT-Plus) and the T-SPOT TB test (T-SPOT)
 2. Mantoux tuberculin skin test (TST)
- IGRAs are the preferred method of testing for groups of people who have poor rates of return for TST reading and interpretation and for people who have received the BCG vaccine
- TST is preferred method of testing for children younger than 5 years of age
- Routing testing using both IGRA and a TST is **NOT RECOMMENDED**.

5

TREATMENT OF LTBI

- Prevents development of TB disease
- People in certain groups **should receive high priority for LTBI treatment** if they have a positive TST or IGRA result
 - TST criterion that is 5 or more millimeters/QuantiFERON TB Gold result: recent contacts of people with infectious TB disease, people born in or who have recently migrated to countries where TB disease is common, people with organ transplants, immunosuppressed patients
 - TST criterion that is 10 or more millimeters/QuantiFERON TB Gold result: contacts of people with infectious TB disease in certain people who are at high risk for TB disease, people who work in certain high-risk congregate settings, people who work in certain high-risk congregate settings, people with medical conditions that increase risk for TB disease, children younger than 5 years of age, infants, children and adolescents exposed to adults in high-risk groups
- Before starting LTBI treatment, it is important to exclude TB disease

6

TB 101, Part Two

3/29/2020

REGIMEN FOR LTBI TREATMENT

• All persons being considered for LTBI treatment should receive a medical evaluation

• **Four Regimens are approved for treatment of LTBI**

1. Isoniazid and Rifampin, 9-month treatment (32 Weeks)
2. Rifampin, 4-month treatment (Daily)
3. Isoniazid, 9-month treatment
4. Isoniazid, 6-month treatment

• All regimens are Effective, but **shorter regimens should be prescribed** when possible

RECOMMENDED REGIMEN FOR LTBI TREATMENT

Priority rank*	Regimen	Recommendation (strong or conditional)	Evidence (high, moderate, low, or very low)
Preferred	3 mos isoniazid plus rifampine given once weekly	Strong	Moderate
Preferred	4 mos rifampin given daily	Strong	Moderate (HIV negative)
Preferred	3 mos isoniazid plus rifampin given daily	Conditional	Very low (HIV negative)
		Conditional	Low (HIV positive)
Alternative	6 mos isoniazid given daily	Strong [†]	Moderate (HIV negative)
		Conditional	Moderate (HIV positive)
Alternative	9 mos isoniazid given daily	Conditional	Moderate

*Recommendation based on US CDC's Treatment Guidelines for Latent TB Infection (2019 edition). Table 10-1.

LTBI TREATMENT CONSIDERATIONS

• **12-dose regimen of isoniazid and rifampine**

- Recommended for people 2 years of age and older, including people with HIV/AIDS who are taking antiretroviral medications that have acceptable drug-drug interactions with rifampine.

• **9-month Isoniazid treatment**

- Effective in preventing the development of TB disease in both people infected with HIV and those not infected with HIV

• **6-month Isoniazid treatment**

- NOT recommended for people living with HIV, children and people with chest x-ray findings suggestive of previous TB disease

SPECIAL CONSIDERATIONS FOR LTBI TREATMENT

- Pregnant women should not be given LTBI treatment until after delivery, unless they have certain medical conditions
- All persons taking LTBI treatment should be educated about the symptoms caused by adverse reactions
- All persons receiving LTBI treatments should be evaluated at least monthly during therapy for signs and symptoms of TB disease and adverse reactions
- All persons should receive documentation upon completion of LTBI treatment

REFERENCES

- CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC). (2019). SELF-STUDY MODULES ON TUBERCULOSIS, MODULE 1: TRANSMISSION AND PATHOGENESIS OF TUBERCULOSIS. ATLANTA, GEORGIA.
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- CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC). (2019). SELF-STUDY MODULES ON TUBERCULOSIS, MODULE 3: TARGETED TESTING AND THE DIAGNOSIS OF LATENT TUBERCULOSIS INFECTION AND TUBERCULOSIS DISEASE. ATLANTA, GEORGIA.
- CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC). (2019). SELF-STUDY MODULES ON TUBERCULOSIS, MODULE 4: TREATMENT OF LATENT TUBERCULOSIS INFECTION AND TUBERCULOSIS DISEASE. ATLANTA, GEORGIA.
- THE WORLD HEALTH ORGANIZATION (WHO). (2019A). GLOBAL TUBERCULOSIS REPORT 2019. GENEVA, SWITZERLAND.
- THE WORLD HEALTH ORGANIZATION. (2019B). GLOBAL HEALTH OBSERVATORY (GHO) DATA. RETRIEVED FROM [HTTPS://WWW.WHO.INT/GHO/TB/EPIDEMIOLOGY/CASES_DEATHS/EN/](https://www.who.int/gho/tb/epidemiology/cases_deaths/en/)
- THE WORLD HEALTH ORGANIZATION. (2019C). THE END TB STRATEGY. RETRIEVED FROM [HTTP://WWW.WHO.INT/TB/POST2019_END_TB_STRATEGY/EN/](http://www.who.int/tb/post2019_end_tb_strategy/en/)

Appendix R

Highlights of Updated CDC TB Recommendations

3/29/2020



Highlights of the 2019 Centers for Disease Prevention and Control (CDC) Tuberculosis (TB) Recommendations for Health Care Personnel

How your practice will need to change



1

DISCLOSURE

ALL INFORMATION ON THE FOLLOWING SLIDES WERE OBTAINED FROM:

1. Sosa, et al. (2019). Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC. 2019. *MMWR Morbidity and Mortality Weekly Report* 2019;68:439–443.
2. Center for Disease Prevention and Control (CDC): <https://www.cdc.gov/tbhi/ncb/ncb/2019/recommendations-for-tb-screening.html>

2

OBJECTIVES

- Identify the 2019 CDC TB Recommendations for Health Care Personnel
- Discuss Implementation and suggested solutions



3

2019 CDC TB Recommendations for Health Care Personnel

- 2019 Systematic Review
- Reflect the decrease of TB cases and the low incidence of TB among health care personnel due to occupational exposure
- Outlines changes to the 2005 CDC guidelines for preventing *Mycobacterium tuberculosis* transmission in health care settings

4

2019 CDC TB Recommendations Include:

1. Individual baseline (pre-placement) risk assessment
2. Symptom evaluation and testing of persons without prior TB or latent TB infection (LTBI)
3. No routine serial testing in the absence of exposure or ongoing transmission
4. Treatment for HCP diagnosed with LTBI
5. Annual symptom screening for persons with untreated LTBI
6. Annual TB education of all HCP

5

Individual Baseline (Pre-placement) Risk Assessment

- All U.S. health care personnel should have baseline TB screening, including an individual risk assessment
- Provide a basis for comparison in the event of a potential or known exposure to *M. tuberculosis*
- Facilitate detection and treatment of LTBI or TB disease
- Reduce the risk to patients and other health care personnel
- Helps guide decisions when interpreting test results.

6

Highlights of Updated CDC TB Recommendations

3/29/2020

What do you need to do?



- Create and Administer an Individual risk assessment form to all pre-hire/pre-placement employees
- Educate all staff (clinical and administrative) to utilize form for all pre-employment/new hires
- Educate clinicians that a response of "yes" to any of the questions on the form requires further follow-up
- Update TB policy at your institution

7

Resources Available

- The State of California has already created a "risk Assessment form" and user guide that can be formatted for your use.
- An editable PDF version of the "risk assessment form" that can be personalized for your institution can be found under TB resources in the module.

8

Symptom Evaluation and Testing of Persons

Without prior TB or latent TB infection (LTBI)

- **Screen** for TB disease
- **Test** with an interferon-gamma release assay (IGRA) or a tuberculin skin test (TST)
- **Evaluate** for signs and symptoms of TB, which include bad cough that lasts 3 weeks, pain in chest, coughing up blood or sputum (mucus from deep inside the lungs), weakness or fatigue, weight loss, no appetite, chills, fevers, sweating at night.

9

What do you need to do?



- Create and Administer a TB symptom evaluation form
- Decide what your institution will use to test for TB exposure: IGRA or TST
- Educate clinicians on the proper use of IGRA and/or TST
- Update TB Policy at your institution

10

Resources Available

- **TB Surveillance template form** can be used for pre-placement and annually for persons with untreated LTBI, occupational risk and/or ongoing TB exposure
- ✓ Screens Individuals for signs and symptoms of TB

11

Resources Available

- NYC Department of Health offers a **two-day training** for correct placement and reading of Tuberculin Skin Test.
 - Ensures all staff are properly trained and individuals with LTBI are screened and offered treatment.
- Speak to your representative that supplies your Interferon Gamma Release Assay (IGRA) blood tests to ensure accurate collection and processing of the blood test is being performed by your staff.

12

Highlights of Updated CDC TB Recommendations

3/29/2020

No routine serial testing in the absence of exposure or ongoing transmission

- U.S. health care personnel without LTBI **SHOULD NOT** undergo routine serial TB screening or testing at any interval after baseline
- Serial TB screening is **ONLY FOR** those who have increased occupational risk for TB exposure and/or ongoing TB transmission

13

Serial TB Testing Considerations

- Determinations should be individualized
 - Some factors include the number of patients with infectious pulmonary TB who are examined in these areas, whether delays in initiating airborne isolation occurred, or whether prior annual testing has revealed ongoing transmission
- Consultation with the local or state health department is encouraged to assist in making these decisions



14

What do you need to do?



- Identify which individuals/groups have an occupational TB risk
- Consult with local or state health department to make these determinations
- Update institutional TB policy to reflect these new changes

15

Treatment for HCP diagnosed with LTBI



- Strongly encouraged
- Four treatment regimens available
- Shorter-course treatment regimen recommended unless a contraindication exists

16

What do you need to do?



- Identify and treat all HCP with LTBI
- Identify public health agencies that can administer TB treatment if your institution does not offer treatment
- Be familiar with treatment regimens and side effects
- Update TB policy to reflect these new changes

17

Resources Available

- CDC (2019). "Latent Tuberculosis Infection: A Guide for Primary Health Care Providers"

<https://www.cdc.gov/tb/publications/tbi/treatment.htm>

18

Highlights of Updated CDC TB Recommendations

3/29/2020

Annual Symptom Screening for persons with untreated LTBI

- HCP who do not complete LTBI treatment should be monitored with annual symptom evaluation
 - To detect early evidence of TB disease
 - To reevaluate the risks and benefits of LTBI treatment.
- HCP should be educated about the signs and symptoms of TB disease that should prompt an immediate evaluation between screenings

19

What do you need to do?



- Administer Annual TB surveillance form to these individuals
- Encourage LTBI treatment
- Collaborate with Public Health Agencies
 - Technical assistance
 - Medical consultation regarding diagnosis and treatment of LTBI
 - Clarification of state or local regulations, surveillance requirements, and guidelines.

20

Annual TB Education of all HCP



- Includes information about
 1. TB risk factors
 2. Signs and symptoms of TB disease
 3. TB infection control policies and procedures

21

What do you need to do?



- Create TB education for HCP
- Require Annual TB Education as part of compliance training for all HCP
- Update institutional TB policy

22

Resources Available

- CDC offers an online and hard copy of Self Study Modules on Tuberculosis
<https://www.cdc.gov/tb/education/selfstudymodules/default.htm>
- CDC offers "Tools for Health Care Providers"
https://www.cdc.gov/tb/education/provider_edmaterials.htm

23

Review



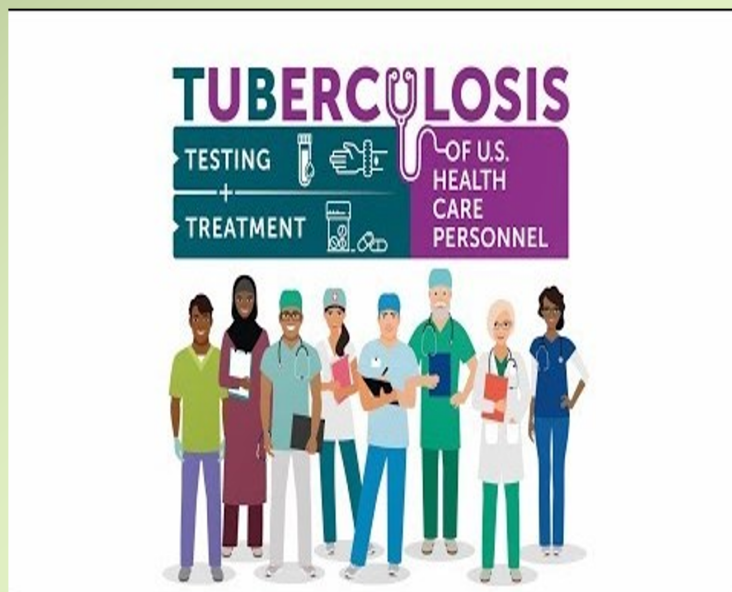
- You've completed the "Highlights of the 2019 TB Recommendations for Health Care Personnel!"
- Next, watch a video that recaps everything we have just covered then proceed to Module 3: TB Case Studies.

24

Appendix S

Video: TB Testing and Treatment of Health Care Personnel

Video: TB Testing and Treatment for Health Care Personnel

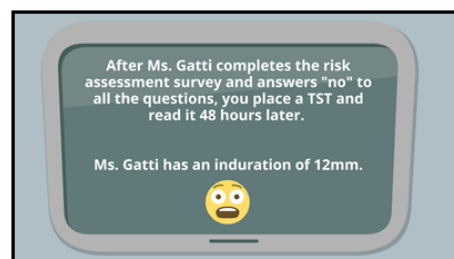
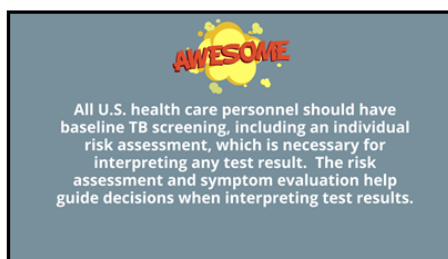
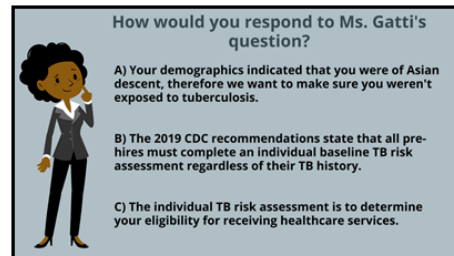
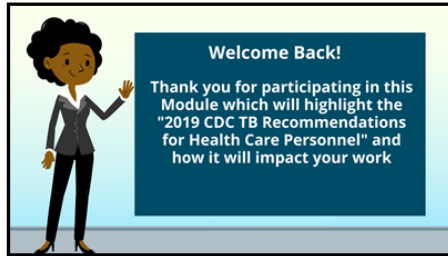


URL: <https://www.youtube.com/watch?v=JsrFrdzmtRU>

Appendix T

POWTOON TB Case Studies

3/29/2020




1

POWTOON TB Case Studies

3/29/2020

What is the best course of action to take?



A) Assuming Ms. Gatti is asymptomatic, retest Ms. Gatti with another TST to confirm her positive status, since she answered "no" to all the questions on the individual TB risk assessment.

B) Assume Ms. Gatti is positive, assess her for signs and symptoms of active TB, schedule her for a chest x-ray, offer her LTBI treatment, and consider her positive.

C) Assuming Ms. Gatti is asymptomatic, retest Ms. Gatti with an IGRA to confirm her positive status.

7


AWESOME

Health care personnel with a positive test who are asymptomatic, unlikely to be infected with *M. tuberculosis*, and at low risk for progression on the basis of their risk assessment should have a second test.

In this example, Ms. Gatti should be considered infected if both the first and second tests are positive.

8

Case Study #2



Mr. Smith, a microbiologist in the TB lab, presents to the clinic for his Annual TB screening and informs the nurse that:

"A nurse who works on the Labor and Delivery Floor, told me that serial TB testing is no longer required. So why am I here?"

9

How would you best respond to Mr. Smith's question?

A) Mr. Smith, stop listening to your co-workers. They don't know the rules and regulations like we do.

B) Mr. Smith we wouldn't have made you come to the clinic if we didn't think you needed to be screened for TB.

C) Mr. Smith, you are considered high-risk because you deal directly with TB specimens. CDC recommendations state that high risk personnel are subject to serial testing. The labor and delivery floor is considered low-risk for TB.


10

AWESOME

Annual TB screening is no longer recommended for most healthcare personnel unless there is an occupational risk or ongoing exposure.

11

Case Study #3



Mr. Gonzalez, a patient-care technician with a history of diabetes, presents to the clinic for his annual TB screening. His record shows he has a history of LTBI but has never taken TB medication. You offer him treatment and he responds:


"Why do I have to take medication, if I feel fine?"

12

2

POWTOON TB Case Studies

3/29/2020



How would you respond to Mr. Gonzalez?

A) Mr. Gonzalez, you are right. You do not need to take LTBI medication. You are not at risk for developing TB disease.

B) Mr. Gonzalez, you have a history of diabetes, which puts you at a higher risk of developing TB disease in the future. Treating your LTBI will decrease the risk of you developing TB disease.


C) Mr. Gonzalez, you are right. TB medication is only recommended if you have signs and symptoms of TB.

13



LTBI treatment is recommended for all health care personnel. Diabetes can increase the risk for TB disease

14



Congratulations!
You have now completed the Educational Module. Now, let's see what you've learned.



Proceed to TB Knowledge Post Test

15

3

Appendix U

Post Test TB Knowledge

- 1) Tuberculosis (TB) is the _____ global cause of morbidity and mortality world-wide.
 - e) 1st
 - f) 5th
 - g) 10th
 - h) 3rd
- 2) How is TB spread?
 - e) TB spreads person to person through blood
 - f) TB spreads person to person through the air
 - g) TB spreads person to person through touch
 - h) All of the above
- 3) How is LTBI detected?
 - d) Mantoux tuberculin skin test (TST)
 - e) Interferon-gamma release assay (IGRA)
 - f) All of the above
- 4) Fifty percent of all TB cases in the United States were reported from which four states?
 - e) New York, New Jersey, California, Florida
 - f) Hawaii, New York, Arkansas, Connecticut
 - g) New York, Texas, California, Florida
 - h) Idaho, Illinois, Kansas, Texas
- 5) Which group of people are more likely to develop TB disease once infected? Select all that apply.
 - ☐ People living with HIV
 - ☐ Children younger than 5 years of age
 - ☐ People recently infected with M. Tuberculosis (within the past 2 years)
 - ☐ Persons with silicosis, diabetes mellitus, chronic renal failure, leukemia, or cancer of the head, neck or lung
 - ☐ Persons receiving immunosuppressive therapy
 - ☐ Cigarette smokers and persons who abuse drugs or alcohol
 - ☐ Overweight/obese people
 - ☐ Persons who have had a gastrectomy or jejunioileal bypass
- 6) Five or more millimeters of induration is considered a positive reaction for which of the following groups? Select all that apply.
 - ☐ People living with HIV
 - ☐ People with organ transplants
 - ☐ Persons receiving immunosuppressive therapy

- ☐ People with chest x-ray findings suggestive of previous TB disease

7) What is target testing?

- d) TB control strategy to identify and treat persons with latent TB infection who are at high risk for developing TB disease once infected with *M. tuberculosis*
- e) TB control strategy to identify and treat persons with latent TB infection who are at low risk for developing TB disease once infected with *M. tuberculosis*
- f) Both a and b

8) How many treatment regimens are approved for the treatment of LTBI?

- e) 2
- f) 6
- g) 4
- h) 3

The following statements are either True or False

9) Routing testing using both an IGRA and a TST is recommended.

10) IGRAs are the preferred method of testing for groups of people who have poor rates of return for TST reading and interpretation and for people who have received the BCG vaccine.

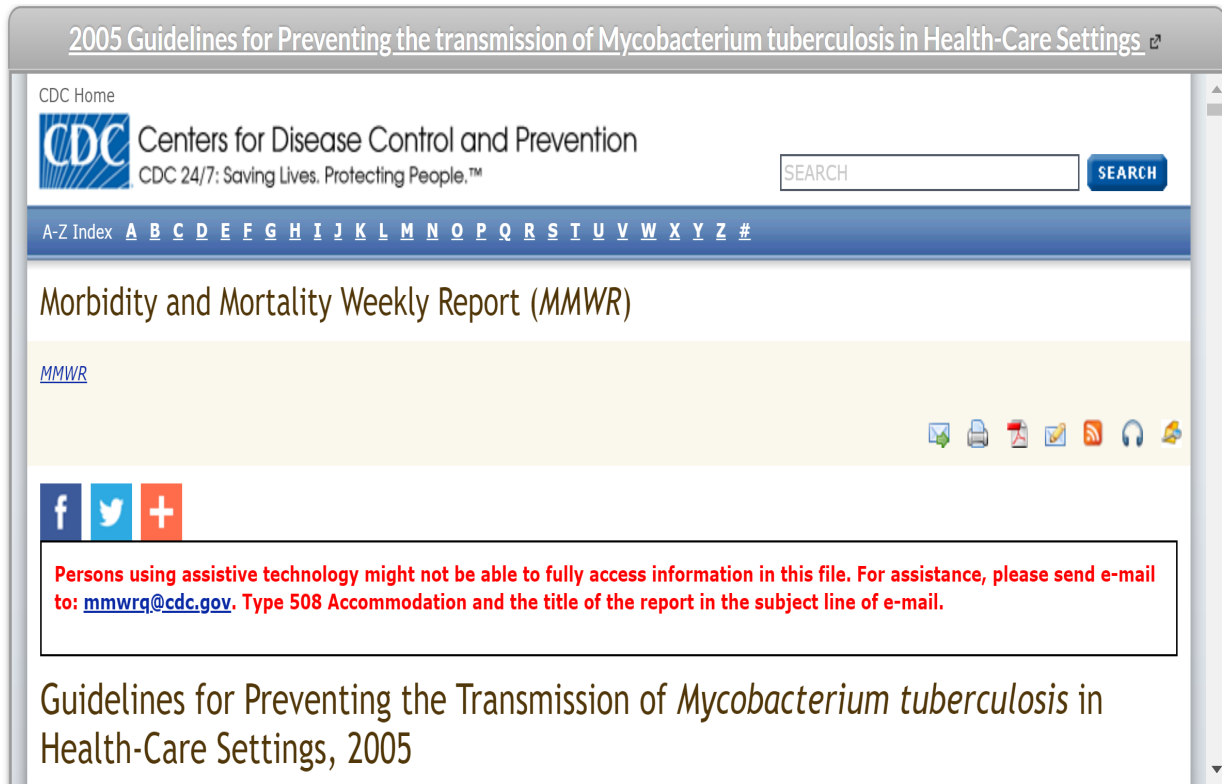
11) Which of the following are the 2019 CDC TB recommendations for healthcare personnel? Select all that apply.

- ☐ All U.S. health care personnel should have baseline TB screening, including an individual risk assessment upon pre-placement/pre-hire.
- ☐ Annual TB testing is not recommended for health care personnel unless they have been exposed to TB or there is ongoing TB transmission.
- ☐ All health care personnel with a known exposure to TB disease should receive a TB symptom screen and timely testing.
- ☐ Annual TB education should include information about TB risk factors, signs and symptoms of TB disease, and TB infection control policies

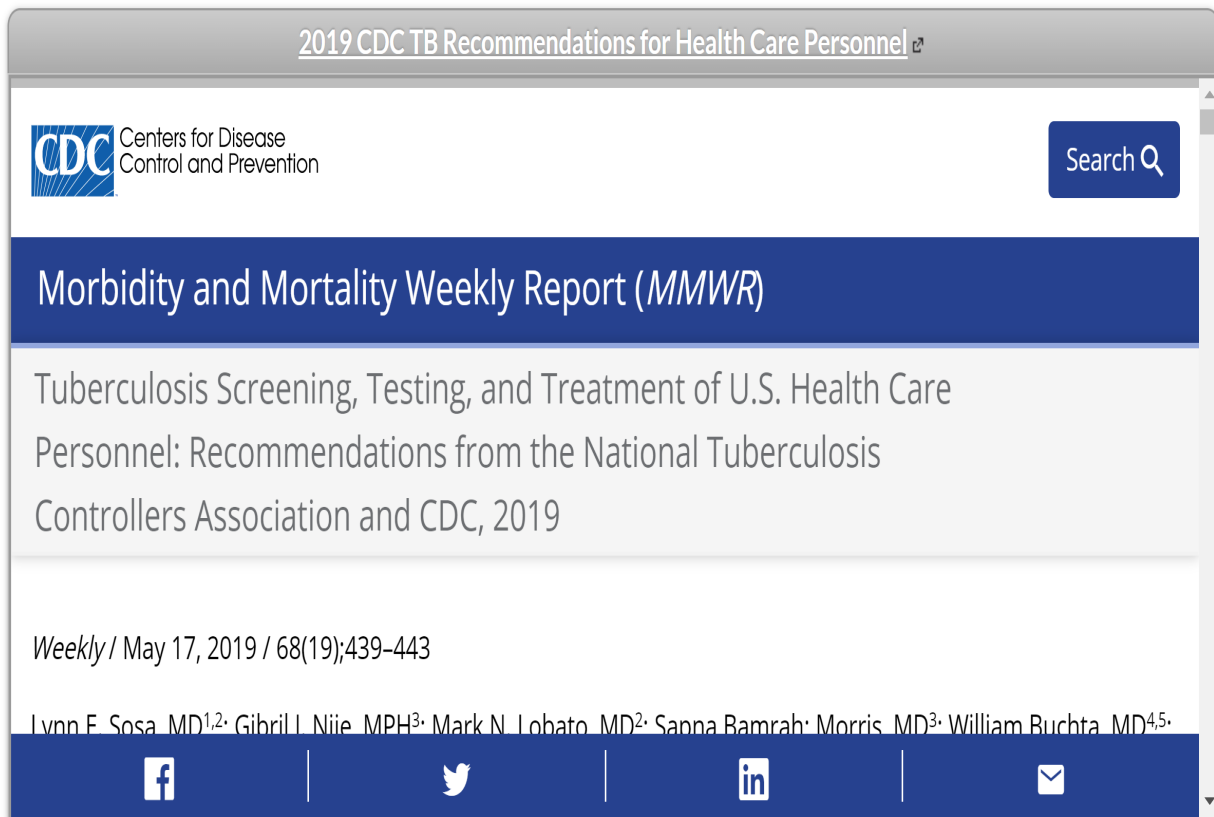
Appendix V

TB Resources

2005 Guidelines for Preventing the transmission of *Mycobacterium tuberculosis* in Healthcare Settings



URL: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5417a1.htm>

2019 CDC TB Recommendations for Health Care Personnel

URL: <https://www.cdc.gov/mmwr/volumes/68/wr/mm6819a3.htm>

Latent Tuberculosis Infection: A Guide for Primary Health Care Providers

The screenshot shows a web browser window displaying the CDC website. The address bar at the top shows the URL: [Latent Tuberculosis Infection: A Guide for Primary Health Care Providers](https://www.cdc.gov/tb/publications/ltni/treatment.htm). The CDC logo is in the top left, and a search bar is in the top right. A dark green banner with the text 'Tuberculosis (TB)' is below the header. The main content area has the title 'Latent Tuberculosis Infection: A Guide for Primary Health Care Providers'. Below this, there is a link 'Return to Table of Contents' and a large heading 'Treatment of Latent TB Infection'. To the right of the heading is a box titled 'On This Page' containing a link 'Treatment Regimens'. At the bottom, there is a dark green bar with social media icons for Facebook, Twitter, LinkedIn, and Email.

Latent Tuberculosis Infection: A Guide for Primary Health Care Providers

CDC Centers for Disease Control and Prevention

Search

Tuberculosis (TB)

Latent Tuberculosis Infection: A Guide for Primary Health Care Providers

[Return to Table of Contents](#)

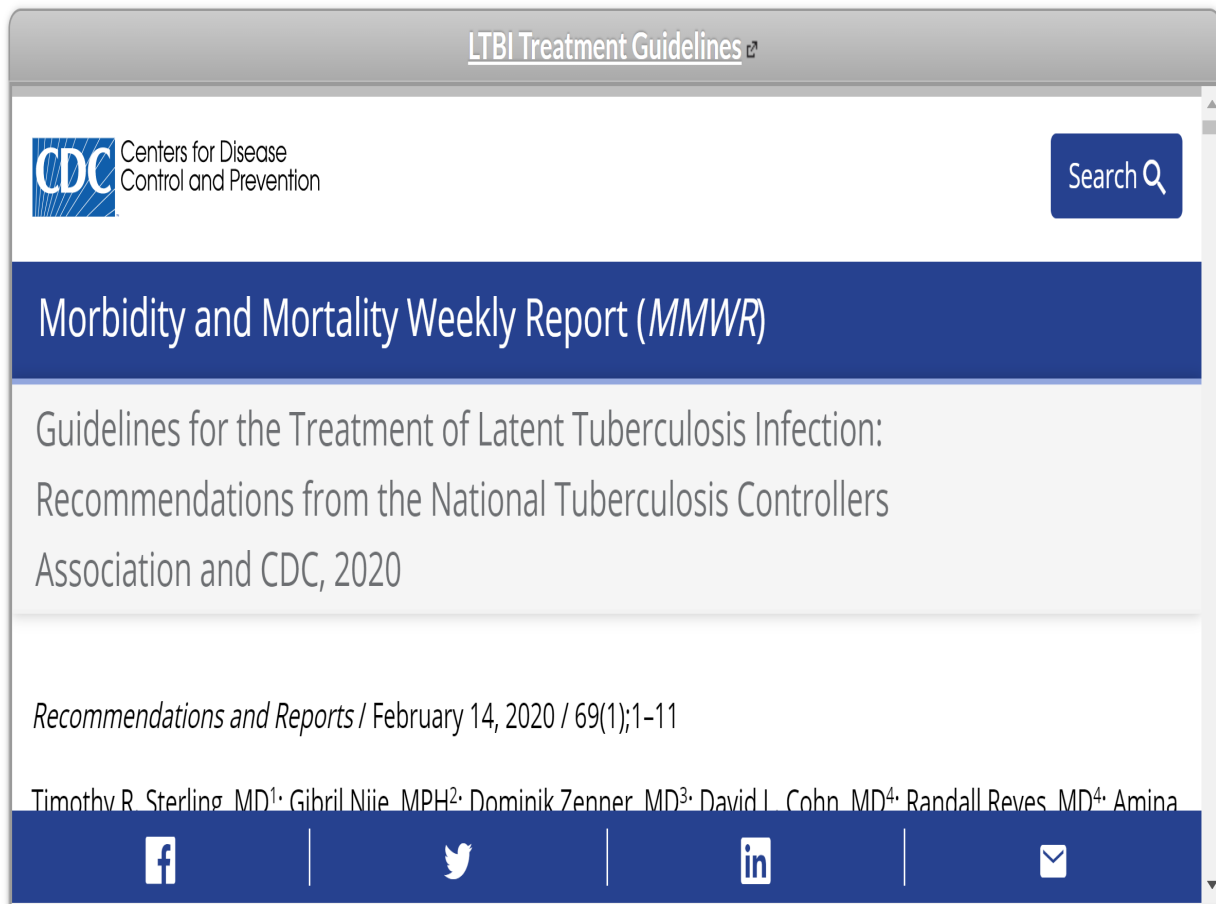
Treatment of Latent TB Infection

On This Page

[Treatment Regimens](#)

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URL: <https://www.cdc.gov/tb/publications/ltni/treatment.htm>

LTBI Treatment Guidelines

The screenshot shows a web browser window with the title "LTBI Treatment Guidelines". The CDC logo and name are in the top left, and a search bar is in the top right. A blue banner reads "Morbidity and Mortality Weekly Report (MMWR)". Below it, the main title is "Guidelines for the Treatment of Latent Tuberculosis Infection: Recommendations from the National Tuberculosis Controllers Association and CDC, 2020". The issue information is "Recommendations and Reports / February 14, 2020 / 69(1);1-11". The authors listed are Timothy R. Sterling MD¹, Gibril Njie MPH², Dominik Zenner MD³, David L. Cohn MD⁴, Randall Reyes MD⁴, and Amina. At the bottom is a social media bar with icons for Facebook, Twitter, LinkedIn, and Email.

LTBI Treatment Guidelines

CDC Centers for Disease Control and Prevention

Search

Morbidity and Mortality Weekly Report (MMWR)

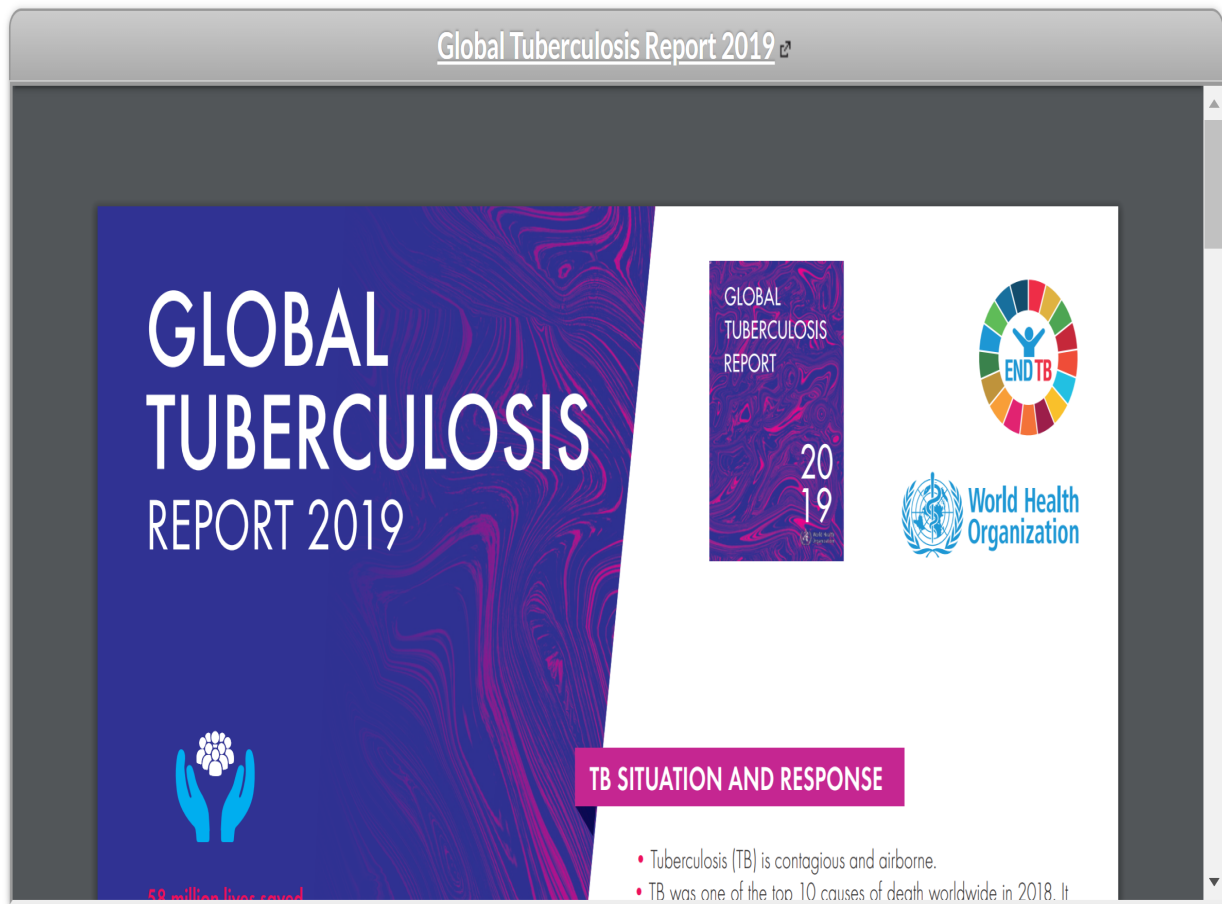
Guidelines for the Treatment of Latent Tuberculosis Infection:
Recommendations from the National Tuberculosis Controllers
Association and CDC, 2020

Recommendations and Reports / February 14, 2020 / 69(1);1-11

Timothy R. Sterling MD¹, Gibril Njie MPH², Dominik Zenner MD³, David L. Cohn MD⁴, Randall Reyes MD⁴, Amina

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URL: https://www.cdc.gov/mmwr/volumes/69/rr/rr6901a1.htm?s_cid=rr6901a1_w


Global Tuberculosis Report 2019

URL: https://www.who.int/tb/publications/factsheet_global.pdf?ua=1


Adult TB Risk Assessment Form

<p style="color: red; font-weight: bold;">Insert Here</p> <p style="color: red; font-style: italic;">[Institution Logo]</p>	<h3 style="margin: 0;">Adult Tuberculosis Risk Assessment</h3>	<p style="color: red; font-weight: bold;">Insert Here</p> <p style="color: red; font-style: italic;">[Institution Name, Address, Phone #]</p>
<p>Provider Name: _____</p> <p>Assessment Date: _____</p>	<p>Patient Name: _____</p> <p>Date of Birth: _____</p>	
<ul style="list-style-type: none"> Use this tool to identify asymptomatic adults for latent TB infection (LTBI) testing. Do not repeat testing unless there are new risk factors since the last test. Do not treat for LTBI until active TB disease has been excluded: <i>For patients with TB symptoms or an abnormal chest x-ray consistent with active TB disease, evaluate for active TB disease with a chest x-ray, symptom screen, and if indicated, sputum AFB smears, cultures and nucleic acid amplification testing. A negative tuberculin skin test or interferon gamma release assay does not rule out active TB disease.</i> <p>Check all that apply:</p>		
LTBI testing is recommended if any of the boxes below are checked.		
<div style="border: 1px solid #002060; padding: 5px; margin-bottom: 5px;"> <input type="checkbox"/> Birth, travel, or residence in a country with an elevated TB rate for at least 1 month <ul style="list-style-type: none"> Includes any country other than the United States, Canada, Australia, New Zealand, or a country in western or northern Europe If resources require prioritization within this group, prioritize patients with at least one medical risk for progression (see the California Adult Tuberculosis Risk Assessment User Guide for this list). Interferon Gamma Release Assay is preferred over Tuberculin Skin Test for non-U.S.-born persons ≥2 years old </div> <div style="border: 1px solid #002060; padding: 5px; margin-bottom: 5px;"> <input type="checkbox"/> Immunosuppression, current or planned <small>HIV infection, organ transplant recipient, treated with TNF-alpha antagonist (e.g., infliximab, etanercept, others), steroids (equivalent of prednisone ≥15 mg/day for ≥1 month) or other immunosuppressive medication</small> </div> <div style="border: 1px solid #002060; padding: 5px; margin-bottom: 5px;"> <input type="checkbox"/> Close contact to someone with infectious TB disease during lifetime </div>		
<p>Treat for LTBI if:</p> <ul style="list-style-type: none"> - Any of the above is checked off, and - LTBI test result is positive, and - Active TB disease is ruled out 		
<input type="checkbox"/> None ; no TB testing is indicated at this time.		
<p><small>See the California Adult Tuberculosis Risk Assessment User Guide for more information about using this tool. To ensure you have the most current version, go to the TB RISK ASSESSMENT page (https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/TB-Risk-Assessment.aspx)</small></p>		
<p><small>Adopted from: the California Adult TB Risk Assessment and User Guide (September 2018)</small></p>		

Adult TB Risk Assessment Form



**California Adult TB Risk Assessment
User Guide**



Avoid testing persons at low risk
Routine testing of persons without risk factors is not recommended and may result in unnecessary evaluations and treatment because of falsely positive test results.

Prioritize persons with risks for progression
If health system resources do not allow for testing of all non-U.S. born persons from a country with an elevated TB rate, prioritize patients with at least one of the following medical risks for progression:

- diabetes mellitus
- smoker within past 1 year
- end stage renal disease
- leukemia or lymphoma
- silicosis
- cancer of head or neck
- intestinal bypass/gastrectomy
- chronic malabsorption
- body mass index ≤ 20
- History of chest x-ray findings suggestive of previous or inactive TB (no prior treatment). Includes fibrosis or non-calcified nodules, but does not include solitary calcified nodule or isolated pleural thickening. In addition to LTBI testing, evaluate for active TB disease.

United States Preventive Services Task Force
The USPSTF has recommended testing persons born in or former residents of, a country with an elevated tuberculosis rate and persons who live in or have lived in high-risk congregate settings such as homeless shelters and correctional facilities. Because the increased risk of exposure to TB in congregate settings varies substantially by facility and local health jurisdiction, clinicians are encouraged to follow local recommendations when considering testing among persons from these congregate settings. The USPSTF did not review data supporting testing among close contacts to persons with infectious TB or among persons who are immunosuppressed because these persons are recommended to be screened by public health programs or by clinical standard of care.

Children
This risk assessment tool is intended for adults. A risk assessment tool created for use in California for children is available on the [TBCB Risk Assessment page](https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/TBCB-CA-Pediatric-TB-Risk-Assessment.pdf).
([https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/TBCB-CA-Pediatric-TB-Risk-](https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/TBCB-CA-Pediatric-TB-Risk-Assessment.pdf)

Assessment.pdf)

Local recommendations
Local recommendations and mandates should also be considered in testing decisions. Local TB control programs can customize this risk assessment according to local recommendations. **Providers should check with local TB control programs for local recommendations.**
A directory of TB Control Programs is available on the [CTCA website](https://www.ctca.org/locations.html). (<https://www.ctca.org/locations.html>)


Mandated testing and other risk factors
Several risk factors for TB that have been used to select patients for TB screening historically or in mandated programs are not included among the components of this risk assessment. This is purposeful in order to focus testing on patients at highest risk. However, certain populations may be mandated for testing by statute, regulation, or policy. This risk assessment does not supersede any mandated testing. Examples of these populations include: healthcare workers, residents or employees of correctional institutions, substance abuse treatment facilities, homeless shelters, and others.

Age as a factor
Age (among adults) is not considered in this risk assessment. However, younger adults have more years of expected life during which progression from latent infection to active TB disease could develop. Some programs or clinicians may additionally prioritize testing of younger non-U.S.-born persons when all non-U.S.-born are not tested. An upper age limit for testing has not been established but could be appropriate depending on individual patient TB risks, comorbidities, and life expectancy.

Foreign travel
Travel to countries with an elevated TB rate may be a risk for TB exposure in certain circumstances (e.g., extended duration, likely contact with persons with infectious TB, high prevalence of TB in travel location, non-tourist travel). The duration of at least 1 consecutive month to trigger testing is intended to identify travel most likely to involve TB exposure. TB screening tests can be falsely negative within the 8 weeks after exposure, so are best obtained 8 weeks after return from travel.

California Adult TB Risk Assessment and User Guide (September 2018)

Page | 2 of 3



TB Screening Surveillance Form**INSTITUTION LOGO****(NAME OF YOUR INSTITUTION)**

Phone # Fax #

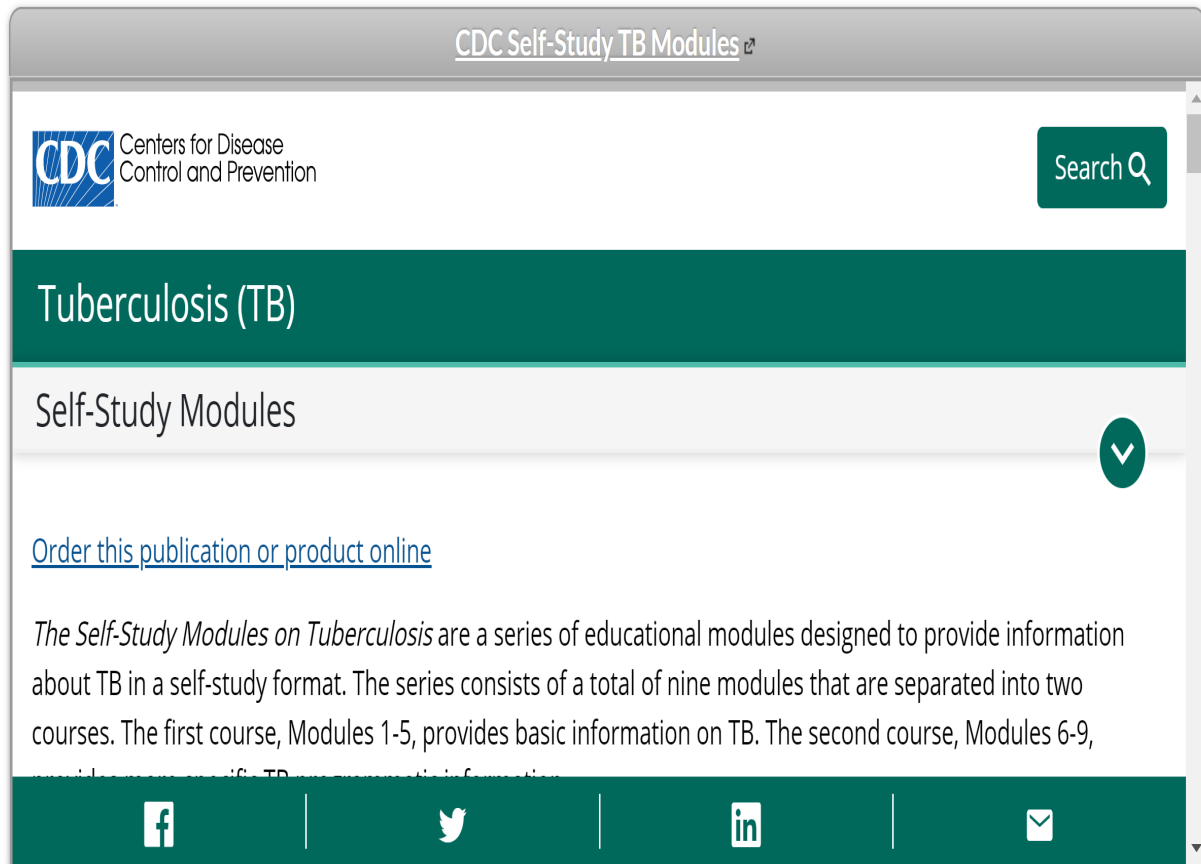
Tuberculosis Surveillance:
For Employees with a History of a Positive TST/Positive IGRA_____
Name (please print)_____
Date_____
DOB_____
Signature_____
Department

The Centers for Disease Control and Prevention (CDC) provides guidelines for preventing the transmission of tuberculosis in health care facilities. These guidelines require annual tuberculosis screening of health care personnel (HCP). Annual Assessment of these employees will include evaluation for the symptoms of tuberculosis.

Do you currently have any of the following symptoms?

- | | | |
|------------------------------|------------------------------|-----------------------------|
| 1. Persistent cough | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2. Coughing up bloody sputum | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3. Unexplained weight loss | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4. Fevers/chills | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 5. Loss of appetite | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 6. Night sweats | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 7. Shortness of breath | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 8. Chest pain | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Reviewed by: _____ Date _____

TB Resources:**CDC Self-Study TB Modules**

URL: <https://www.cdc.gov/tb/education/ssmodules/default.htm>

Tools for Health Care Providers

The screenshot shows a web browser window with the title "Tools for Health Care Providers". The page features the CDC logo and name in the top left, a search bar in the top right, and a large green header with the text "Tuberculosis (TB)". Below this is a section titled "Tools for Healthcare Providers" with a dropdown arrow. The main content area contains a banner with three parts: a photo of a doctor and a patient, a purple box with the text "LATENT TB INFECTION", and a green box with the text "Online Resource Hub Your one-stop-shop for information, guidance & education". To the right of the green box is a microscopic image of purple bacteria. At the bottom, there is a dark green bar with social media icons for Facebook, Twitter, LinkedIn, and Email.

Tools for Health Care Providers

CDC Centers for Disease Control and Prevention

Search Q

Tuberculosis (TB)

Tools for Healthcare Providers

LATENT TB INFECTION

Online Resource Hub
Your one-stop-shop for information,
guidance & education

Facebook Twitter LinkedIn Email

URL: https://www.cdc.gov/tb/education/provider_edmaterials.htm

Intent to Change Practice: CPD Reaction Questionnaire

Please answer each of the following questions by indicating the number that best describes your opinion about the behavior indicated. Some of the questions may appear to be similar, but they do address somewhat different aspects of the behavior stated.

[illegible]

[illegible]

personnel into their practice?							
Scale	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I intend to implement all of the 2019 CDC TB recommendations for healthcare personnel into my practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scale	Useless 1	2	3	4	5	6	Useful 7
Overall, I think that for me implementing all of the 2019 CDC TB recommendations for healthcare personnel into my practice would be:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scale	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
Most people who are important to me in my profession implement all of the 2019 CDC TB recommendations for healthcare personnel into their practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scale	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7

It is acceptable to implement all of the 2019 CDC TB recommendations for healthcare personnel into my practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly Disagree						Strongly Agree
Scale	1	2	3	4	5	6	7
I have the ability to implement all of the 2019 CDC TB recommendations for healthcare personnel into my practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Harmful						Beneficial
Scale	1	2	3	4	5	6	7
Overall, I think that for me implementing all of the 2019 CDC TB recommendations for healthcare personnel into my practice would be:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CPD Reaction Questionnaire Reference:

Légaré F, Borduas F, Freitas A, Jacques A, Godin G, Luconi F, Grimshaw J, and the CPD-KT team (2014). Development of a simple 12-item theory-based instrument to assess the impact of continuing professional development on clinical behavioural intentions. PLoS ONE, 9(3): e91013. doi:10.1371/journal.pone.0091013.

Appendix X**Consent to Use CPD Reaction Questionnaire**

From: [REDACTED]
Sent: Wednesday, December 18, 2019 1:08 PM
To: [REDACTED]
Cc: [REDACTED]
Subject: Re: Marleni Estrella: DNP Student interested in CPD Reaction Questionnaire

[EXTERNAL/UNTRUSTED]

Hi Marleni,

Yes, you can use the tool. I am enclosing the user manual of the questionnaire.

I put you in cc [REDACTED] co-author of the tool.

Do not hesitate if you have any questions,

Happy Holidays time,

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

De : [REDACTED]
Envoy 類 Wednesday, December 18, 2019 8:13:38 AM

Objet : Marleni Estrella: DNP Student interested in CPD Reaction Questionnaire

Good Morning [REDACTED],

Hope your day is off to a great start ☺

The reason for my inquiry is to seek approval for using the CPD Reaction Questionnaire. I was referred to you by Francesca Luconi, one of the investigators for the tool.

I am a current DNP student at Rutgers University, School of Nursing in New Jersey, and I am working on creating an educational module on Tuberculosis for Health Care Providers. I wanted permission to use your tool to capture their intent to change practice after taking my module.

Please let me know what step I need to take to have permission to use your tool.
Thank you so much for your consideration.

Marleni Estrella RN, MS, MPH

Appendix Y

Post-4-week Survey

Post-4-week survey to participants will be sent May 11, 2020, through May 22, 2020, to see if they have implemented at least one recommendation from the CDC TB guidelines into their practice.

Questions

- 1) Have you implemented any of the CDC TB recommendations into your current practice?

Click Yes/No

- 2) What barriers, if any, did you encounter when attempting to implement the new recommendations into practice?

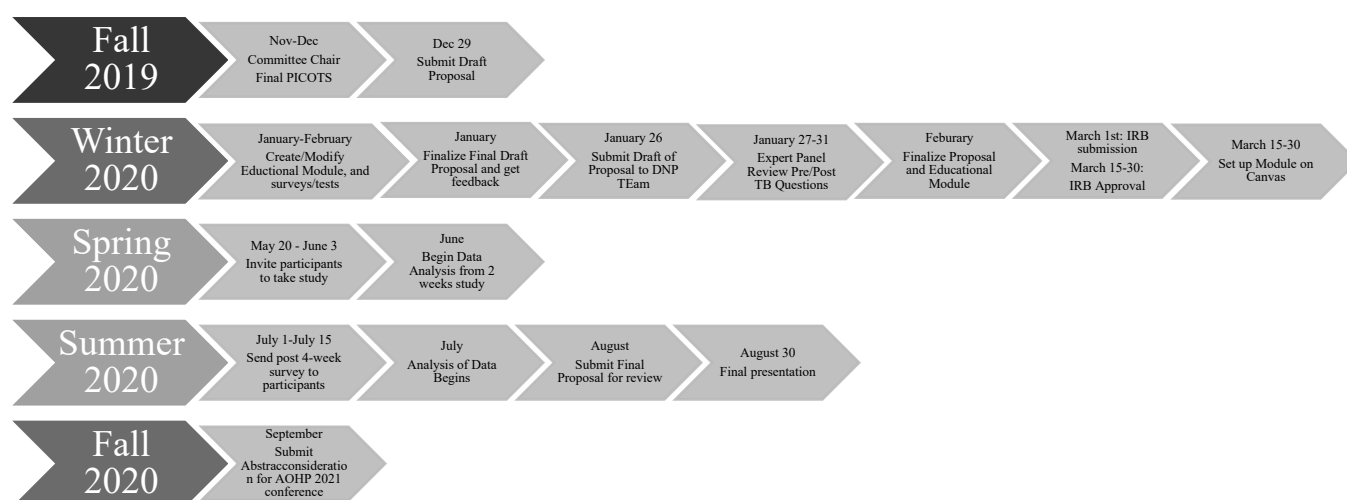
Click all that apply and explain:

- ☐ Lack of such resources as time and commitment.
- ☐ Resistance to change.
- ☐ Lack of senior leadership support or physician champion.
- ☐ Lack of cooperation from other agencies, providers, departments, and facilities.
- ☐ Ineffective teams.
- ☐ Other

- 3) What resources do you feel you would need to implement all the recommendations into your practice? Please Explain.

Appendix Z

Project Timeline



Appendix AA**Project Budget**

Expense	Cost	Total Cost
Online Platform: Canvas	\$171 x 2 semesters (Rutgers Computer Fee)	\$342
One Contact Hour	\$600	\$600
POWTOON Subscription	\$228	\$228
Educational Materials: CDC Self Study TB Modules (1-5)	Free	\$0
2019 Updated CDC TB Recommendations for Health Care Personnel	Free	\$0
Statistician Consultant	\$50 x 2 hours	\$100
Dissemination Poster	\$75	\$75
	Total Cost:	\$1345

Appendix AD

Site Approval Letter



RUTGERS
School of Nursing

Letter of Cooperation

Date: 04/02/2020

Re: Letter of Cooperation For [REDACTED]

Dear Jeanette Manchester,

This letter confirms that that I, as an authorized representative of [REDACTED] allow the PI access to conduct study-related activities at the listed site(s), as discussed with the PI and briefly outlined below, and which may commence when the PI provides evidence of IRB approval for the proposed project.

- **Research Site(s):** [REDACTED]
- **Study Purpose:** This project aims to ensure OHPs are utilizing the most current tuberculosis clinical guidelines to identify, screen accurately, and treat employees at the highest risk of developing active TB disease. The knowledge objective for this project is that by the end of the educational module, OHP will have demonstrated increased TB clinical guideline knowledge, as evidenced by their post-test scores. The learning objective is that by the end of the educational module, OHP will demonstrate an intent to change practice, as evidenced by their Continuing Professional Development (CPD) Reaction Questionnaire scores. The performance objective is that by the end of the educational module, OHP will have initiated the implementation of at least one recommendation into their current practice, as evidenced by their response in the post-4-week follow-up survey.
- **Study Activities:** The interactive educational module was developed using content from the 2019 CDC Updated TB guidelines, and the CDC TB Self-Study Modules, sessions 1-5. It will consist of a pre and post TB test, videos, case studies, and completion of a CPD reaction questionnaire. The interactive educational TB module will have eleven parts: 1) consent, 2) pre-test TB Knowledge test, 3) Tuberculosis 101, Part One, 4) Video, 5) TB 101, Part Two 6) Highlights of the 2019 CDC TB recommendations, 7) Video, 8) Three POWTOON case studies, 9) post-test TB knowledge test, 10) CPD questionnaire, and 11) TB resources. A follow-up survey will be sent via e-mail four weeks after completion of the module to self-report any changes made in their current practice to implement the CDC TB recommendations.
- **Subject Enrollment:** Inclusion criteria includes being an active member of AOHP region 4. Exclusion criteria will be men and women who are inactive members of AOHP and part of regions 1, 2, 3, or 5. Using Raosoft, Inc. (2004) for an a priori power analysis to calculate sample size, having a 5% margin of error and 95% confidence level, the necessary sample size is 55 participants. As a result, the total sample size needed is 55 participants.
- **Site(s) Support:** Access to [REDACTED] members will be done on her behalf by an administrator of the organization to avoid any sharing of identifiers.
- **Data Management:** The data will be securely stored in a password-protected computer in the Rutgers Biomedical Health Sciences building located at 65 Bergen Street, Newark, NJ 07103. All data will be locked, following the RU encryption process. The data collected will be tracked using Microsoft Excel for analysis. A secure Qualtrics server will collect and store the data in the password-protected electronic format. This server ensures that all responses remain anonymous, as it does not collect information such as name, e-mail, or IP address. No names or identifying information will be included in any publications or presentations, and all responses to the questionnaire will remain confidential. Subject confidentiality will be maintained, and only the PI will have access to the information from the pre and post-tests.
- **Other:** N/A
- **Anticipated End Date:** July 1, 2020

We understand that this site's participation will only take place during the study's active IRB approval period. All study related activities must cease if IRB approval expires or is suspended. I understand that any activities involving Personal Private Information or Protected Health Information may require compliance with HIPAA Laws and Rutgers Policy.

Our organization agrees to the terms and conditions stated above. If we have any concerns related to this project, we will contact the PI. For concerns regarding IRB policy or human subject welfare, we may also contact the Rutgers IRB (see orra.rutgers.edu/happ).

Site Approval Letter



Regards,

[Please ask the representative authorized to grant permission to use the site for research to provide the following]:

